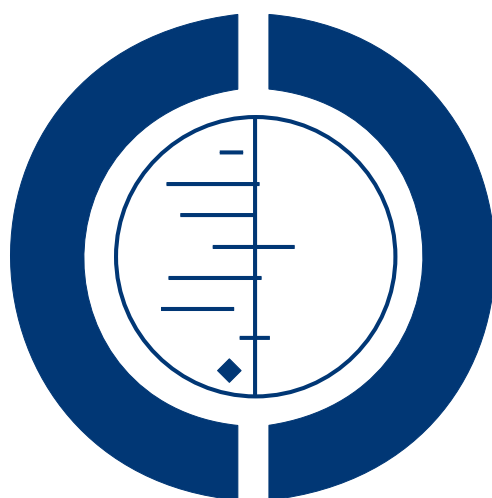


Media campaigns for the prevention of illicit drug use in young people (Review)

Ferri M, Allara E, Bo A, Gasparrini A, Faggiano F



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Media campaigns for the prevention of illicit drug use in young people

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ABSTRACT

Background

Substance-specific mass media campaigns which address young people are widely used to prevent illicit drug use. They aim to reduce use and raise awareness of the problem.

Objectives

To assess the effectiveness of mass media campaigns in preventing or reducing the use of or intention to use illicit drugs amongst young people.

Search methods

We searched the Cochrane Central Register of Controlled Trials (CENTRAL, *The Cochrane Library* 2013, Issue 1), including the Cochrane Drugs and Alcohol Group's Specialised Register; MEDLINE through PubMed (from 1966 to 29 January 2013); EMBASE (from 1974 to 30 January 2013) and ProQuest Dissertations & Theses A&I (from 1861 to 3 February 2013).

Selection criteria

Cluster-randomised controlled trials, prospective and retrospective cohort studies, interrupted time series and controlled before and after studies evaluating the effectiveness of mass media campaigns in influencing drug use, intention to use or the attitude of young people under the age of 26 towards illicit drugs.

Data collection and analysis

We used the standard methodological procedures of The Cochrane Collaboration.

Main results

We included 23 studies involving 188,934 young people, conducted in the USA, Canada and Australia between 1991 and 2012. Twelve studies were randomised controlled trials (RCT), two were prospective cohort studies (PCS), one study was both a RCT and a PCS, six were interrupted time series and two were controlled before and after (CBA) studies. The RCTs had an overall low risk of bias, along

with the ITS (apart from the dimension 'formal test of trend'), and the PCS had overall good quality, apart from the description of loss to follow-up by exposure.

Self reported or biomarker-assessed illicit drug use was measured with an array of published and unpublished scales making comparisons difficult. Pooled results of five RCTs (N = 5470) show no effect of media campaign intervention (standardised mean difference (SMD) -0.02; 95% confidence interval (CI) -0.15 to 0.12).

We also pooled five ITS studies (N = 26,405) focusing specifically on methamphetamine use. Out of four pooled estimates (two endpoints measured in two age groups), there was evidence of a reduction only in past-year prevalence of methamphetamine use among 12 to 17 years old.

A further five studies (designs = one RCT with PCS, two PCS, two ITS, one CBA, N = 151,508), which could not be included in meta-analyses, reported a drug use outcome with varied results including a clear iatrogenic effect in one case and reduction of use in another.

Authors' conclusions

Overall the available evidence does not allow conclusions about the effect of media campaigns on illicit drug use among young people. We conclude that further studies are needed.

PLAIN LANGUAGE SUMMARY

Do media campaigns prevent young people from using illicit drugs?

Media campaigns to prevent illicit drug use are a widespread intervention. We reviewed 23 studies of different designs involving 188,934 young people and conducted in the United States, Canada and Australia. The studies tested different interventions and used several questionnaires to interview the young people about the effects of having participated in the studies brought to them. As a result it was very difficult to reach conclusions and for this reason we are highlighting the need for further studies.

BACKGROUND

Health promotion, mass media campaigns are initiatives typically undertaken by national authorities which use communication media to disseminate information about, for example, health or threats to it and to persuade people to adopt behavioural changes. Mass media campaigns are implemented via television and radio broadcasts, newspaper or magazine advertisements, billboards and road posters. They can also use colourful advertisements and brochures available for travellers on buses and the metro and, more recently, a broad range of available technology including the Internet, mobile phone short messages and email lists. Media campaigns can be of short or longer duration and sometimes they encompass several consequent rounds of delivery. They can be standalone interventions or be integrated into complex social marketing programmes.

Mass media campaigns for the prevention of illicit drug use are very common worldwide but only few campaigns have been formally evaluated (Wammes 2007). Furthermore, most of those evalua-

tions (Rossi 2003) assessed only the process (in terms of understanding, retention and appeal of the messages) and the very few that assessed outcomes (in terms of behaviours of use) often found weak or counterproductive effects.

Description of the condition

Initiation of use of all substances typically occurs during the teens or early years of adulthood (ESPAD 2011; UNODC 2012). Since the neurological or psychological factors that may influence how and whether addiction develops are unknown, "even occasional drug use can inadvertently lead to addiction" (Leshner 1997; Leshner 1999). Indeed, research has found that drug use leading to dependence usually starts in adolescence (Camí 2003; McLelland 2000; Swendsen 2009).

Since the neurological and social mechanisms of dependence are similar for all addictive substances, a common view, therefore, is that prevention should focus on an age group (teenagers) rather

than specific substances (Ashton 2003; Leshner 1997; Nestler 1997; Wise 1998).

Description of the intervention

The mass media (TV, Internet, radio, newspapers, billboards) have increasingly been used as a way of delivering preventive health messages. They have the potential to modify the knowledge or attitudes of a large proportion of the community (Redman 1990). They also have the potential to reach large populations of suscepti-

ble individuals and groups that may be difficult to access through more traditional approaches. In addition, in terms of the per capita cost of prevention messages, they are relatively inexpensive (Brinn 2010).

This review is limited to mass media campaigns that aim to prevent the uptake of illicit drug use (both in general or that of specific substances) or to reduce or stop the use of illicit drugs. It excludes mass media campaigns that aim to promote safer or less harmful use of drugs.

The following table summarises the main characteristics of most mass media campaign.

Category	Objective	Target audience	Details
Information campaign	Warning	General or youth population	Information about the dangers and risks of a range of illicit substances
	Empowerment	General population, especially parents	Information about how to contribute to drug prevention through your own behaviour
			Information about where and how to seek support, counselling and treatment regarding illicit drug use, especially for your children
		Youth population	Information about where and how to seek support, counselling and treatment regarding illicit drug use
	Support	General population	Information about existing prevention interventions or programmes in communities, in schools or for families in order to strengthen community involvement and support for them
Social marketing campaign	Correct erroneous normative beliefs	General or youth population	Declared purpose is to correct erroneous normative beliefs about the extent and acceptance of drug use in peer populations ("you're not weird if you don't use because 80% of your peers don't either")
	Setting or clarifying social and legal norms	General or youth population	Declared purpose is to deglamorise and demystify drug use and related behaviour (e.g. drug driv-

(Continued)

			ing) and to explain the rationale of community norms and control measures
	Setting positive role models or social norms	General or youth population	Declared purpose is to promote non-drug-use-related prototypes of lifestyles, behaviour and personality

How the intervention might work

Most campaigns are based on a limited number of theoretical models, such as the health belief model (lack of knowledge about health harms may lead to drug use), the theory of planned behaviour (drug use is a rational decision due to attitude toward drugs, perceived social norms and perceived control over drugs) and the social norms theory (overrated perception of prevalence among peers may lead to drug use). In summary, the theories most frequently used as base for anti-drugs mass media campaigns are:

- **Health belief model.** This model (Glanz 2002) is based on the concept that the perceived susceptibility to and the severity of the disease and the perceived benefits of action to avoid disease are the key factors in motivating a positive health action. So, based on some elements of the model, the provision of factual information about the negative effects and dangers of drugs should deter use or prevent substance abuse by creating negative attitudes towards drug use.

Intervention based on this theory: information campaign

- **Theory of reasoned action/theory of planned behavior.** The theory of reasoned action/theory of planned behaviour (Ajzen 1991) proposes that an individual's behavioural intentions have three constituent parts: the individual's attitude towards the behaviour, the social norms as perceived by the individual and the perceived control over the behaviour. Individuals may weight these differently in assessing their behavioural intentions. According to this model, drug use is a consequence of a rational decision (intention), which is based on the belief about drug use, the social norms towards drug use and the belief about control over the behaviour.

Intervention based on this theory: social marketing campaigns with the objective of setting or clarifying social and legal norms as well as information campaigns

- **Social norms theory.** This theory (Perkins 1986) states that "our behaviour is influenced by incorrect perceptions of how other members of our social groups think and act" (Berkowitz 2004, p. 5). Campaigns based on this theory, which are also referred to as 'normative education', challenge the

misconception that many adults and most adolescents use drugs. For example, students are provided with information on the prevalence - from either national or local surveys - of drug use among their peers so that they can compare their own estimates of drug use with the actual prevalence.

- Related to this is the **Super-Peer Theory** (Strasburger 2008). The Super-Peer Theory postulates that media portrayal of drug use (or casual sex or violence) influences the susceptible teens.

Intervention based on this theory: social marketing campaigns that aim to correct erroneous normative beliefs

- **Social learning theory.** The social learning theory (Bandura 1977) postulates that personality is an interaction between environment, behaviours and the psychological processes of an individual. Also referred to as observational learning, the theory of social learning places an emphasis on observing and modelling other people's behaviours, attitudes and emotional reaction.

Intervention based on this theory: social marketing campaigns setting positive role models or social norms

Why it is important to do this review

Bühler and Kröger (Bühler 2006) conclude their review of reviews with the recommendation to use media campaigns only as supporting measures and not as a single strategy alone, whereas Hawks 2002, in line with the review of reviews by the Health Development Agency (HDA) (McGrath 2006), concludes that "the use of the mass media on its own, particularly in the presence of other countervailing influences, has not been found to be an effective way of reducing different types of psychoactive substance use. It has however been found to raise information levels and to lend support to policy initiatives".

Despite concerns in reviews about poor effectiveness and possible harm of anti-drug prevention activities (Faggiano 2008), media campaigns are still very popular worldwide and in European Union member states (EMCDDA 2009).

An assessment of both positive and negative (iatrogenic) effects is important for ethical reasons as well, because mass media campaigns - unlike other social or health interventions - are imposed on populations that have neither asked for nor explicitly consented to the intervention (Sumnall 2007). A systematic review of all the studies assessing media campaign interventions aimed at preventing illicit drug use in young people is therefore necessary in order to inform future strategies and to help design campaigns that avoid harm. Such a review will also contribute to the identification of further areas for research.

OBJECTIVES

To assess the effectiveness of mass media campaigns in preventing or reducing the use of or intention to use illicit drugs amongst young people.

METHODS

Criteria for considering studies for this review

Types of studies

Any study that evaluates the effectiveness of mass media campaigns in influencing drug use, intention to use or the attitude of young people towards illicit drugs.

1. Randomised controlled trials in which the unit of randomisation is an individual or a cluster (the school, community or geographical region)
2. Controlled trials without randomisation allocating schools, communities or geographical regions
3. Prospective and retrospective cohort studies
4. Interrupted time series
5. Controlled before and after studies

Types of participants

Young people under the age of 26.

Types of interventions

Experimental intervention

The following definition was adopted by a similar Cochrane review (Brinn 2010): "Mass media is defined here as channels of communication such as television, radio, newspapers, billboards, posters, leaflets or booklets intended to reach large numbers of

people and which are not dependent on person to person contact". To be included in the review, a study needs to assess a mass media campaign explicitly aimed at influencing people's drug use, intention to use or attitude towards illicit drugs use.

Control intervention

- 1) No intervention; 2) other types of communication interventions such as school-based drug abuse prevention programmes (Faggiano 2008); 3) community-based prevention programmes; 4) lower exposure to intervention; 5) time before exposure to intervention.

Types of outcome measures

Primary outcomes

1. Self reported or biomarker-assessed illicit drug use

Secondary outcomes

1. Intentions not to use/to reduce use/to stop use
2. Attitudes towards illicit drug use
3. Knowledge about the effects of illicit drugs on health
4. Understanding of intended message and objectives
5. Perceptions (including perceptions of peer norms and perceptions about illicit drug use)
6. Adverse effects induced by the campaign (reactance, i.e. a reaction to contradict the prevailing norms of rules and positive descriptive norms, i.e. increased perception that drug use in peer population is common, normal or acceptable)

Search methods for identification of studies

Electronic searches

We obtained relevant trials from the following sources:

1. Cochrane Central Register of Controlled Trials (CENTRAL, *The Cochrane Library* 2013, Issue 1) which includes the Cochrane Drugs and Alcohol Group's Specialised Register;
2. MEDLINE through PubMed (freely accessible at <http://www.ncbi.nlm.nih.gov/pubmed/>) (from 1966 to 29 January 2013);
3. EMBASE (from 1974 to 30 January 2013);
4. ProQuest Dissertations & Theses A&I (from 1861 to 3 February 2013).

We compiled detailed search strategies for each database searched. These were based on the search strategy developed for PubMed but revised appropriately for each database to take account of differences in controlled vocabulary and syntax rules.

The search strategy for:

1. CENTRAL is shown in [Appendix 1](#);
2. PubMed is shown in [Appendix 2](#);
3. EMBASE is shown in [Appendix 3](#);
4. ProQuest Dissertations & Theses A&I was: *(media campaigns OR mass media) AND illicit drug* AND prevent**.

We searched for ongoing clinical trials and unpublished studies on the following Internet sites:

1. <http://www.controlled-trials.com>;
2. <http://apps.who.int/trialsearch/>;
3. <http://clinicaltrials.gov/>;
4. <https://eudract.emea.europa.eu/>.

Searching other resources

We also searched other sources to identify relevant studies. We assessed conference proceedings that were likely to contain relevant material and contacted the authors. We contacted investigators or experts in the field to seek information on unpublished or incomplete trials. We also reviewed EMCDDA National Focal Points Annual National Reports for any description of relevant studies conducted in Europe.

We used the first studies identified as fulfilling the inclusion criteria to inspect the MeSH terms and to integrate the search strategies. Moreover, we used the “related articles” function of PubMed in a “capture-recapture method” to validate the inclusiveness of the search strategy.

We did not apply any language restriction.

Data collection and analysis

Selection of studies

Two review authors (EA and MF) inspected the search hits by reading the titles and the abstracts. We obtained each potentially relevant study identified in the search in full text and at least two review authors assessed studies for inclusion independently. In case of doubts as to whether a study should have been included, this was resolved by discussion between the review authors. We collated and assessed multiple publications as one study.

Data extraction and management

Two review authors (EA and AB) independently extracted data and input relevant information into Review Manager ([Review Manager 2012](#)) for meta-analysis. Two review authors (MF and FF) assessed the theoretical background of the campaigns. We discussed and solved every step by consensus. We produced a narrative synthesis of the key findings along with a meta-analysis of studies which used appropriate measures.

Assessment of risk of bias in included studies

Four review authors (EA, AB, MF and FF) performed quality assessments independently. We discussed and solved any disagreement by consensus. We uploaded final assessments into Review Manager. In order to obtain more information on the criteria for reducing risk of bias, we contacted the authors of most of the studies.

To assess RCTs we followed the criteria recommended by the *Cochrane Handbook for Systematic Reviews of Interventions* ([Higgins 2011](#)). The recommended approach for assessing risk of bias in studies included in Cochrane Reviews is a two-part tool, addressing seven specific domains, namely sequence generation and allocation concealment (selection bias), blinding of participants and providers (performance bias) blinding of outcome assessor (detection bias), incomplete outcome data (attrition bias) selective outcome reporting (reporting bias) and other source of bias. The first part of the tool involves describing what was reported to have happened in the study. The second part of the tool involves assigning a judgement relating to the risk of bias for that entry, in terms of low, high or unclear risk. The domains of sequence generation and allocation concealment (avoidance of selection bias) were addressed in the tool by a single entry for each study. Blinding of participants might not be applicable for this type of intervention, and we therefore considered blinding of personnel and outcome assessors (avoidance of performance bias and detection bias). We considered a study to have low risk of bias if the data were obtained with an anonymous questionnaire or administered by computer. We considered incomplete outcome data (avoidance of attrition bias) for all outcomes.

For ITS studies we used the tools developed by the Effective Practice and Organization of Care (EPOC) Group ([Appendix 4](#)). For cohort studies we used the SIGN Quality Criteria described in [Appendix 5](#).

Measures of treatment effect

We intended to analyse dichotomous outcomes (such as intention to use or actual use of illicit substances) by calculating the risk ratio (RR) or odds ratio (OR) for each trial and express the uncertainty in each result with their 95% confidence intervals. We only found continuous outcome measures which we analysed by calculating the standardised mean difference (SMD) with its corresponding 95% confidence intervals.

Unit of analysis issues

In the case of cluster-randomised trials the unit of analysis is either the school or the town. We stated at protocol level that in this case we would have taken into account the criteria for assessing bias in cluster-randomised trials as described in the *Cochrane Handbook*. We inflated each arm's standard deviation for two studies ([Slater 2006](#); [Newton 2010](#)) by multiplying it by the study design effect,

a coefficient which takes into account the average cluster size and the study intra-class correlation.

Dealing with missing data

Where needed, we contacted the authors of the studies for integration of any possible missing data.

Assessment of heterogeneity

The presence of heterogeneity between the trials was tested using the I^2 statistic and the Chi^2 test. A P value of the I^2 statistic higher than 0.50 and a P value of the Chi^2 test lower than 0.10 suggests that there is some evidence of heterogeneity.

Assessment of reporting biases

We intended to use funnel plots (plots of the effect estimate from each study against the standard error) to assess the potential for bias related to the size of the trials, which could indicate possible publication bias. In fact we did not reach the minimum number of (10) studies included in the meta-analysis which is suggested as sufficient for conducting a funnel plot ([Higgins 2011](#)).

Data synthesis

We intended to carry out a meta-analysis by combining RR/OR or the SMD where possible. We performed a meta-analysis of the RCTs using a random-effect model in order to take into consideration the heterogeneity among studies.

For the studies evaluating the Meth Project ([Colorado Meth 2011](#); [Georgia Meth 2011](#); [Hawaii Meth 2011](#); [Idaho Meth 2010](#); [Wyoming Meth 2011](#)) we performed a separate meta-analysis. An interrupted time series (ITS) design was applied for estimating the differences in prevalence of methamphetamine use before and after the Meth Project intervention, adjusting for any underlying temporal trend. Statistical models were based on multilevel mixed effects logistic regression, with State as a random intercept modelling baseline log odds of methamphetamine use to vary randomly across states. The relatively few data points did not allow exploring of more complex models, e.g. the temporal trend could not be assumed to vary randomly across states. The fixed part of the final model assumes (i) a different baseline by age group, but similar among states; (ii) a linear temporal trend homogeneous across states; (iii) an effect of the intervention differing by age group but constant across time and occurring immediately after the intervention. The model may be written as $\text{logit}(\text{use}_{ij}) = \beta_0 + u_{0j} + \beta_1 \text{time}_i + \beta_2 \text{interv}_i + \beta_3 \text{age}_i + \beta_4 \text{age} \times \text{interv}_i + \epsilon_{ij}$, with use

as prevalence of methamphetamine use, time as a continuous variable, intervention and age as two-level categorical variables and J indicating state. The exponentiated coefficient β_2 is interpretable as the ratio between the odds of using methamphetamine after (numerator) and before (denominator) the intervention ([Gilmour 2006](#)). The model was fitted separately for past-month and past-year use of methamphetamine. Data points regarding lifetime use of methamphetamine were not analysed.

Subgroup analysis and investigation of heterogeneity

We intended to perform stratified meta-analysis in order to assess the differential effect of the campaigns based on different theoretical approaches. However the impact of media campaigns may be mediated by the sub-cultural environment and, in particular, by the attitude towards substance use in a given culture. Therefore, at protocol level it was anticipated that subsets of studies were to be analysed by characteristics of target participants (regional location, users versus non-users etc.) whenever possible. Studies could also be compared by type of campaign, based on different theoretical approaches. We did not reach the number of studies sufficient to perform any type of sub-set analysis.

Sensitivity analysis

To incorporate the assessment of risk of bias in the review process we first plotted the intervention effect estimates against the assessment of risk of bias. We subsequently inspected the results stratified for risk of bias and we did not find significant associations between measure of effect and risk of bias. We therefore decided to not include the 'Risk of bias' assessment in the meta-analysis and to discuss it narratively in the results section. The items considered in the sensitivity analysis were the random sequence, blinding of personnel and outcome assessors, and selective reporting.

RESULTS

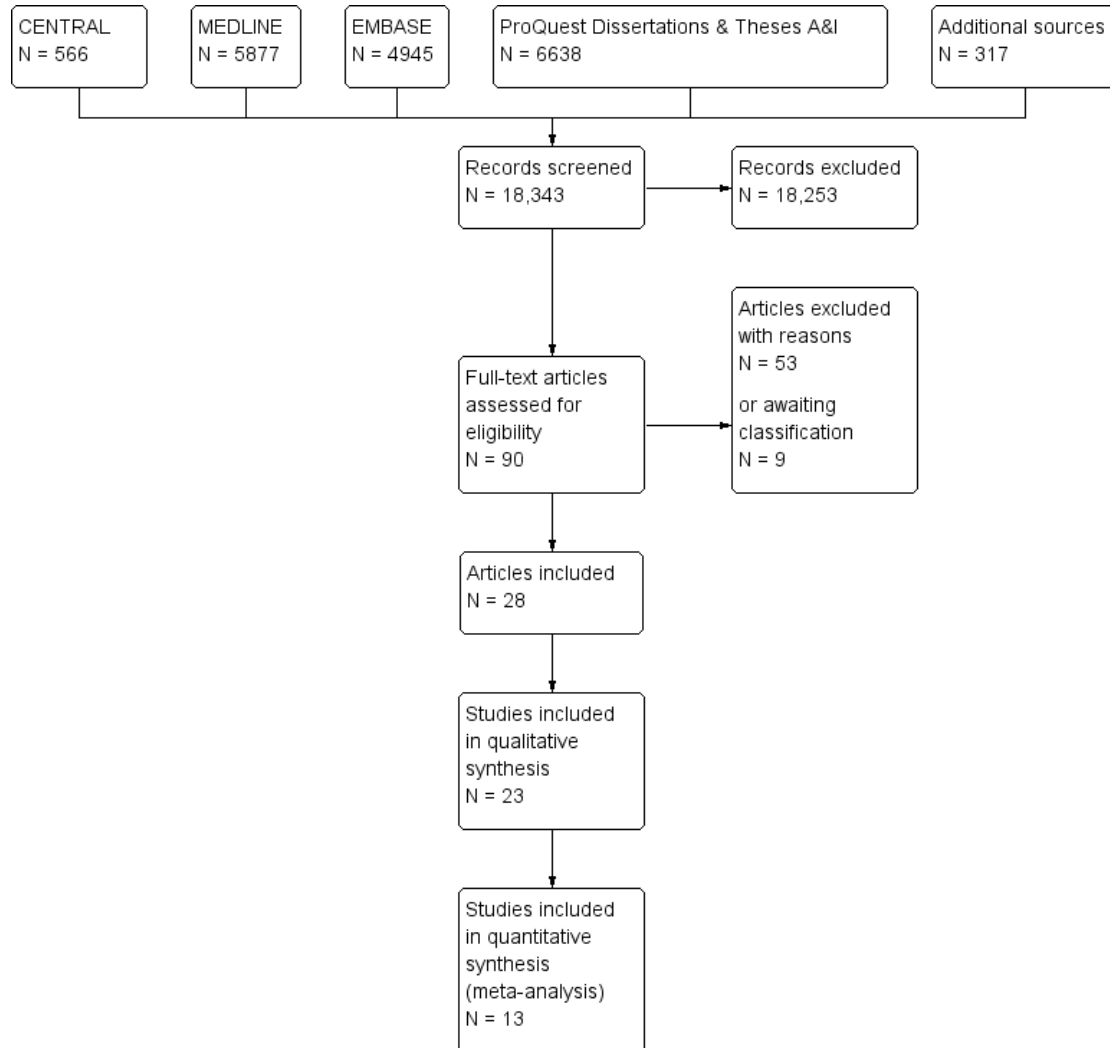
Description of studies

See: [Characteristics of included studies](#), [Characteristics of excluded studies](#) and [Characteristics of studies awaiting classification](#).

Results of the search

The study flow chart is presented in [Figure 1](#).

Figure 1. Study flow diagram. Please note that some studies include more than one article. This explains why there are 23 included studies out of 28 included articles.



Search sources

On 29 January 2013 we performed a PubMed (MEDLINE) search as described in [Appendix 2](#), which identified 5877 records. On 30 January 2013 we searched CENTRAL which returned 566 results and EMBASE which gave 4945 records. On 3 February 2013 we also performed a ProQuest 'Dissertations & Theses A&I' search which returned 6638 records.

We also obtained additional records (N = 317) from one single paper ([Hornik 2006](#)) using PubMed's 'Similar articles' feature, and from papers extracted from 10 reviews ([Battjes 1985](#); [Berberian 1976](#); [Hailey 2008](#); [Kumpfer 2008](#); [Romer 1994](#); [Romer 1995](#); [Schilling 1990](#); [Stephenson 2003b](#); [Wakefield 2010](#); [Werb 2011](#)),

three reports ([EMCDDA 2010](#); [Know the Score 2007](#); [NCI 2008](#)) and three book chapters ([Crano 2001](#); [Flay 1983](#); [Moskowitz 1983](#)).

Screening

We independently screened records from each source search, i.e. no automatic removal of duplicates was used because of the risk of false-positive duplicates. Therefore, we screened 18,343 titles and abstracts. Of them, we excluded 18,253 records (99.5%) as obviously irrelevant.

Full-text analysis

We examined the full-text articles of the remaining 90 records. Of them, 62 records were either excluded ($N = 53$) due to ineligibility of intervention type, participant age and reported outcome, or set in a pending status ($N = 9$) due to missing information. We contacted authors whenever possible.

Twenty-eight records corresponded to 23 unique studies which were included in this review. A subset of 13 studies (eight RCTs and five ITS) could also be included in meta-analyses, mostly thanks to personal communication with some authors who provided us with unpublished data and additional reports.

Included studies

Study design

Out of 23 unique studies, 12 were randomised controlled trials (RCT) (Czyzewska 2007; Fang 2010; Fishbein 2002; Kelly 1992; Lee 2010; Newton 2010; Palmgreen 1991; Polansky 1999; Schwinn 2010; Slater 2011; Yzer 2003; Zhao 2006), two were prospective cohort studies (PCS) (Hornik 2006; Scheier 2010), one study was both a RCT and a PCS (Slater 2011), six were ITS (Carpenter 2011; Colorado Meth 2011; Hawaii Meth 2011; Idaho Meth 2010; Palmgreen 2001; Wyoming Meth 2011) and two were before and after (CBA) studies (Georgia Meth 2011; Miller 2000).

Population

No study enrolled subjects younger than 10 years old. Twenty-one studies included subjects older than 10 and younger than 20 years old. Two studies included subjects older than 20 years old and younger than this review's limit of 26 years old; one of them included only people older than 20 (Miller 2000) and one people aged 18 to 22 (Palmgreen 1991).

Three studies included only girls (Fang 2010; Kelly 1992; Schwinn 2010). The others did not specify any sex-related selection criteria. Two studies focused on specific ethnic or racial groups: one on Mexican-American boys and girls (Polansky 1999) and one on Asian-American girls (Fang 2010). The remaining studies did not use ethnicity, racial or socioeconomic characteristics to define the selection criteria.

Intervention

Mass media components

Eight studies evaluated standalone TV/radio commercials (Czyzewska 2007; Fishbein 2002; Kelly 1992; Palmgreen 1991; Palmgreen 2001; Polansky 1999; Yzer 2003; Zhao 2006) and four studies evaluated standalone Internet-based interventions (Fang 2010; Lee 2010; Newton 2010; Schwinn 2010). Eleven studies evaluated multi-component interventions, three regarding TV/radio and printed advertising (Miller 2000; Slater 2006; Slater 2011) and eight regarding TV/radio commercials, printed advertisements and Internet advertising (Carpenter 2011; Hornik 2006; Scheier 2010 and the five Meth Projects). No study evaluated interventions using standalone printed advertising.

Three studies added a school-based drug prevention curriculum (Slater 2006; Slater 2011) or a combination of peer education, computer resources, campus policy and campus-wide events (Miller 2000) to the mass media component(s).

Setting

Eleven studies were conducted in only one setting: eight studies in a school/college setting (Czyzewska 2007; Fishbein 2002; Kelly 1992; Lee 2010; Miller 2000; Newton 2010; Polansky 1999; Yzer 2003), two in a community setting (Fang 2010; Schwinn 2010) and one in a national/statewide setting (Palmgreen 2001).

Twelve studies were conducted in multiple settings: three in school and community settings (Palmgreen 1991; Slater 2006; Zhao 2006), eight in community and national settings (Carpenter 2011; Hornik 2006; Scheier 2010 and the five Meth Projects), while one (Slater 2011) reported evaluations of two similar but distinct interventions - one implemented in a school and community setting and one aired to the whole nation.

Comparison group

Fourteen studies compared one or more mass media interventions with no intervention (Fang 2010; Fishbein 2002; Lee 2010; Miller 2000; Palmgreen 2001; Schwinn 2010; Slater 2006; Yzer 2003; Zhao 2006 and the five Meth projects). Four studies compared higher to lower exposure to a mass media intervention (Carpenter 2011; Hornik 2006; Scheier 2010; Slater 2011). Five studies compared anti-drug advertisements with another intervention (Czyzewska 2007; Kelly 1992; Newton 2010; Palmgreen 1991; Polansky 1999). Two studies (Palmgreen 1991; Yzer 2003) had different intervention arms comparing either another intervention or no intervention. For details of control interventions see the table [Characteristics of included studies](#).

The following table summarises the interventions evaluated and the exposure of the comparison groups, as well as the theories underlying the interventions.

Studies	Ex- plicit under- pinning the- ory	Intervention			Comparison group		
		Inter- net-based in- tervention	PSA (public service - TV/ radio) adver- tisements	Printed ad- vertisement	No interven- tion	Lower expo- sure to inter- vention	Other inter- vention/dif- ferent combi- nation of same inter- vention
Palmgreen 1991	In- fluence of sen- sation-seeking on drug use		X				X
Kelly 1992	Role of discus- sion on atti- tudes and opinions		X				X
Polansky 1999	Decision the- ory		X				X
Miller 2000	Self regulation theory		X	X	X		
Palmgreen 2001	In- fluence of sen- sation-seeking on drug use		X		X		
Fishbein 2002	Beliefs, norms or self efficacy		X		X		
Yzer 2003	The- ories of behav- ioral change: persuasion ef- fects		X		X		X
Slater 2006	Social-eco- logical frame- work (norms and expec- tations influ- ence drug use)		X	X	X		
Zhao 2006	Normative be- liefs		X		X		

(Continued)

Czyzewska 2007	Reactance theory		X				X
Hornik 2006	Unclear	X	X	X		X	
Scheier 2010	Social marketing	X	X	X		X	
Schwinn 2010	Social learning theory	X			X		
Lee 2010	Readiness to change	X			X		
Fang 2010	Family-oriented	X			X		
Newton 2010	Social influence approach	X					X
Idaho Meth 2010	Perception of risk and perception of social disapproval are correlated with drug consumption	X	X	X	X		
Colorado Meth 2011							
Georgia Meth 2011							
Hawaii Meth 2011							
Wyoming Meth 2011							
Slater 2011	Autonomy and aspiration perceptions as mediators marijuana use		X	X		X	
Carpenter 2011	Unclear; evaluated many heterogeneous mass media campaigns	X	X	X		X	

Outcome

The sum of studies described in this paragraph exceeds the number of included studies because many studies measured more than one outcome.

Sixteen studies measured the effect of mass media campaigns on illicit drugs use. Thirty-six studies reported the following secondary outcomes (seven were without primary outcomes):

- seven studies: intentions not to use/to reduce use/to stop use;
- 15 studies: attitudes towards illicit drug use;
- two studies: knowledge about the effects of illicit drugs on health;
- one study: understanding of intended message and objectives;
- 11 studies: perceptions (including perceptions of peer norms and perceptions about illicit drug use).

Country

Twenty-one studies were conducted in the USA, one in the USA and Canada (Schwinn 2010), and one in Australia (Newton 2010).

Duration

No follow-up was described, or was applicable, for seven studies (Carpenter 2011; Czyzewska 2007; Fishbein 2002; Palmgreen

1991; Polansky 1999; Yzer 2003; Zhao 2006). Follow-up was shorter than 12 months for four studies (Fang 2010; Kelly 1992; Lee 2010; Schwinn 2010), and longer than or equal to 12 months for the remaining 12 studies.

Excluded studies

Several thousand studies were excluded after screening their title and abstract because they did not meet the inclusion criteria. Fifty-three studies required closer scrutiny and are listed in the [Characteristics of excluded studies](#) table.

Four were excluded because the population studied did not meet the inclusion criteria; nine studies included interventions different from our inclusion criteria. The remainder were excluded because the study design did not meet the inclusion criteria.

Risk of bias in included studies

Randomised controlled trials (RCTs)

Approximately half of the included studies are randomised and quasi-randomised controlled trials. One of them is a mixed RCT-cohort study (Slater 2011). The results of their 'Risk of bias' assessments are presented in [Figure 2](#) and [Figure 3](#) and described in detail in [Table 1](#).

Figure 2. Randomised controlled trial 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

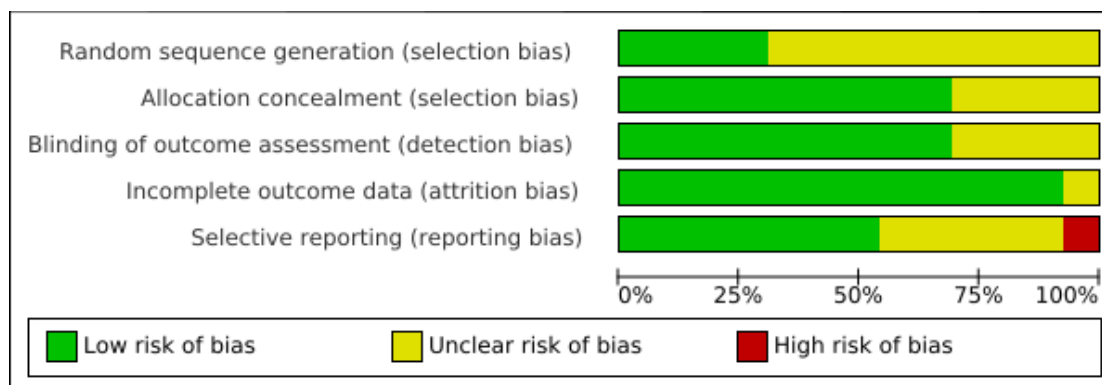


Figure 3. Randomised controlled trial 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)
Czyzewska 2007	?	+	+	+	?
Fang 2010	?	+	+	+	?
Fishbein 2002	?	?	+	+	+
Kelly 1992	?	?	?	+	+
Lee 2010	+	+	+	+	?
Newton 2010	+	+	+	+	?
Palmgreen 1991	?	?	?	+	+
Polansky 1999	?	?	+	?	+
Schwinn 2010	?	+	+	+	-
Slater 2006	?	+	?	+	+
Slater 2011	+	+	?	+	+
Yzer 2003	+	+	+	+	+
Zhao 2006	?	+	+	+	?

Overall the quality of the included RCTs is acceptable: the stronger dimension is the consideration of risk of attrition bias (incomplete data addressed in the discussion) and the weaker dimension the risk of selection bias (unclear description of method for randomisation). More than half of the studies were clearly free of selective outcome reporting. In one case ([Schwinn 2010](#)) there was a clear indication of potential high risk of reporting bias.

Other potential sources of bias

Ecological factors are likely to interfere with the effect of a me-

dia campaign. These factors can include exposures to other media campaigns (advertisements), films or mass media debates directly addressing illicit drugs or other factors acting indirectly (for example, a popular singer who dies from an overdose).

Interrupted time series (ITS) and before and after studies (CBA)

Six studies are ITS and two studies are CBA. The results of their 'Risk of bias' assessments are presented in [Figure 4](#) and [Figure 5](#).

Figure 4. Interrupted time series 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies.

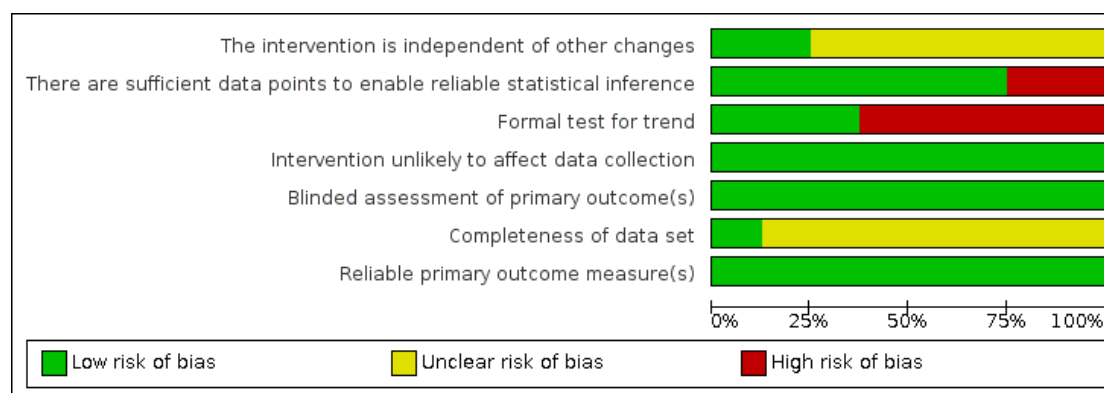


Figure 5. Interrupted time series 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.

	The intervention is independent of other changes	There are sufficient data points to enable reliable statistical inference	Formal test for trend	Intervention unlikely to affect data collection	Blinded assessment of primary outcome(s)	Completeness of data set	Reliable primary outcome measure(s)
Carpenter 2011	+	-	+	+	+	?	+
Colorado Meth 2011	?	+	-	+	+	?	+
Georgia Meth 2011	?	+	-	+	+	?	+
Hawaii Meth 2011	?	+	-	+	+	?	+
Idaho Meth 2010	?	+	-	+	+	?	+
Miller 2000	+	-	+	+	+	+	+
Palmgreen 2001	?	+	+	+	+	?	+
Wyoming Meth 2011	?	+	-	+	+	?	+

Overall the studies reported sufficient data points to enable reliable statistical inferences; they also had good strategies to ensure anonymous or computer-administered questionnaires and to ensure that interventions did not affect data collection. The reliability of primary outcome measures was also satisfactory for all the studies. The weaker points were the lack of a formal test for trends and the unclear completeness of the data sets for many studies.

Prospective cohort studies (PCS)

Three studies are cohort studies and one of them is a mixed RCT-cohort study (Slater 2011). The results of their 'Risk of bias' assessments are presented in Table 2, Figure 6 and Figure 7.

Figure 6. Prospective cohort studies 'Risk of bias' graph: review authors' judgements about each risk of bias item presented as percentages across all included studies

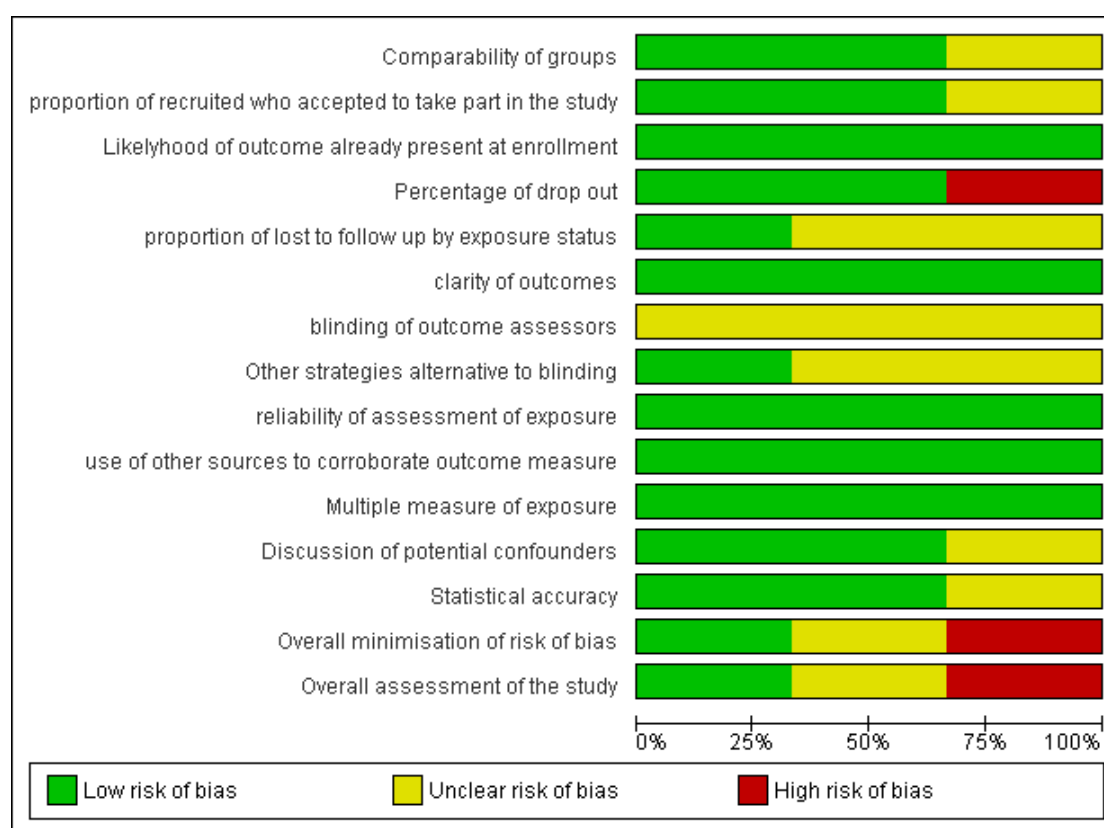


Figure 7. Prospective cohort studies 'Risk of bias' summary: review authors' judgements about each risk of bias item for each included study.

	Comparability of groups	proportion of recruited who accepted to take part in the study	Likelihood of outcome already present at enrollment	Percentage of drop out	proportion of lost to follow up by exposure status	clarity of outcomes	blinding of outcome assessors	Other strategies alternative to blinding	reliability of assessment of exposure	use of other sources to corroborate outcome measure	Multiple measure of exposure	Discussion of potential confounders	Statistical accuracy	Overall minimisation of risk of bias	Overall assessment of the study
Hornik 2006	+	+	+	+	?	+	?	+	+	+	+	+	+	+	+
Scheier 2010	+	+	+	+	+	+	?	?	+	+	+	?	?	-	-
Slater 2011	?	?	+	-	?	+	?	?	+	+	+	+	+	?	?

Overall, all PCS addressed an appropriate and clearly focused question. In two studies subjects were selected with proper procedures in order to make them comparable in all respects. The same two studies indicated how many of the people asked to take part actually participated in the study. One study (Slater 2011) failed to address these issues. Attrition was 35% in two studies and 42.9% in Slater 2011. Comparison between participants and those lost to follow-up was made only in Scheier 2010.

Assessment

The outcomes were clearly defined in all studies. Blinding to exposure status was not applicable for any of the studies. In one study (Hornik 2006) there was some recognition that knowledge of exposure status could have influenced the assessment of the outcomes. In all studies the measure of assessment of exposure was reliable: evidence from other sources was used to demonstrate that the method of outcome assessment was valid and reliable, and exposure level or prognostic factor was assessed more than once.

Confounding

The main potential confounders were adequately identified and taken into account in two studies (Hornik 2006; Slater 2011).

Statistical analysis

Confidence intervals were provided in two studies. One study reported only P values (Scheier 2010).

Overall assessment of the study

One study did very well in addressing the risk of bias or confounding (Hornik 2006), one did quite well (Slater 2011) and one did not adjust for potential confounders (Scheier 2010).

Effects of interventions

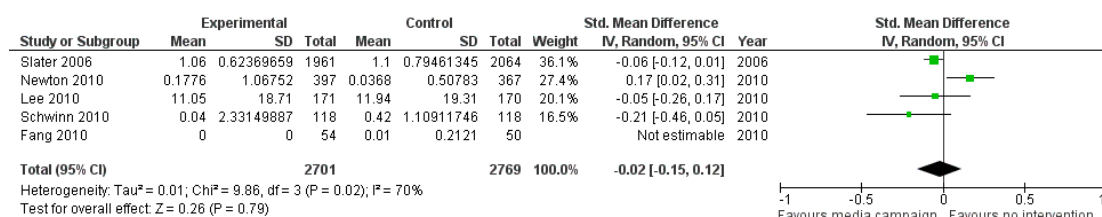
Primary outcomes

Self reported or biomarker-assessed illicit drug use

This primary outcome is measured in 15 studies: five randomised controlled trials (RCT) + one RCT and prospective cohort study; two prospective cohort studies; six interrupted time series (ITS) and one controlled before and after (CBA) study.

The five RCTs (Fang 2010; Lee 2010; Newton 2010; Schwinn 2010; Slater 2006) enrolled 5470 young people and were included in a meta-analysis (see Figure 8). Their pooled results show no effect of media campaign intervention (standardised mean difference (SMD) - 0.02; 95% confidence interval (CI) -0.15 to 0.12, heterogeneity $P = 0.02$) (Analysis 1.1). Youngsters exposed to a media campaign tend to use, on average, fewer illicit substances measured through an array of published and unpublished scales including the American Drug and Alcohol Survey (Centers for Disease Control and Prevention), Youth Risk Behavior Survey, Australian National Drug Strategy Household Survey and Global Appraisal of Individual Needs-I (see Table 3).

Figure 8. Forest plot of comparison: I Mass media versus no mass media intervention (RCT), outcome: I.1 Drug use.



Several time points of use were available in the different studies, but we chose the six-month follow-up as a standard comparable across studies. To do this we have used both published and unpublished data kindly provided by the authors. Among the six-month assessments, Slater 2006 and Schwinn 2010 measured use in the past 30 days, Lee 2010 measured use in the past three months and Newton 2010 frequency of use in the past 12 months.

The pooled result shows no effect of the intervention, with overall significant heterogeneity among studies ($P < 0.05$); this can be partially explained by the results of Newton 2010 which showed a reduction of use in the control group.

The theoretical background for the five studies was varied, with two studies based on the social learning theory (Schwinn 2010) and the social ecological framework (Slater 2006) providing the better results, whereas the study based on the social influence ap-

proach (Newton 2010) favoured the control group.

Five ITS (Colorado Meth 2011; Georgia Meth 2011; Hawaii Meth 2011; Idaho Meth 2010; Wyoming Meth 2011, $N = 26,405$) evaluated the Meth Project intervention in five US states. In every study the first year reports pre-campaign figures. Observed and predicted overall and state-specific probabilities were plotted against time for both past-month (Figure 9) and past-year (Figure 10) use of methamphetamine. Among study participants aged 12 to 17 years old there was no evidence of an effect on past-month prevalence of methamphetamine (odds ratio (OR) 1.16, 95% CI 0.63 to 2.13) and evidence of a reduction in past-year prevalence (OR 0.59; 95% CI 0.42 to 0.84). Among participants aged between 18 and 24 years old there was no evidence of an effect for past-month (OR 0.72; 95% CI 0.16 to 3.20) or past-year (OR 0.91; 95% CI 0.43 to 1.94) prevalence of methamphetamine.

Figure 9. Observed and predicted probabilities of past-month methamphetamine use in the Meth Project studies

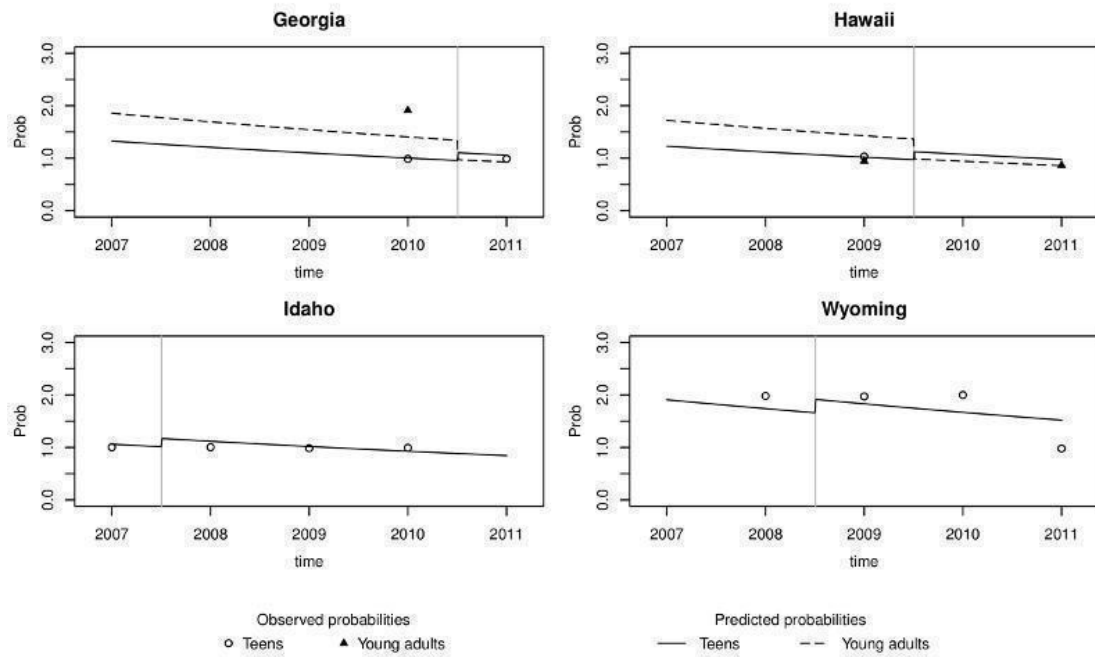
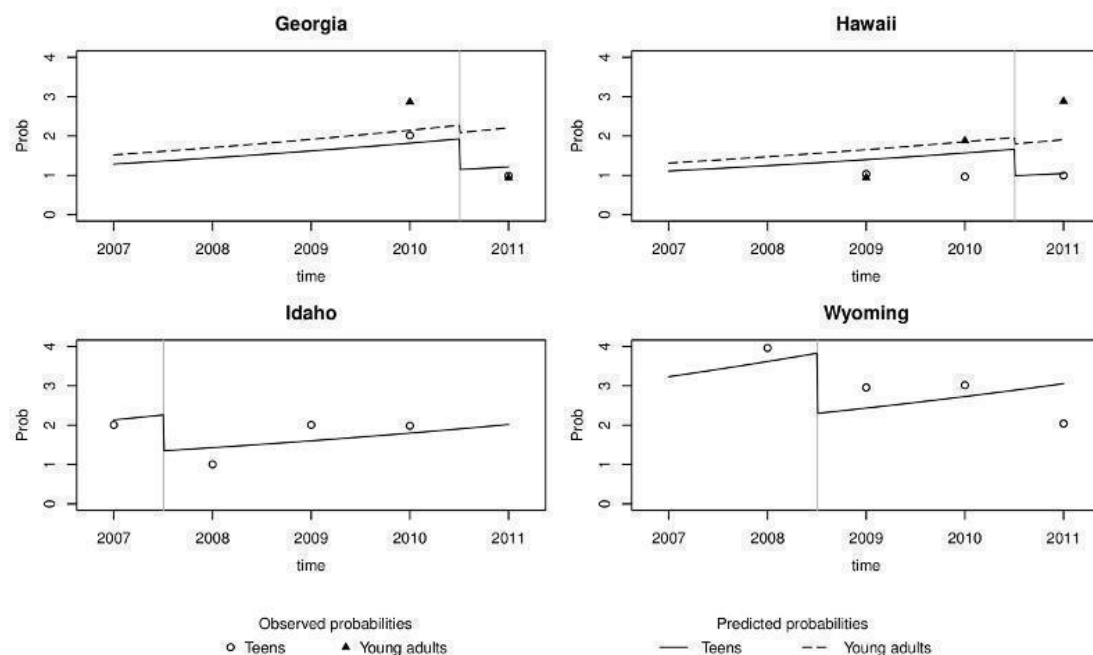


Figure 10. Observed and predicted probabilities of past-year methamphetamine use in the Meth Project studies



Due to the intrinsic methodological limitations of ITS studies and the impossibility of conducting more sophisticated analyses (e.g. by adjusting for potential confounders), these findings should be considered with caution.

Slater 2011, the only RCT that included a prospective cohort study (the reason why it was not included in the meta-analysis) found evidence that a community-level campaign, adjusted for the effect of a school-level campaign, reduced marijuana uptake compared to no intervention (estimate -0.511; $P = 0.026$).

Two prospective cohort studies ($N = 10,632$) found results ranging from non-significantly effective to a significant iatrogenic effect. Namely, Scheier 2010 found that over time young participants in the experimental arms reported increasingly more awareness and recalled increasingly more campaign messages, and also a concomitant but not statistically significant decrease in their reported levels of marijuana use. Hornik 2006 measured past-year marijuana use after exposure to a national media campaign as a function of exposure to a specific advertisement at a prior round and found an increase in use (odds ratio (OR) 1.21; 95% CI 1.19 to 1.65), controlled for considered confounders.

One ITS (Palmgreen 2001) was included in the meta-analysis because the author we contacted for this review suggested presenting the data as in the original papers. In this 32-month study, high sensation-seekers exhibited a significant upward trend in 30-day

marijuana use before exposure to the campaign and a significant downward trend after exposure. This finding was reported in both the communities involved in the study (Knox County Time Series ($P = 0.001$) and the Fayette County Time Series ($P = 0.003$ and $P = 0.001$ after campaign 1 and 2, respectively)).

One ITS (Carpenter 2011) analysed the relationship between exposure to the 'Above the Influence' campaign in 210 US media markets and adolescent marijuana use from 2006 to 2008. The study showed lower rates of past-month (adjusted odds ratio (AOR) 0.67; 95% CI 0.52 to 0.87) and lifetime (AOR 0.76; 95% CI 0.62 to 0.93) marijuana use among girls in grade eight. For boys in grade eight and both girls and boys in grades 10 and 12 there was no evidence of an association between the campaign and a reduction in marijuana use.

The only controlled before and after (CBA) study (Miller 2000) found a modest increase in drug use in the control campus, paralleled by a modest decrease in drug use in the experimental campus, without statistical significance.

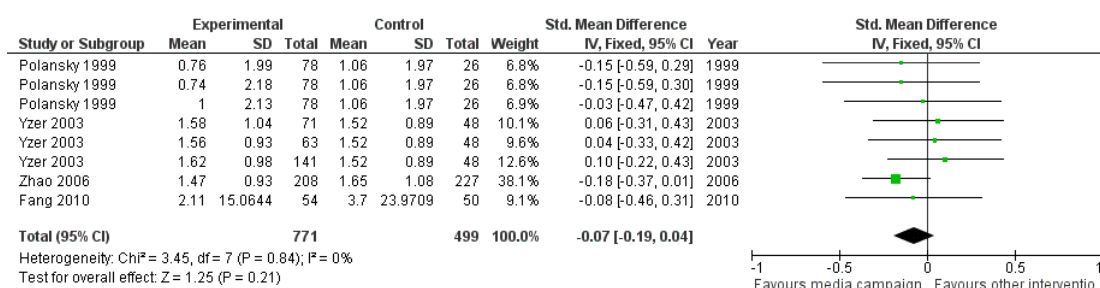
Secondary outcomes

Intentions not to use/to reduce use/to stop use

This outcome was measured by four RCTs, which found a non-statistically significant effect in favour of media campaigns, and one prospective cohort study which, on the other hand, found a possible iatrogenic effect.

Four RCTs (Fang 2010; Polansky 1999; Yzer 2003; Zhao 2006) involving 1270 students were included in the meta-analysis (see Figure 11) and the pooled analysis shows that there is no effect (SMD -0.07; 95% CI -0.19 to 0.04) (Analysis 1.2). Intentions to use drugs were measured with several unpublished scales and the Drug Attitude Scale (see Table 3 for a brief description of the scales used).

Figure 11. Forest plot of comparison: 1 Mass media versus no mass media intervention (RCT), outcome: 1.2 Intention to use drugs.



Hornik 2008 was not included in the meta-analysis because its study design (prospective cohort study) was not comparable with that adopted by the others (randomised controlled trial). The study found that at one round a higher level of exposition was associated with more intention to use marijuana (expressed as less intention to avoid marijuana use(y= -0.07; 95% CI -0.13 to -0.01).

Attitudes towards illicit drug use

Fourteen studies including 37,172 youngsters considered this outcome which was measured specifically by eight RCTs, one prospective cohort study and five ITS. No meta-analysis was possible and results have been described narratively. Overall, no conclusions can be drawn on the basis of the available studies.

Eight RCTs showed mixed results with four studies giving positive results and four uncertain results. For example, Palmgreen 1991 found that media campaign messages specifically targeting high sensation-seekers were more effective than controls in increasing negative attitude towards drug use. In Kelly 1992 the exposed group showed a change in attitude towards drugs. In Polansky 1999 ninth-grade students exposed to media advertisement showed more ability to resist peer pressure to use drugs than

the control group. In Czyzewska 2007 the anti-marijuana advertisements group showed a tendency to more negative implicit attitudes to marijuana than the control whereas Newton 2010 showed that at the 12-month follow-up no differences between groups persisted for alcohol expectancies, cannabis attitudes or alcohol- and cannabis-related harms. The advertisements studied by Yzer 2003 targeted the belief that marijuana is a gateway to use of stronger drugs. Nevertheless results did not support this as no clear persuasion was found for any of the ad sequences. In comparison to the control condition, adolescents in the explicit gateway condition tended to agree less with the gateway message and displayed weaker correlations between anti-marijuana beliefs and their attitude towards marijuana use. Schwinn 2010 measured drug resistance/refusal skills; however they did not report results. Zhao 2006 did not find any significant effect on individual measures of attitude change.

Hornik 2006 found a small but significant increase in anti-marijuana beliefs and attitudes in students exposed to media campaigns even though this was not accompanied by significant parallel gains in intentions not to use, social norms or self efficacy.

Heterogeneous results were reported in the five included Meth

Project studies. In [Wyoming Meth 2011](#) more teens disapproved of experimental meth use (i.e. trying meth once or twice) in 2008 than 2011, and both experimental and regular use of heroin, marijuana and cocaine. In [Colorado Meth 2011](#) disapproval of experimental use of marijuana decreased but disapproval of regular use increased from 2009 to 2011. In [Georgia Meth 2011](#) most 12 to 17-year-olds disapproved of experimental use of meth, heroin and cocaine in 2011 than in 2010. In [Hawaii Meth 2011](#) more 12 to 17-year-olds disapproved experimental use of meth in 2009 than in 2011. Most 18 to 24-year-olds disapproved of experimental and regular use of meth and experimental use of heroin and cocaine. In [Idaho Meth 2010](#) more teens disapproved of experimental and regular use of meth, heroin and cocaine in 2007 than in 2010.

Knowledge about the effects of illicit drugs on health

One RCT measured this outcome, finding a possible association between the effectiveness of the campaign and message on individual characteristics. One study shows significant improvement in knowledge about the target substance in the experimental group. [Lee 2010](#) found an association between contemplation for change and marijuana use at three-month follow-up. Intervention participants who were higher in contemplation for change showed a significant decrease in marijuana use. Nevertheless, this result was not confirmed at six months follow-up. [Newton 2010](#) showed that at the 12-month follow-up, significant improvements in alcohol and cannabis knowledge in students in the intervention group compared to the control group were present.

Understanding of intended message and objectives

Only one RCT addressed this outcome: [Fishbein 2002](#) which adopted a measure of perceived effectiveness of a media campaign.

Perceptions (including perception of peer norms and perception of risks of use of illicit drugs)

This outcome was measured by 11 studies (N = 40,243): four RCTs, one prospective cohort study, one CBA and five ITS. Only one of the four included RCTs found a significant effect in favour of media campaigns in changing towards a negative perception of marijuana use ([Zhao 2006](#)). The remainder found weaker results apparently in favour of interventions. [Fishbein 2002](#) adopted a measure of perceived effectiveness of media campaign based on realism, learning and emotional responses, all considered highly correlated with effective messages. [Zhao 2006](#) found that students exposed to media campaign messages showed changes towards a negative perception about the consequences of marijuana use. [Schwinn 2010](#) measured the normative belief among participants and found a change in the experimental group which was not maintained at six months follow-up. As already mentioned [Yzer 2003](#) targeted the belief that marijuana is a gateway to stronger drugs. Results did not support this and no clear

persuasion was found for any of the ad sequences. In comparison to the control condition, adolescents in the explicit gateway condition tended to agree less with the gateway message and displayed weaker correlations between anti-marijuana beliefs and their attitude toward marijuana use.

[Hornik 2006](#), the only prospective cohort study investigating this outcome, found a small but significant increase in anti-marijuana beliefs and attitudes in students exposed to media campaigns yet this was not accompanied by significant parallel gains in intentions not to use, social norms or self efficacy

The only CBA ([Miller 2000](#)) found that the students enrolled in the experimental arm showed significantly higher perceived risks from substance use

Results differed considerably across the five included Meth Project studies. In [Wyoming Meth 2011](#) perception of ease to acquire any of the examined drugs (meth, heroin, marijuana and cocaine) decreased from 2008 to 2011. More teens agreed with all of the 14 perceived risks attributed to meth and more teens disagreed with six out of the nine perceived benefits attributed to meth. In [Colorado Meth 2011](#) more teens in 2011 than in 2009 agreed with nine of the 14 items concerning risks attributed to meth. In [Georgia Meth 2011](#) perception of ease to acquire cocaine and heroin decreased from 2010 to 2011 among 12 to 17-year-olds. More teens agreed with all of the 14 perceived risks attributed to meth, and fewer teens agreed with five of the nine perceived benefits attributed to meth. Among 18 to 24-year olds, more young adults agreed with seven of the 14 perceived risks attributed to meth, and fewer young adults agreed with six of the nine perceived benefits attributed to meth. In [Hawaii Meth 2011](#) perception of ease to acquire heroin decreased from 2009 to 2011 among 12 to 17-year-olds. The percentage of those who see a "great risk" in taking meth, heroin and cocaine decreased by around 10 points. More teens agree with 13 of the 14 perceived risks attributed to meth. Among 18 to 24-year-olds a reduction of perceived ease to acquire marijuana and cocaine was also described. In such an age group the percentage of those who see a "great risk" in taking meth, heroin and cocaine decreased by around 15 points. More young adults agreed with all of the 14 perceived risks attributed to meth and fewer young adults agreed with five of nine perceived benefits of meth. In [Idaho Meth 2010](#) perception of risk in trying meth, heroin and cocaine once or twice increased from 2007 to 2010. More teens agreed with all of the 14 perceived risks attributed to meth and fewer teens agreed with all of the nine perceived benefits attributed to meth.

Adverse effects

- Reactance (i.e. a reaction to contradict the prevailing norms of rules)

[Fishbein 2002](#) found that six out of 16 studied Public Service Advertisements (PSA) were judged by the young participants as not effective. In other words, adolescents viewing these six PSAs

reported that they and their friends would be more likely to try or to use drugs, and would feel less confident about how to deal with situations involving drugs. Specifically negative correlations were found for the advertisement tackling marijuana ($r = -0.52$), those not specifying a drug or talking about drugs in general, also tended to be judged as ineffective, although this relationship was not significant ($r = -0.23$). PSAs describing the “just say no” message tended to be judged as less effective ($r = -0.29$). [Yzer 2003](#) found that adolescents exposed to the “Gateway” message (explicitly saying that marijuana use led to use of hard drugs) considered this message less effective and were (although not statistically significantly) more positive towards marijuana use, while [Hornik 2006](#) found a possible presence of pro-marijuana effects in at least two analyses out of 10 in terms of intention to use and initiation.

- Positive descriptive norms (i.e. increased perception that drug use in peer population is common, normal or acceptable)

[Palmgreen 2001](#) found a reinforcing effect of the media campaign on pro-marijuana beliefs (particularly for occasional use).

DISCUSSION

Summary of main results

The studies included in this review tested an array of different interventions including national campaigns, public service advertisements, television messages, video tapes and Internet-based campaigns and the effects were measured by means of unpublished and published scales administered to the participating adolescents. Hence the first issue is the comparability of results.

Overall 15 studies measured the effects on the use of drugs of nine campaigns of which four used the Internet, one was performed in school setting and four were TV broadcasting campaigns (the Meth Project was assessed by five studies and the National Youth Anti-Drug Media Campaign (NYADMC) was assessed at different stages by five studies).

The outcomes on the use of drugs of five randomised controlled trials (RCTs) (four on Internet-based interventions and one on TV/radio broadcasting) have been pooled, resulting in no effect of mass media campaigns (standardised mean difference (SMD) -0.02; 95% confidence interval (CI) -0.15 to 0.12), with statistically significant heterogeneity ($P = 0.02$). The four studies including Internet-based interventions gave contrasting results about drug use (some showed that the intervention reduced the use of drugs and some showed that the intervention could favour use), whereas the study on the national campaigns found a reduction in use in the experimental group.

The study evaluating the school media campaign found a non-significant reduction in drug use in the experimental group.

The studies evaluating the Meth Project on methamphetamine were included in a separate meta-analysis, the pooled results of

which showed a significant reduction in the past-year use of methamphetamine.

Five studies evaluated different phases of the NYADMC. The preliminary study showed positive results in favour of the campaign, the two studies evaluating the 1st phase showed an opposite effect, with a significant increase in drug use in the more robust study, and the two studies evaluating the 2nd phase showed positive results in favour of the campaign.

There are a series of observational studies, generally cohort studies or interrupted time series (ITS), which can be classified as field trials and evaluate the effectiveness of the multimedia-TV campaigns intervention in its context. They show contrasting results, from weakly effective, as for the Meth Project campaign, to clearly harmful, as one form ([Hornik 2006](#)) reported statistically significant results in favour of the control group, showing an increase in marijuana use of 20% in those more exposed to the campaign compared to those less exposed. The multistage evaluation of the NYADMC campaign conducted to positive results.

Looking at the secondary outcomes, the RCTs included in the meta-analysis showed non-significant results in favour of the groups exposed to the campaign for intention to use, an outcome considered a proxy for future behavior ([Litchfield 2006](#); [Olds 2005](#)). One observational study ([Hornik 2006](#)) found a possible reinforcing effect of media campaign exposure on intention to use, especially cannabis.

Summing up the available evidence from RCTs shows that media campaigns based on the Internet are not effective in reducing the use of drugs, whereas the evidence from observational studies shows that there are some positive effects in reducing last-year prevalence in younger people. A study based on independent data collection gave overall positive results for girls and showed no effectiveness in boys in terms of marijuana use.

Overall completeness and applicability of evidence

The objective of this review was to measure the effect of media campaigns on influencing drug use among young people. The studies we included only partially answer the question and they are hardly comparable. In fact the studies focused on a variety of interventions and used several different scales to measure the outcomes. It was therefore not possible to have results on all the typologies of campaign listed in the introduction section, and any attempt to compare effects is limited.

A second threat to the applicability of results is the nature of the studies: the RCTs are always carried out in an experimental context such as, for example, schools in which the students randomised to the intervention arm are exposed to the media message, or the trials enrolling volunteers on the Internet, a very selected population. This appears to measure efficacy and not effectiveness of the intervention, given that subjects are out of the context in which they would be exposed in the real world. The other studies, called

field studies, measure the effect in a real context, but are limited in numbers, overall methodological quality and are actually focused on two campaigns.

Furthermore, all the studies were conducted in the USA, apart from two in Canada and Australia, and as a consequence the generalisability to other geographical and social contexts, such as Europe, remains unclear.

Quality of the evidence

We included 23 studies on very different interventions, the effects of which were measured with several scales. The methodological quality of the included studies was hard to assess as many dimensions were unclear in the relevant publications. Nevertheless, when the dimensions were reported the quality of the studies was acceptable. In many cases further information was obtained by contacting the study authors. The main limitation of the evidence available is the lack of comparability of some measures of outcomes and, more importantly, the unclear causal relationship between the campaign size and its effect. This lack of clarity reduces the generalisability of results, i.e. it is still unclear which part of a campaign should be reproduced to achieve which results.

Potential biases in the review process

The inclusion of studies which are different from randomised controlled trials complicates the identification and retrieval of the studies, due to a less structured indexing of studies in different databases, and lack of devoted registries and unique identification of studies. We therefore acknowledge that we might have missed some studies. Nevertheless, an accurate cross-check of all the reference lists and contacts with the principal investigators in the field may have reduced this risk.

The assessment of study quality relied on study design-specific checklists, yet for many publications the majority of the information we used to assess and score the quality criteria was unclear. We therefore contacted many authors to ask for clarification, but in the case of the older studies it was not possible to retrieve additional information.

Agreements and disagreements with other studies or reviews

Werb and colleagues (Werb 2011) performed a systematic review of all the studies assessing public service announcements (eight studies) including meta-analyses for two outcomes: intention to use and mean use of illicit drugs. In spite of different inclusion criteria (as we also included non-PSA interventions) and criteria for analysis, we reached similar conclusions. Furthermore, Wakefield 2010, in their broader analysis of media campaigns aiming to change health behaviour, address the media campaign effect

on illicit drugs use with five studies, concluding that the relevant evidence is inconclusive.

AUTHORS' CONCLUSIONS

Implications for practice

The effectiveness of media campaigns to prevent illicit drug use among young people is not clearly supported, with some evidence of iatrogenic effects. Therefore it is recommended that such campaigns should only be provided in the context of rigorous, well-designed and well-powered evaluation studies.

Implications for research

The great majority of the studies are conducted in the United States, thus more worldwide studies should be carried out. Moreover, validated and standardised tools to measure the outcome are recommended to allow comparability and generalisability of results. As the actual evidence suggests some effectiveness in specific populations (younger and female, for example) we need to focus better on investigation of the components of media campaigns which are effective in specific populations.

For this reason, beyond the general methodological recommendations, we suggest a strategy to make the best use of available resources and study designs. Our suggestions initially consider general improvement of methods:

- field evaluation studies should adopt, whenever possible, a cohort design;
- studies should be conducted in different countries and contexts;
- validated, comparable and standard tools should be used for the measurement of effects;
- the separate testing of specific media campaign components for their efficacy should be carried out by pilot randomised controlled trials in specific populations;
- future studies should ensure consistency among hypothesis testing, study design and measures of outcomes.

In general, whenever possible, interrupted time series studies, using independent and current data collection (such as the one by Carpenter 2011), should be conducted to assess the overall effects of any anti-drug media campaign.

Until the development of this research is ensured, we should not exclude the possibility of a campaign having iatrogenic effects.

ACKNOWLEDGEMENTS

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies [ordered by study ID]

Carpenter 2011

Methods	Study design: interrupted time series study Sampling: systematic sampling (schools are selected within geographic areas that are determined by the sampling section of the University of Michigan Survey Research Center, page 949) Comparison group(s): pre-intervention surveys Follow-up duration: n/a Study time span: 2006 to 2008 (approximately 36 months)	
Participants	130,245 youths from 8th to 12th grade (13- to 18-year-old)	
Interventions	All media for 210 media markets for 2006 to 2008, after the introduction of the Above the Influence campaign	
Outcomes	<ul style="list-style-type: none">● Past 30-day marijuana use● Lifetime marijuana use● Past-month alcohol consumption	
Notes		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not reported
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Colorado Meth 2011

Methods	Study design: interrupted time series study Sampling: n/a Comparison group(s): pre-intervention survey Follow-up duration: n/a Study time span: March 2009 to April 2011 (26 months)	
Participants	1803 youths (600 + 601 + 602)	
Interventions	Meth Project (USA), a “messaging campaign, supported by community outreach, and public policy initiatives”. The campaign comprises “television, radio, print, billboard, and Internet advertising”	
Outcomes	<ul style="list-style-type: none">• Past-month use of methamphetamine• Attitudes on methamphetamine and other drugs• Perceptions concerning methamphetamine and other drugs• Information sources and advertising awareness• Statewide Meth Project awareness and perceptions	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Methods	Study design: randomised controlled trial Sampling: not specified Comparison group(s): 4 = 2 anti-tobacco advertisements x 2 orders of advertisements (i.e. explicit attitudes towards tobacco or marijuana) Follow-up duration: not applicable Study time span: not specified
Participants	229 college students aged 18 to 19 years
Interventions	15 advertisement embedded in a 15-minute science programme (USA). 10 advertisements were youth directed, 5 were non-youth directed. Each programme comprised of 90-second science film segments, 30-second youth-directed ad, 30-second non-youth-directed ad, then again another 30-second youth-directed ad. There were 4 versions of recorded programme corresponding to 4 experimental conditions: 2 types of advertisements (i.e. anti-tobacco or anti-marijuana) x 2 orders of advertisements (i.e. explicit attitudes towards tobacco or marijuana)
Outcomes	<ul style="list-style-type: none"> • Implicit and explicit attitude towards tobacco • Implicit and explicit attitude towards marijuana
Notes	Implicit attitudes were assessed through the Implicit Association Test (IAT)

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	p. 117 "They were randomly assigned to experimental conditions", but randomisation details are not reported
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 117: "Two groups of 18- to 19-year-old college students were exposed to either anti-tobacco or anti-marijuana advertisements followed by implicit and explicit tests of attitudes to both, marijuana and tobacco"
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 119 "Next to a computer, each person had a survey with a pre-recorded ID number on it"
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants completed the test (being a post-only design); p. 117 "Two groups of 18- to 19-year-old college students were

		exposed to either anti-tobacco or anti-marijuana advertisements followed by implicit and explicit tests of attitudes to both, marijuana and tobacco”
Selective reporting (reporting bias)	Unclear risk	No study protocol was mentioned

Fang 2010

Methods	Study design: randomised controlled trial Sampling: random sampling (through online advertisement and community service agencies) Comparison group(s): no intervention Follow-up duration: 6.25 months Study time span: September 2007 to ~December 2008 (~16 months)
Participants	108 Asian-American girls aged 10 to 14 with private access to a computer, and their mothers
Interventions	Internet-based prevention programme (USA) guided by family interaction theory and aiming to prevent girls' substance use through enhancing mother-daughter interactions. 9 sessions: mother-daughter relationship, conflict management, substance use opportunities, body image, mood management, stress management, problem solving, social influences, self efficacy. The programme was not designed expressly for Asian-Americans
Outcomes	<ul style="list-style-type: none"> ● Past 30-day use of <ul style="list-style-type: none"> ○ alcohol ○ cigarettes ○ marijuana ○ prescription drugs ● Intention to use any of the above in the future ● Depression ● Other variables <ul style="list-style-type: none"> ○ Self efficacy ○ Refusal skills ○ Mother-daughter closeness ○ Mother-daughter communication ○ Maternal monitoring ○ Family rules against substance use
Notes	Only 1 post-test survey. Unclear whether the intervention focused on a single substance or many

Risk of bias

Bias	Authors' judgement	Support for judgement
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Random sequence generation (selection bias)	Unclear risk	p. 530 "Mother-daughter dyads were randomly assigned to intervention (n = 56) and control arms (n = 52)", but randomisation details are not reported
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 530: "Delivered by voice-over narration, animated graphics, and games, session content involved skill demonstrations and interactive exercises that required the joint participation of mothers and daughters."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Online questionnaire p. 530 "Girls and mothers had separate and unique log-in names and passwords, and each completed a pretest and posttest survey online"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Low number of missing outcome data; missing data balanced in numbers across study groups p. 530 "Mother-daughter dyads were randomly assigned to intervention (n = 56) and control arms (n = 52)" "Two mother-daughter dyads attrited from each arm, and 104 dyads (54 intervention and 50 control) successfully completed both pretest and posttest measures"
Selective reporting (reporting bias)	Unclear risk	p. 530 "The study protocol was approved by Columbia University's Institutional Review Board"

Fishbein 2002

Methods	Study design: randomised controlled trial Sampling: systematic random sampling (letters from each included middle/high school) Comparison group(s): 5 experimental (6 advertisements each, embedded in a 24-minute documentary) + versus no intervention (documentary only) condition Follow-up duration: not applicable Study time span: not specified
Participants	3608 youths aged 11 to 18 years (grades 4 to 12), median age 15 years

Interventions	30 public service announcements produced by the Partnership for a Drug Free America (USA)	
Outcomes	<ul style="list-style-type: none">● 30 dependent variables (5 scores for each of the 6 PSAs)<ul style="list-style-type: none">○ Perceived PSA effectiveness and realism○ Negative and positive emotional response○ Amount learned (understanding of intended message and on)● 5 scores resulting from mean of the 6 PSA scores<ul style="list-style-type: none">○ Total perceived PSA effectiveness and realism○ Total negative and positive emotional response○ Total amount learned (understanding of intended message and on)● Perceptions:<ul style="list-style-type: none">○ Perceived danger of engaging in risky behaviours○ Perceived harmfulness of engaging in risky behaviours○ Social norms	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	No mention of the sequence generation in the article (methods section p. 239)
Allocation concealment (selection bias)	Unclear risk	No mention of the sequence generation in the article (methods section p. 239)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 240 “Confidentiality and anonymity were emphasized in the instructions, both in written and audio-video form”
Incomplete outcome data (attrition bias) All outcomes	Low risk	Apparently almost all the sample exposed to interventions were included in the final analysis (and filled out the questionnaires) . But no mention of the number originally enrolled, mention of some drop-outs apparently unlinked to outcomes but no absolute numbers reported
Selective reporting (reporting bias)	Low risk	Protocol not available but we do not suspect selective reporting

Georgia Meth 2011

Methods	Study design: before and after study Sampling: 4-stage probability sampling Comparison group(s): pre-intervention survey Follow-up duration: n/a Study time span: November 2009 to April 2011 (18 months)
Participants	4454 youths (2432 + 2022)
Interventions	Meth Project (USA), a “messaging campaign, supported by community outreach, and public policy initiatives”. The campaign comprises “television, radio, print, billboard, and Internet advertising”
Outcomes	<ul style="list-style-type: none"> • Past-month use of methamphetamine • Attitudes towards methamphetamine and other drugs • Perceptions concerning methamphetamine and other drugs • Information sources and advertising awareness • Statewide Meth Project awareness and perceptions
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Hawaii Meth 2011

Methods	Study design: interrupted time series study Sampling: 4-stage probability sampling Comparison group(s): pre-intervention survey Follow-up duration: n/a Study time span: March 2009 to March 2011 (25 months)
Participants	3305 youths (1065 + 1035 + 1205)

Interventions	Meth Project (USA), a “messaging campaign, supported by community outreach, and public policy initiatives”. The campaign comprises “television, radio, print, billboard, and Internet advertising”	
Outcomes	<ul style="list-style-type: none">● Past-month use of methamphetamine● Attitudes on methamphetamine and other drugs● Perceptions concerning methamphetamine and other drugs● Information sources and advertising awareness● Statewide Meth Project awareness and perceptions	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Hornik 2006

Methods	Study design: prospective cohort study Sampling: systematic sampling (4-stage, geographic) Comparison group(s): lower exposure to intervention Follow-up duration: November 1999 to June 2004 (56 months) Study time span: September 1999 to June 2004 (58 months). Up to 4 observations per each of the 3 cohorts. Interviews were carried out at home
Participants	8117 youths aged 12.5 to 18 years in the first round
Interventions	The National Youth Anti-Drug Media Campaign (USA) was a comprehensive social marketing campaign aimed at youths aged 9 to 18 years and disseminated through television, radio, websites, magazines, movie theatres and others. The campaign established partnership with civic, professional and community groups and outreach programs with the media, entertainment and sport industries

Outcomes	<ul style="list-style-type: none">• Lifetime, past-year and past 30-day use of marijuana• Intention to use marijuana• Attitudes towards marijuana and self efficacy to resist use of marijuana• Perceptions and social norms about marijuana	
Notes	NIDA report ' Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings. June 2006 ', on which this article is based, was also used to retrieve information for this meta-analysis	
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous and administered via computer p. 2230 (Hornik 2008) "NSPY questionnaires were administered on laptop computers brought into the respondents' homes. The interviewer recorded answers for the opening sections, but for most of the interview, to protect privacy, respondents heard pre-recorded categories of questions and answer through headphones and responded via touch screen selection on the computer. Interviews could be conducted in English or Spanish"
Incomplete outcome data (attrition bias) All outcomes	Low risk	"The overall response rate among youths for the first round was 65%, with 86% to 93% of still eligible youths interviewed in subsequent rounds", page 2230 in Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, page 2-12, table 2-A "Completed interviews by wave"
Selective reporting (reporting bias)	Low risk	No protocol available but the we do not suspect selective reporting bias

Idaho Meth 2010

Methods	Study design: interrupted time series study Sampling: 4-stage probability sampling Comparison group(s): pre-intervention survey Follow-up duration: n/a Study time span: September 2007 to December 2010 (40 months)	
Participants	11,143 youths (3091 + 2590 + 2641 + 2821)	
Interventions	Meth Project (USA), a “messaging campaign, supported by community outreach, and public policy initiatives”. The campaign comprises “television, radio, print, billboard, and Internet advertising”	
Outcomes	<ul style="list-style-type: none">● Past-month use of methamphetamine● Attitudes towards methamphetamine and other drugs● Perceptions concerning methamphetamine and other drugs● Informations sources and advertising awareness● Statewide Meth Project awareness and perceptions	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Kelly 1992

Methods	<p>Study design: randomised controlled trial.</p> <p>Sampling: not specified.</p> <p>Comparison group(s):</p> <ul style="list-style-type: none"> • control group (no anti-drug PSA and no group discussion). • experimental group 1 (anti-drug PSA without group discussion) • experimental group 2 (anti-drug PSA with group discussion) <p>Follow-up duration: 1.5 months (6 weeks).</p> <p>Study time span: not specified, at least 1.5 months.</p>
Participants	79 female college students, primarily 18 to 19 years old
Interventions	Anti-drug messages (USA) selected from the library of the Media Advertising Partnership for a Drug-Free America and centred on drugs and alcohol
Outcomes	<ul style="list-style-type: none"> • Attitudes towards marijuana • Attitudes towards cocaine • Attitudes towards crack • Attitude towards getting drunk
Notes	Pre-test, post-test and 6-week follow-up means are provided. Standard deviations are not provided

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not reported p.80 "Subjects were randomly divided into a total of 9 discussion groups."
Allocation concealment (selection bias)	Unclear risk	Not reported Baseline comparisons reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding of outcome assessors not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data and clear reporting of sample size both of the intervention and control group
Selective reporting (reporting bias)	Low risk	<p>No study protocol available but clear reporting of main study hypothesis and direct correlation between main topics investigated in the experiment and reported outcomes</p> <p>TOPICAL EXPERIMENTAL AREAS: p. 79 "two topical areas chosen for the study were (1) the age at which parents</p>

		<p>should talk to their children about dangers of drugs, (2) how much responsibility one has, if any, for another's drug use"</p> <p>OUTCOMES:</p> <p>p. 80 "three questions asking at what age children should be spoken to about marijuana, cocaine and crack"</p> <p>p. 81 "one question asked subjects to rate their agreement on a 5 point Likert scale with the statement "whether or not I get drunk is nobody's business". Similar question were asked regarding use of marijuana, cocaine and crack"</p>
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Lee 2010

Methods	<p>Study design: randomised controlled trial</p> <p>Sampling: random sampling (letters and email sent to ~4000 college students at a "large public university in the Northwest United States")</p> <p>Comparison group(s): no intervention (no feedback or information, students were asked to complete web-based assessments)</p> <p>Follow-up duration: 6 months</p> <p>Study time span: June 2005 to not specified (at least 6 months because a 6-month follow-up was performed)</p>
Participants	341 college students aged 17 to 19 with any use of marijuana in the 3 months before study
Interventions	Internet-based personalised feedback intervention (USA). Participants were presented with feedback about their marijuana use, perceived and actual descriptive norms about marijuana use, and perceived pros and cons of using marijuana. Skills and training tips for avoiding marijuana and making changes in use were provided, as well as limited alcohol feedback. Perceived high-risk contexts and alternative activities around campus and in the communities were provided
Outcomes	<ul style="list-style-type: none"> • Past 90-day use of marijuana • Contemplation to change marijuana use (intention) • Consequences of marijuana use (knowledge) • Family history of drug problem
Notes	Baseline survey, then 3- and 6-month follow-ups

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Computer-based p. 267, "Students were randomly assigned

		to a personalized feedback intervention (PFI) or control condition based on their screening responses (prior to baseline), using a stratified randomization procedure to produce groups with equivalent use rates at randomization”
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 268: “Students in the intervention group received individual personalized feedback based on baseline information. On completion of the baseline survey, PFI participants could immediately view feedback online and could choose to print feedback to their own printer. Participants could return to view feedback on the web for 3 months”
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Computer-administered questionnaire (p. 266-7)
Incomplete outcome data (attrition bias) All outcomes	Low risk	p. 268 “All analyses are based on intent-to-treat, regardless of whether participants viewed their feedback”
Selective reporting (reporting bias)	Unclear risk	p. 267 “All study procedures were approved by the university IRB and a federal Certificate of Confidentiality was obtained from the National Institutes of Health”

Miller 2000

Methods	Study design: before and after study Sampling: random sampling Comparison group(s): no intervention (other campus with no intervention) Follow-up duration: 1 year Study time span: 1988-9, for 1.5 years
Participants	1024 college students at baseline (median age 25 in the intervention group, 22 in the control group), 865 at 1-year follow-up
Interventions	The Campuswide Alcohol and Drug Abuse Prevention Program (CADAPP; USA), based on self regulation theory. The campaign made use of printed materials, videotapes, speakers, peer-education, computer resources, campus policy, campus wide events. Other components of CADAPP targeted particular at-risk segments: free and confiden-

	tial psychological 'drinker's checkup', list of drug/alcohol referral services available in the community, free psychological help for concerned family members and friends, alcohol self control training for on-campus fraternities	
Outcomes	<ul style="list-style-type: none">● Frequency of use of 10 types of drugs including cannabis and cocaine● Past 30-day alcohol consumption● Perception of risk related to alcohol and other drugs use● Problems related to alcohol and other drug use	
Notes		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 746 "Impact of CADAPP was measured through anonymous surveys of students on each campus [...]"
Incomplete outcome data (attrition bias) All outcomes	Low risk	p. 751 "At baseline (fall) assessment, 1,400 surveys were distributed to enrolled UNM students, a sample of approximately 6% selected randomly by the university's computerized mailing list program. Of these, 567 surveys were returned and usable (41%). At the control campus, 1,080 surveys were distributed to a random sample of students, 457 of whom returned them (42.3%). [...] The return rates were 431 (31%) at UNM and 434 (34%) at NMSU"
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Newton 2010

Methods	Study design: randomised controlled trial Sampling: cluster sampling Comparison group(s): other type of communication interventions (usual health classes) Follow-up duration: 12 months Study time span: March 2007 to November 2008 (21 months)
Participants	764 13-year-old students from 10 Australian independent secondary schools (intervention branch: N = 397, 5 schools; control branch: N = 367, 5 schools). Students who enrol in independent schools come predominantly from high socioeconomic backgrounds
Interventions	Climate Schools course (Australia) is an Internet-based intervention founded on the social influence approach, derived from Bandura's social learning theory. The course delivered 2 sets of 6 40-minute lessons, each including 15 to 20-minute Internet-based lesson completed individually and 20 to 25-minute teacher-delivered activities. During the Internet-based part, students followed a cartoon storyline of teenagers experiencing real-life situations and problems with alcohol and cannabis
Outcomes	<ul style="list-style-type: none"> • Use of alcohol (number of drinks per week) and cannabis (times per week) • Alcohol and cannabis knowledge • Alcohol and cannabis attitudes • Alcohol- and cannabis-related harms
Notes	Assessment: baseline, immediately post, and 6 and 12 months following completion of the intervention Hybrid intervention: both school- and Internet-based

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	p. 750 "The 10 participating schools were assigned randomly using an online randomization system (www.randomizer.org) to either the control condition (usual drug education) or the intervention condition (the Climate Schools: Alcohol and Cannabis course)"
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 750 "The Climate Schools: Alcohol and Cannabis course comprised the delivery of two sets of six 40-minute lessons. The Climate Schools: Alcohol module was delivered immediately after the baseline assessment, and the Climate Schools: Alco-

		hol and Cannabis module was delivered 6 months later in the same school year. Each lesson included a 15-20-minute Internet-based lesson completed individually, where students followed a cartoon storyline of teenagers experiencing real-life situations and problems with alcohol and cannabis. The second part of each lesson was a predetermined activity delivered by the teacher to reinforce the information taught in the cartoons. Intervention group teachers were provided with a programme manual but no additional training."
Blinking of outcome assessment (detection bias) All outcomes	Low risk	p. 751 "A self-report questionnaire was completed online by all students in a classroom setting, where anonymity and confidentiality were assured"
Incomplete outcome data (attrition bias) All outcomes	Low risk	Similar attrition % over the 2 study groups (figure 1, page 754) p. 754 "Compared to students who were present at baseline and any follow-up occasion, students present only at baseline had significantly higher alcohol-related knowledge [7.66 versus 7.48 (of 16); F(1, 758) = 4.88, P < 0.05]. There were no significant differences on any other alcohol or cannabis outcome measures, nor was there evidence of differential attrition"
Selective reporting (reporting bias)	Unclear risk	No study protocol was mentioned

Palmgreen 1991

Methods	<p>Study design: randomised controlled trial.</p> <p>Sampling: random sampling (students were recruited from a variety of sources, including driver's licence listings, recruitment advertisements in local newspapers and shopper weekly, etc)</p> <p>Comparison group(s): 2 experimental viewing conditions</p> <ul style="list-style-type: none"> • one public service announcements (PSA) aimed at high sensation-seekers (HSSs) • one PSA aimed at low sensation-seekers (LSSs) <p>Follow-up duration: not applicable</p> <p>Study time span: not specified, at least 1 day</p>
Participants	207 18- to 22-year-old youths

Palmgreen 1991 (Continued)

Interventions	2 national-quality 30-second embedded PSAs, one aimed at HSS and the other at LSS (USA)	
Outcomes	<ul style="list-style-type: none">● Attitude toward drug use● Intention to call a support hotline	
Notes		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not clearly reported p. 221 "LSSs ad HSSs were randomly assigned to one of the experimental conditions or the control group"
Allocation concealment (selection bias)	Unclear risk	Not reported No baseline comparisons reported
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding of outcome assessors not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	No missing data and clear reporting of sample size both of the intervention and control group
Selective reporting (reporting bias)	Low risk	No study protocol available but clear reporting of main study hypothesis (p. 219) and outcomes measures

Palmgreen 2001

Methods	Study design: interrupted time series study Sampling: systematic sampling (geographical and grade stratification from enrolment lists of 7th to 10th graders in spring 1996) Comparison group(s): pre-intervention surveys Follow-up duration: n/a Study time span: March 1996 to December 1998 (34 months)
Participants	6371 youths from 7th to 10th grade (12- to 17-year-olds), 3174 from Fayette County and 3197 youths from Knox County
Interventions	3 anti-marijuana public service announcements televised from January through April 1997 and from January through April 1998 in Fayette and Knox Counties (USA). These advertisements were based on the SENTAR (sensation-seeking targeting) prevention approach

Palmgreen 2001 (Continued)

Outcomes	● Past 30-day use of marijuana	
Notes	The 2 samples differed significantly on some independent (e.g. perceived peer and family drug use, delinquency) and dependent (use of marijuana) variables, although demographic and sensation-seeking variables were consistent between the 2 samples	
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 293 "Interviews were private and anonymous, with self-administration of drug and alcohol items via laptop computer"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Polansky 1999

Methods	Study design: randomised controlled trial Sampling: systematic sampling (gender, classroom) Comparison group(s): 2 × 2 × 4 design (replication × gender × treatment) Follow-up duration: not specified Study time span: not specified
Participants	312 7th through to 9th graders from a rural south-western Mexican-American community
Interventions	3 substance abuse prevention videotapes (USA) derived from different theoretical frameworks: information-based programming, social skills approach and assertiveness training (a subset of social skills approach)
Outcomes	<ul style="list-style-type: none"> Attitudes towards drugs Use of drugs Other: knowledge of videotape content and disposition to select socially appropriate responses

Notes		
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Randomisation procedure not clearly reported p. 189 "...and then randomly assigned to one of the four treatment and control conditions"
Allocation concealment (selection bias)	Unclear risk	Not reported No baseline comparisons reported
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 191 "to permit collating pre-post protocols while preserving respondent anonymity, the students devised an identification code that they placed on all materials"
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Unclear reporting of the size of both the intervention and control group Moreover unclear whether the final number of students (312) is the initial sample or is the final number of just those who answered (i.e. after drop-out) Abstract "participants were 312 students" p. 189 "153 seventh and eighth grade student responses and 159 ninth-grader responses were analysed"
Selective reporting (reporting bias)	Low risk	No study protocol available but all outcome measures expected (per hypothesis p. 188) have been reported, including those not statistically significant (p. 192/194)

Scheier 2010

Methods	Study design: prospective cohort study Sampling: systematic sampling (representative of major racial groups) Comparison group(s): lower exposure to intervention Follow-up duration: 48 months Study time span: April 1999 to March 2003 (48 months)
Participants	2515 youth aged 12 to 18 interviewed by the National Survey of Parents and Youth (NSPY)

Scheier 2010 (Continued)

Interventions	The National Youth Anti-Drug Media Campaign (USA), already described in Hornik 2006	
Outcomes	<ul style="list-style-type: none">● Past 12-month episodes of drunkenness or cannabis intoxication● Past 30-day binge drinking (5 or more drinks in a row)● Past 30-day use of cigarettes	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous and computer-administered questionnaire p. 248 “Assessment of alcohol and drug use relied on an Anonymous Computer Assisted Self-report Interview (ACASI)”
Incomplete outcome data (attrition bias) All outcomes	Low risk	Same as Hornik 2008 (“The overall response rate among youths for the first round was 65%, with 86% to 93% of still eligible youths interviewed in subsequent rounds”, page 2230 Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, page 2-12, table 2-A “Completed interviews by wave”)
Selective reporting (reporting bias)	Unclear risk	Not applicable

Schwinn 2010

Methods	Study design: randomised controlled trial Sampling: random sampling Comparison group(s): no intervention Follow-up duration: 6 months Study time span: at least 8 months (not directly specified, but pretest was administered 6 weeks before intervention and last follow-up was assessed after 6 months)
Participants	236 girls aged 13 to 14 from 42 US states and 4 Canadian provinces, recruited through the youth-oriented website Kiwibox.com™

Interventions	Internet-based gender-specific intervention (USA, Canada) composed by 12 sessions. This intervention is a pilot test of a gender-specific intervention based on the social learning theory and employs a social competence and skill building strategy. High interaction	
Outcomes	<ul style="list-style-type: none">● Past 30-day alcohol, cigarette, marijuana, poly drug and total substance use● Mediator variables<ul style="list-style-type: none">○ Decision-making skills○ Goal-setting skills○ Drug resistance/refusal skills○ Stress management○ Social skills○ Self esteem○ Body esteem○ Self efficacy	
Notes	Baseline and 6-month follow-up	
<i>Risk of bias</i>		
Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	p. 26 "After study enrolment, girls were randomly assigned to the intervention or control arm"
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 26 "After completing online pretest measures, intervention girls were immediately directed to the first program session. Control girls were thanked for their time and reminded that they would be notified when the next survey was available."
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Computer-administered questionnaire p. 26 "After completing online pretest measures, intervention girls were immediately directed to the first program session. [...] Immediately following completion of the last program module, girls in the intervention group completed the post-test"
Incomplete outcome data (attrition bias) All outcomes	Low risk	p. 28 "Differential attrition was assessed across the three measurement occasions using the same variables analysed in baseline

		equivalency. Pretest to posttest attrition was 6.8%; the attrition rates for girls in intervention and control groups did not differ, $X^2(1) = 1.74, p > 0.05$. At final follow-up, attrition was 9%; again, rates did not differ by study group, $X^2(1) = 0.84, p > 0.05$ "
Selective reporting (reporting bias)	High risk	Protocol not mentioned. Subjective outcomes were not described in full but only as predictors of objective outcomes (substance use)

Slater 2006

Methods	Study design: quasi-randomised controlled trial (assignment to media condition was random; assignment to school condition was not fully random because of problem of staff scheduling in 7 of the 16 communities) Sampling: randomised cluster sampling (treatment and control communities were extracted from 4 major regions of the US) Comparison group(s): no intervention (8 intervention versus 8 non-intervention communities) Follow-up duration: 24 months Study time span: Autumn 1999 to Spring 2003 (~42 months; but intervention lasted 24 months for each community, entry to the in project was different in different communities)	
Participants	4216 6th- and 7th-grade students; mean age at baseline was 12.2 years	
Interventions	The 'Be Under Your Own Influence' programme (USA) is a school- and community-based media effort on marijuana, alcohol and tobacco uptake. The programme emphasised “non-use as an expression of personal identity and the consistency of non-use with youth aspiration”. The school-based intervention was research-based All Stars™ (13 sessions in the first year + 7 booster sessions in the second year); the community intervention was composed of workshops held by trained project staff	
Outcomes	<ul style="list-style-type: none">• Lifetime and past 30-day use of marijuana• Lifetime and past 30-day episodes of alcohol intoxication• Lifetime and current smoking of cigarettes	
Notes	This intervention ran concurrently with the Office of National Drug Policy's national anti-drug campaign (Hornik 2006; Scheier 2010), but their simultaneous effect was not assessed in this study	
Risk of bias		
Bias	Authors' judgement	Support for judgement

Slater 2006 (Continued)

Random sequence generation (selection bias)	Unclear risk	Matching procedure described but no specification of random sequence generation
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Blinding of outcome assessors not reported
Incomplete outcome data (attrition bias) All outcomes	Low risk	Missing data have been imputed using appropriate methods (p. 161)
Selective reporting (reporting bias)	Low risk	No protocol available but the we do not suspect selective reporting bias

Slater 2011

Methods	<p>Study design: randomised controlled trial with a nested prospective cohort study</p> <p>Sampling: systematic sampling (schools were recruited based on National Center for Educational Statistics district listings)</p> <p>Comparison group(s): 4 groups, each including 10 schools and each comprising low to high exposure to the ONDCP campaign</p> <ul style="list-style-type: none"> • Be Under Your Own Influence (BUYOI) intervention both at school and in the community • BUYOI intervention at school but not in the community • BUYOI intervention in the community but not at school • no BUYOI intervention neither at school nor in the community <p>Follow-up duration: 24 months</p> <p>Study time span: Autumn 2005 to Spring 2009 (~42 months)</p>
Participants	3236 students, mean age 12.4 ± 0.6 years
Interventions	<p>The Office of National Drug Control Policy's (ONDCP) 'Above the Influence' media campaign (USA) and a school- and community-based mass media intervention, 'Be Under Your Own Influence' (BUYOI; USA). They both started in 2005 and ran concurrently</p> <ul style="list-style-type: none"> • The ONDCP's campaign is the rebranded version of the national anti-drug campaign launched in 1998 (Hornik 2006; Palmgreen 2007; Scheier 2010). This version, like the original one, used televised ads supplemented by printed ads (e.g. posters) • The BUYOI campaign is a replication and extension of a campaign launched in 1999 (Slater 2006). This campaign employed only printed ads and was implemented both in schools and communities <p>Although the ONDCP's campaign used far more creative executions given its funding</p>

	levels, both campaigns were similar in concept, i.e. both linked substance use with autonomy and aspiration threats	
Outcomes	<ul style="list-style-type: none">• Attitudes: autonomy and aspiration inconsistent with marijuana use• Lifetime, past 90-day and past 30-day use of marijuana	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Page 15 “Random assignment used a group-matching procedure: NCES data on community demographics and location were used to generate possible randomization schemes in which major demographics and location were balanced to the degree possible across experimental conditions and one of the acceptable schemes was randomly selected.”
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	It is unclear who administered the questionnaires and whether they were anonymous
Incomplete outcome data (attrition bias) All outcomes	Low risk	Reasons for missing outcome data unlikely to be related to true outcome
Selective reporting (reporting bias)	Low risk	No protocol available but the we do not suspect selective reporting

Wyoming Meth 2011

Methods	Study design: interrupted time series study Sampling: 4-stage probability sampling Comparison group(s): pre-intervention survey Follow-up duration: n/a Study time span: April 2008 to May 2011 (34 months)
Participants	5700 youths (909 + 913 + 2652 + 1226)

Wyoming Meth 2011 (Continued)

Interventions	Meth Project (USA), a “messaging campaign, supported by community outreach, and public policy initiatives”. The campaign comprises “television, radio, print, billboard, and Internet advertising”	
Outcomes	<ul style="list-style-type: none">● Past-month use of methamphetamine● Attitudes towards methamphetamine and other drugs● Perceptions concerning methamphetamine and other drugs● Informations sources and advertising awareness● Statewide Meth Project awareness and perceptions	
Notes		
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Not applicable
Allocation concealment (selection bias)	Unclear risk	Not applicable
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaires
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not reported
Selective reporting (reporting bias)	Unclear risk	No information regarding potential reporting bias

Yzer 2003

Methods	<p>Study design: randomised controlled trial</p> <p>Sampling: random sampling (from middle and high schools)</p> <p>Comparison group(s):</p> <ul style="list-style-type: none"> • no intervention (documentary with no advertisements) • gateway condition (explicit: 4 anti-hard drug followed by a teenage girl’s testimonial about how her trial use of marijuana led to using hard drugs) • implicit gateway condition (2 anti-marijuana and 2 anti-hard drugs advertisements without explicit reference to the gateway concept) • hard drugs condition (same advertisements of gateway condition, but not followed by testimonials) <p>Follow-up duration: not applicable (post-only design)</p> <p>Study time span: March 2000 to not specified</p>
Participants	418 students of middle/high schools in urban Philadelphia, mean age 14 ± 1.89 years

Interventions	Anti-marijuana and anti-hard drugs advertisements embedded in a documentary video (USA)	
Outcomes	<ul style="list-style-type: none">• Intention to use marijuana in the next 12 months• Attitude towards marijuana• Perceptions about marijuana	
Notes	Similar to Zhao 2006 , many of the authors wrote both papers	
<i>Risk of bias</i>		
Bias	Authors’ judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Participants were randomly assigned to 1 of the 4 experimental conditions, and the stimuli were randomly presented using a randomisation feature in MediaLab software. (Personal communication with the author)
Allocation concealment (selection bias)	Low risk	Participants did not know which condition they were assigned to, and thus did not know which stimuli they and participants in other conditions were exposed to. (Personal communication with the author)
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Anonymous questionnaire p. 135 “All videos and the questionnaire were programmed onto a laptop computer using an interactive program that allows random ordering of questions and videos within blocks”
Incomplete outcome data (attrition bias) All outcomes	Low risk	There were no missing data. (Personal communication with the author)
Selective reporting (reporting bias)	Low risk	No protocol available but the we do not suspect selective reporting bias

Zhao 2006

Methods	<p>Study design: randomised controlled trial</p> <p>Sampling: not specified (informational letters to parents in the 2 school-based studies, mall-intercept of lists held by market researchers for the mall-based study)</p> <p>Comparison group(s): no intervention (documentary about television production, without the embedded anti-marijuana advertisements)</p> <p>Follow-up duration: not applicable (post-only design)</p> <p>Study time span: not specified</p>
Participants	435 youths whose mean age was 15.2 ± 1.88 years
Interventions	3 anti-marijuana advertisements (USA) addressing normative beliefs. The advertisements were embedded and randomly included in a video documentary about television production
Outcomes	<ul style="list-style-type: none"> • Behavioural beliefs towards marijuana (perceptions) • Intention to use marijuana • Social norms on marijuana (perceptions)
Notes	Results were based on combined data from 3 studies done at different points in time, but “identical in terms of methodology, procedures, experimental conditions, and the structure of the outcome questionnaire”. However, whereas study 1 and 2 were collected at middle and high schools, study 3 was conducted at various malls around the country

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	p. 190 “Participants were randomly assigned to condition”, but randomisation details are not reported
Allocation concealment (selection bias)	Low risk	Although full allocation concealment is not possible for this kind of study, there is low risk of selection bias because researchers administering the intervention were unlikely to know the children. See p. 190: “The experimental group saw the three advertisements that challenged undesirable normative beliefs about marijuana use (see Table 1 for a description of the messages). The advertisements were embedded and randomly rotated in a video documentary about television production. The control group was not exposed to any anti-marijuana messages but saw the same documentary as the experimental group”

Blinding of outcome assessment (detection bias) All outcomes	Low risk	Computer-administered questionnaire p. 191 "The instrument (including the video clips) was programmed onto laptop computers using an interactive program called MediaLab (Jarvis, 1998), which allows random ordering of blocks of questions and videos within the questionnaire"
Incomplete outcome data (attrition bias) All outcomes	Low risk	All participants completed the test (being a post-only design); p. 190 "All three studies used the same between-subjects, post-only design, with one experimental condition and one control condition"
Selective reporting (reporting bias)	Unclear risk	No study protocol was mentioned

n/a: not applicable

PSA: public service announcement

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Alemi 1996	Target population is pregnant women who already use or used cocaine
An 2007	This intervention aims to promote inquiry of prescription medicines/treatments, not to hinder use of illicit drugs
Andrews 1995	The purpose of the campaign was to promote public awareness of the link between addiction and child maltreatment, not to prevent addiction
Barber 1990	Target population mean age is 40
Beaudoin 2007	Presented outcomes are not included among those of this review
Beck 2008	Overview of drugs prevalence and school-based prevention interventions in France. Some information about therapeutic interventions, but no information about mass media prevention interventions
Belenko 2009	This study analyses data from the National Survey of Parents and Youth, which was not designed to provide quality information about exposure to anti- or pro-drug websites. This study aims to find factors (e.g. gender, parent-reported income, prior exposure to drugs) associated with viewing of drug websites, not to assess whether viewing of anti-drug websites can influence outcomes included in the protocol of this review

(Continued)

Black 1994	This study aims to assess consistency of data collected with 2 different sampling methods
Brannon 1989	None of the evaluated outcomes (i.e. participation, satisfaction and perceived efficacy of programme) met the inclusion criteria for this review
Chambers 2005	Not a mass media intervention
Chiauzzi 2008	This study assesses the effectiveness of an online stress management tool. Outcomes do not include substance use, intention to use or any other outcome relevant to this review
Collins 1991	This paper aims to prevent alcohol abuse
Cook 1999	Review of books and media, not of studies
David 2006	Evaluated intervention is adolescent discussion about anti-drug advertisements, not advertisements themselves
DeJong 1999	This paper raises concern about the Office of National Drug Control Policy (ONDCP)'s National Youth Anti-Drug Media Campaign without reporting results of its effectiveness assessment
Di Noia 2003	The majority of recruited professionals were older than 26 and the assessed outcomes are not among those needed for inclusion
Donohew 2000	The aim of the study is to understand the relationship between mediators (sensation-seeking and decision-making processes) and alcohol and risky sexual behaviours in adolescents
Epstein 1999	Survey with control group but without pre-intervention questionnaire
Erceg-Hurn 2008	It is not possible to compare different years due to the different methodology used in surveys (see also commentary paper Erceg-Hurn 2008)
Everett 1995	This study does not evaluate intervention effectiveness but matching between HSV/LSV interventions and HSV/LSV subjects
Flay 2000	Reviews of mainly anti-tobacco media-, school- and community-based interventions
Hannon 2000	Narrative review of key African American community values and provides recommendations as to how this information might be incorporated into the development of anti-drug messages and materials targeted at African Americans
Harrington 2003	This study does not evaluate intervention effectiveness but matching between HSV/LSV interventions and HSV/LSV subjects
Helme 2007	Intervention was an anti-smoking campaign
Johnson 1990	The mass media intervention was administered to both study groups
Jordan 2005	This study design (survey) does not allow us to evaluate intervention effectiveness

(Continued)

Kang 2009	This study is an evaluation of the perceived effectiveness of specific elements of the interventions, not the effectiveness of whole interventions on outcome variables included in the protocol for this review
Know the Score 2007	For the 2 cocaine reports: the 4 study waves differed slightly but in many respects (age and working status of respondents, survey locations and, more importantly, survey questions) For the 2 heroin reports: respondent age is not fully comparable across study waves. Additionally, participants in waves 1 and 3 were older than 25
Lorch 1994	No pretest drug-related measure was taken. This study aims to predict responses to PSA and drug use by different sensation-seeking profiles
Lubman 2007	Narrative review on substance addiction prevention. Data were not presented here
Marsiglia 2009	This study evaluates a school-based intervention which has no media-related component
Myers 2006	Not a prevention intervention. It does not include illicit drug-related outcomes
Palmgreen 2007	This study does not evaluate intervention effectiveness but matching between the intervention and HSV/LSV subjects
Pentz 1990	The effect of the mass media component could not be disentangled from other components
Ramirez 1999	Description of theoretical basis, development and implementation of 'Mirame!/Look at Me!' media- and school-based programme for substance abuse among Hispanic youth. However, the programme's effectiveness was not assessed
Reis 1994	Survey. This study design does not allow us to evaluate intervention effectiveness
Ruggiero 2006	Participants are older than 26
Schmeling 1980	Intervention targets prescription drug abusers
Siegel 2008	No blank control, one group focusing on physical harms of inhalant use, the other focusing on social harms
Skinner 1995a	The outcome (perceived persuasiveness) is not among the outcome measures included in our protocol
Sloboda 2006	This book does not include data on studies evaluating mass media programmes
Spitzer 2010	Outcomes concern 'values' and therefore do not meet the inclusion criteria
Stephenson 2002	The aim of this study was to find predictors of exposure from an anti-marijuana media campaign, not to evaluate the effectiveness of the campaign
Stephenson 2002a	CBA study aiming to link perceived message sensation value and viewer's reaction to an anti-heroin PSA
Stephenson 2003	Survey with control group aiming to evaluate sensation-seeking as a moderating variable

(Continued)

Stephenson 2005	This study analyses the content of ads but does not assess their effectiveness
Stevens 1996	School-based intervention with added community activities
Stryker 2003	Ecological study about the impact of media coverage of the negative consequences of marijuana use. This study does not assess the effectiveness of a single prevention intervention
Sussman 1987	Survey with a control group but without a pre-intervention questionnaire
Tait 2010	Systematic review on Internet-based interventions for the treatment of alcohol misuse
Taylor 1984	Outcomes in the pilot study (the statewide intervention was not evaluated) were knowledge, attitudes and behaviours about friendships and human relationships, not substance use/misuse
Varshavsky 2003	Qualitative content analysis of a national campaign
Werch 2010	Not a mass media intervention

CBA: controlled before and after (study)

PSA: public service announcement

HSV: high sensation value

LSV: low sensation value

Characteristics of studies awaiting assessment *[ordered by study ID]*

Block 2002

Methods	
Participants	
Interventions	
Outcomes	
Notes	We contacted authors for results and are waiting for a response

Duncan 2000

Methods	
Participants	
Interventions	

Duncan 2000 *(Continued)*

Outcomes	
Notes	We contacted authors for results and are waiting for a response

Flay 1986

Methods	
Participants	
Interventions	
Outcomes	
Notes	We were unable to retrieve the paper's full text

Longshore 2006

Methods	
Participants	
Interventions	
Outcomes	
Notes	We contacted authors for results and are waiting for a response

Marsch 2007

Methods	
Participants	
Interventions	
Outcomes	
Notes	We were unable to retrieve the paper's full text

Moore 2011

Methods	
Participants	
Interventions	
Outcomes	
Notes	We were unable to retrieve the paper's full text

Moreno 2009

Methods	
Participants	
Interventions	
Outcomes	
Notes	We contacted authors for results and are waiting for a response

Skinner 1995

Methods	
Participants	
Interventions	
Outcomes	
Notes	We were unable to retrieve the paper's full text

Williams 2005

Methods	
Participants	
Interventions	
Outcomes	
Notes	We contacted authors for results and are waiting for a response

DATA AND ANALYSES

Comparison 1. Mass media versus no mass media intervention (RCT)

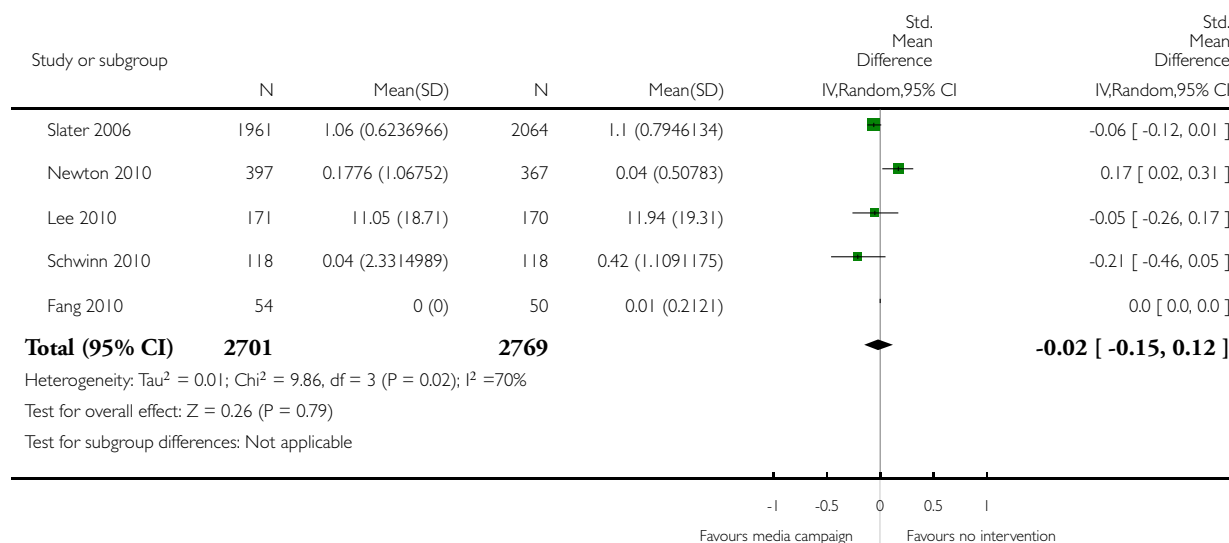
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Drug use	5	5470	Std. Mean Difference (IV, Random, 95% CI)	-0.02 [-0.15, 0.12]
2 Intention to use drugs	4	1270	Std. Mean Difference (IV, Fixed, 95% CI)	-0.07 [-0.19, 0.04]

Analysis 1.1. Comparison 1 Mass media versus no mass media intervention (RCT), Outcome 1 Drug use.

Review: Media campaigns for the prevention of illicit drug use in young people

Comparison: 1 Mass media versus no mass media intervention (RCT)

Outcome: 1 Drug use

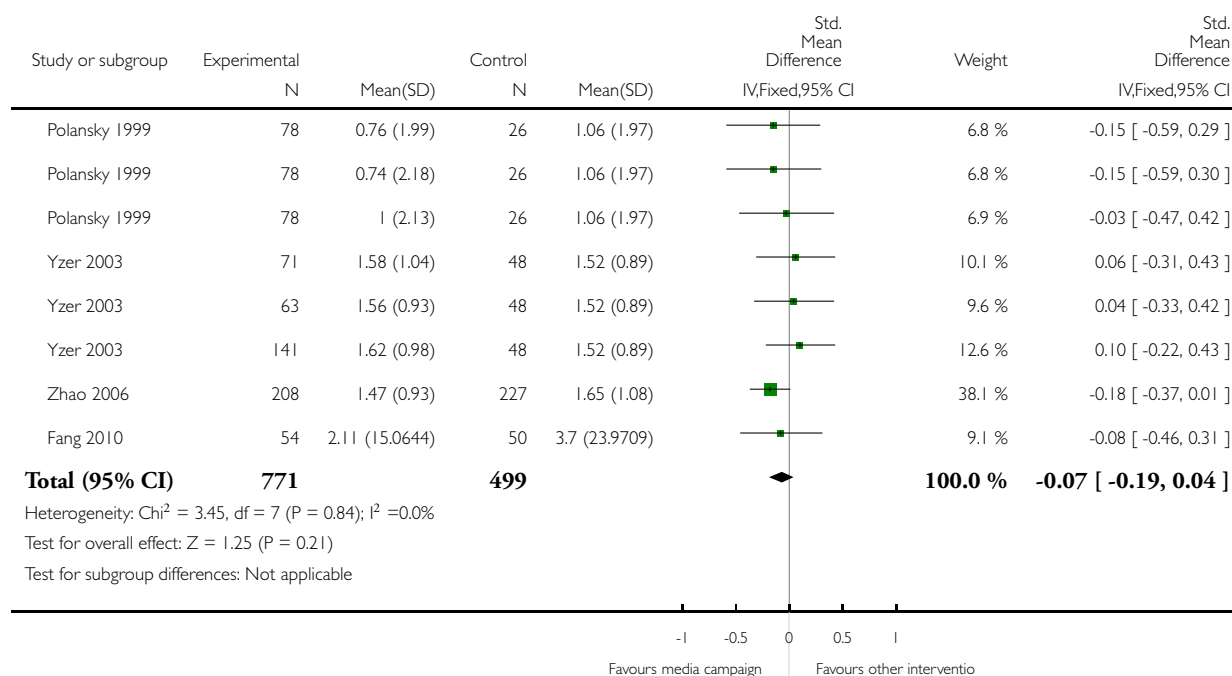


Analysis 1.2. Comparison 1 Mass media versus no mass media intervention (RCT), Outcome 2 Intention to use drugs.

Review: Media campaigns for the prevention of illicit drug use in young people

Comparison: 1 Mass media versus no mass media intervention (RCT)

Outcome: 2 Intention to use drugs



ADDITIONAL TABLES

Table 1. 'Risk of bias' assessment of interrupted time series studies

Miller 2000		
Criterion	Score	Notes
<i>a) Protection against secular changes</i>		
The intervention is independent of other changes	Done	"The usual environmental influences such as prices, taxes, state regulations, campus policies, and enforcement did not change substantially during the study period. Neither was there any reason to expect that students on the two campuses would respond differentially to anonymous surveys. The only obvious difference between the two campuses that might be expected to affect substance use differentially was the implementation of the prevention

Table 1. 'Risk of bias' assessment of interrupted time series studies (Continued)

		program at UNM", page 756
There are sufficient data points to enable reliable statistical inference	Not done	2 data points (before and after)
Formal test for trend. Complete this section if authors have used ANOVA modelling	Done	
<i>b) Protection against detection bias</i>		
Intervention unlikely to affect data collection	Done	"All questionnaires were completed anonymously. To encourage participation, those who returned the survey (by mail) were entered into a lottery for cash prizes by separating a numbered ticket, returning one part with the completed survey and retaining the other half. Winning numbers were announced through the campus newspaper, the Daily Lobo. As an additional incentive for the follow-up survey, respondents were invited to participate in a contest to guess the actual levels of alcohol/drug use on campus, as revealed by the first survey", page 750
Blinded assessment of primary outcome(s)	Done	Anonymous surveys, page 750
<i>c) Completeness of data set</i>	Done	"At baseline (fall) assessment, 1,400 surveys were distributed to enrolled UNM students, a sample of approximately 6% selected randomly by the university's computerized mailing list program. Of these, 567 surveys were returned and usable (41%). At the control campus, 1,080 surveys were distributed to a random sample of students, 457 of whom returned them (42.3%). [...] The return rates were 431 (31%) at UNM and 434 (34%) at NMSU", page 751
<i>d) Reliable primary outcome measure(s)</i>	Done	"Use measures (14 items) included a frequency (number of drinking days per 30) and quantity index of drinking (number of standard drinks consumed per drinking occasion; range: 0-15) that were multiplied to form a single quantity frequency measure (number of drinks per month) [...]", page 750 "Problem measures included 14 indicators of alcohol dependence and adverse consequences of heavy drinking or illicit drug use in the prior year. [...]", page 750 "Risk assessment included 13 items regarding the extent to which students perceived risk or consequences related to alcohol or other drug use [...]", page 750
Palmgreen 2001 (includes Stephenson 1999)		
Criterion	Score	Notes
<i>a) Protection against secular changes</i>		

Table 1. 'Risk of bias' assessment of interrupted time series studies (Continued)

The intervention is independent of other changes	Unclear	
There are sufficient data points to enable reliable statistical inference	Done	32 data points
Formal test for trend. Complete this section if authors have used ANOVA modelling	Done	ANOVA modelling was used. See from page 186 on
<i>b) Protection against detection bias</i>		
Intervention unlikely to affect data collection	Done	Methodology of data collection is not reported to have changed across data points
Blinded assessment of primary outcome(s)	Done	Anonymous computer-administered questionnaire (p. 293)
<i>c) Completeness of data set</i>	Unclear	
<i>d) Reliable primary outcome measure(s)</i>	Done	30-day use of marijuana, attitudes, beliefs, intentions
Idaho Meth 2010, Colorado Meth 2011, Georgia Meth 2011, Hawaii Meth 2011 and Wyoming Meth 2011		
Criterion	Score	Notes
<i>a) Protection against secular changes</i>		
The intervention is independent of other changes	Unclear	
There are sufficient data points to enable reliable statistical inference	Done	Data points for each study ranged from 2 to 4 including only one baseline survey. However, overall, there are a sufficient number of observations
Formal test for trend. Complete this section if authors have used ANOVA modelling	Not done	
<i>b) Protection against detection bias</i>		
Intervention unlikely to affect data collection	Done	Despite some slight changes, methodology of data collection is consistent across studies and across data points
Blinded assessment of primary outcome(s)	Done	Anonymous questionnaires
<i>c) Completeness of data set</i>	Unclear	Not applicable
<i>d) Reliable primary outcome measure(s)</i>	Done	Past-month use of marijuana, attitudes, perceptions

Table 1. 'Risk of bias' assessment of interrupted time series studies (Continued)

Carpenter 2011		
Criterion	Score	Notes
<i>a) Protection against secular changes</i>		
The intervention is independent of other changes	Done	Adjustment by many individual and market variables (page 949)
There are sufficient data points to enable reliable statistical inference	Not done	3 data points (page 949)
Formal test for trend. Complete this section if authors have used ANOVA modelling	Done	"multivariate logistic regression" (page 949)
<i>b) Protection against detection bias</i>		
Intervention unlikely to affect data collection	Done	Ads were broadcasted independently on the surveys
Blinded assessment of primary outcome(s)	Done	Monitoring the Future (MTF) surveys used anonymous questionnaires
<i>c) Completeness of data set</i>	Unclear	
<i>d) Reliable primary outcome measure(s)</i>	Done	Past-month and lifetime marijuana use (page 951)

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011)

Hornik 2006		
Criterion	Score/Info	Notes
<i>In a well-conducted cohort study:</i>		
The study addresses an appropriate and clearly focused question	Well covered	"We examined the cognitive and behavioral effects of the National Youth Anti-Drug Media Campaign on youths aged 12.5 to 18 years and report core evaluation results", abstract
<i>Selection of subjects</i>		
The 2 groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Well covered	"The sample was selected to provide an efficient and nearly unbiased cross-section of US youths and their parents. Respondents

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		were selected through a stratified 4-stage probability sample design: 90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that household.”, page 2229-30
The study indicates how many of the people asked to take part did so, in each of the groups being studied	Well covered	Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, Appendix A, page A-6, table A-1 and page A-11 tables A-8 to A-10
The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	Well covered	“Analyses were restricted to youths who were nonusers of marijuana at the current round (for cross-sectional analyses) or at the previous round (for lagged analyses).”, page 2232
What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	35%	“The overall response rate among youths for the first round was 65%, with 86% to 93% of still eligible youths interviewed in subsequent rounds.”, page 2230 Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, page 2-12, table 2-A “Completed interviews by wave”
Comparison is made between full participants and those lost to follow-up, by exposure status	Not reported	
<i>Assessment</i>		
The outcomes are clearly defined	Well covered	“For 3 reasons, all drug-related measures reported here relate to marijuana use. [...] Four measures or indices represented the following constructs: (1) marijuana intentions, (2) marijuana beliefs and attitudes, (3) social norms, and (4) self-efficacy to resist use.”, page 2230
The assessment of outcome is made blind to exposure status	Not applicable	Blinding to exposure status was not applicable for this study

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	Well covered	"A measure of general exposure to antidrug advertising was derived from responses to questions about advertising recall for each medium or media grouping: television and radio, print, movie theatres or videos, and outdoor advertising.", page 2230
The measure of assessment of exposure is reliable	Well covered	"For 3 reasons, all drug-related measures reported here relate to marijuana use.", page 2230
Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	Well covered	"For 3 reasons, all drug-related measures reported here relate to marijuana use. First, marijuana is by far the illicit drug most heavily used by youths. Second, for other drugs, the low levels of use meant that the NSPY sample sizes were not large enough to detect meaningful changes in use with adequate power. Third, to the extent that the campaign did target a specific drug, it was almost always marijuana. [...] The cognitive measures were developed on the basis of 2 health behavior theories, the theory of reasoned action and social cognitive theory", page 2230
Exposure level or prognostic factor is assessed more than once	Well covered	"3 nationally representative cohorts of US youths aged 9 to 18 years were surveyed at home 4 times.", abstract
<i>Confounding</i>		
The main potential confounders are identified and taken into account in the design and analysis	Well covered	"Potential confounder measures. The analyses employed propensity scoring for confounder control by weighting adjustments, 9-14 incorporating a wide range of standard demographic variables and variables known to be related to youths' drug use or thought likely to be related to exposure to antidrug messages. Propensity scores were developed for the general and specific exposure measures. More than 150 variables were considered possible confounders.", page 2231
<i>Statistical analysis</i>		
Have confidence intervals been provided?	Well covered	Tables 1-4, pages 2233-4

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

<i>Overall assessment of the study</i>		
How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between exposure and effect? <i>Code ++, +, or –</i>	++	Propensity scoring from 150 confounders, page 2231
Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the exposure being investigated?	Yes	This study includes very good control for possible confounders
Are the results of this study directly applicable to the patient group targeted in this guideline?	Unclear	Results are applicable to US youth; it is unclear whether they are generalisable outside the US
<i>Description of the study</i>		
Do we know who the study was funded by?	Public Funds (NIDA), Government (Congress)	"Research for and preparation of this article were supported by the National Institute on Drug Abuse (grants 3-N01-DA085063-002 and 1-R03-DA-020893-01). The evaluation of the National Youth Anti-Drug Media Campaign was funded by Congress as part of the original appropriation for the campaign. The White House Office of National Drug Control Policy directly supervised the campaign. The National Institute on Drug Abuse supervised the evaluation; Westat, with the Annenberg School for Communication at the University of Pennsylvania as a subcontractor, received the contract. All authors were funded for this evaluation and other projects by the National Institute on Drug Abuse.", page 2235
How many centres are patients recruited from?	USA as a whole	"90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that house-

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		hold.", page 2230
From which countries are patients selected? (Select all those involved. Note additional countries after 'Other')	USA	
What is the social setting (i.e. type of environment in which they live) of patients in the study?	Mixed	"More than 150 variables were considered possible confounders. [...] They include [...] urban-rural residency; [...]", page 2231
What criteria are used to decide who should be INCLUDED in the study?	4-stage selection	"Respondents were selected through a stratified 4-stage probability sample design: 90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that household.", page 2229-30
What criteria are used to decide who should be EXCLUDED from the study?	Youth living in boarding schools and college dormitories	"As mentioned previously, youth residing in group quarters were not eligible for selection in any of the three recruitment waves. Thus, youth living in boarding schools and college dormitories were excluded from the scope of the survey. This exclusion was made because it was felt that dormitory residents could not be easily interviewed at their parents' homes and that their experiences were so", Report, A-10
What intervention or risk factor is investigated in the study? (Include dosage where appropriate)	The National Youth Anti-Drug Media Campaign	
What comparisons are made in the study (i.e. what alternative treatments are used to compare the intervention/exposure with). Include dosage where appropriate	Lower exposure versus higher exposure to anti-drug campaign	"The analyses reported here were based on 3 types of measures: recalled exposure to antidrug messages aired by the campaign and other sources; cognitions and behavior related to marijuana, as outcomes; and individual and household characteristics, including a wide range of variables known to be related to drug cognitions and use and to exposure to antidrug messages.", page 2230

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

What methods were used to randomise patients, blind patients or investigators, and to conceal the randomisation process from investigators?	Randomisation: not applicable, but propensity scoring was employed Blinding of patients: not applicable Blinding of investigators: not reported Randomisation concealment: not applicable	
How long did the active phase of the study last?	September 1999 to June 2004 (58 months)	
How long were patients followed up for, during and after the study?	November 1999 to June 2004 (56 months)	
List the key characteristics of the patient population. Note if there are any significant differences between different arms of the trial	Representative of US youths aged 9 to 18	"The sample was selected to provide an efficient and nearly unbiased cross-section of US youths and their parents", page 2229
<i>Record the basic data for each arm of the study. If there are more than 4 arms, note data for subsequent arms at the bottom of the page</i>		Tables 1-4, pages 2233-4
<i>Record the basic data for each IMPORTANT outcome in the study. If there are more than 4, note data for additional outcomes at the bottom of the page</i>		Tables 1-4, pages 2233-4
<i>Notes. Summarise the authors' conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question</i>	Through June 2004, the campaign is unlikely to have had favourable effects on youths and may have had delayed unfavourable effects The evaluation challenges the usefulness of the campaign	
Scheier 2010		
Criterion	Score/Info	Notes
<i>In a well-conducted cohort study:</i>		
The study addresses an appropriate and clearly focused question	Well covered	"In this study, we examined whether awareness (recall) of the National Youth Anti-Drug Media Campaign (NYADMC) benefited youth by attenuating their drug use.", abstract
<i>Selection of subjects</i>		

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

The 2 groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Well covered	Same as Hornik 2008 ("The sample was selected to provide an efficient and nearly unbiased cross-section of US youths and their parents. Respondents were selected through a stratified 4-stage probability sample design: 90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that household.", page 2229-30)
The study indicates how many of the people asked to take part did so, in each of the groups being studied	Well covered	Same as Hornik 2008 (Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, Appendix A, page A-6, table A-1 and page A-11 tables A-8 to A-10)
The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	Well covered	Same questionnaire was administered at baseline and at follow-up. "National Survey of Parents and Youth (NSPY) [...] could be used to assess youths' awareness of the campaign messages and monitor any corresponding changes in drug use trends.", page 241-2
What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	35%	Same as Hornik 2008 ("The overall response rate among youths for the first round was 65%, with 86% to 93% of still eligible youths interviewed in subsequent rounds", page 2230 Evaluation of the National Youth Anti-Drug Media Campaign: 2004 Report of Findings, page 2-12, table 2-A "Completed interviews by wave")
Comparison is made between full participants and those lost to follow-up, by exposure status	Well covered	"Attrition analyses were structured to determine whether certain factors operate systematically to cause dropout from the study. Proportional analyses using the v2 test were used for cross tabulation of binary measures and logistic regression modelling to examine the optimal predictors of retention (coded '1' stay and '0' dropout). We

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		<p>used the WesVar software program to estimate logistic regression models of panel attrition. This statistical modelling program enables us to adjust (through poststratification) the sample variance estimators for the undersampling of primary sampling units and correct any bias in parameter estimates related directly to the complex sampling design (using replicate variance estimators to adjust standard errors for design effects)</p> <p>Proportional tests indicated that panel youth were significantly more likely to be female, smoke more cigarettes, drink alcohol, and smoke marijuana (all v2 proportional tests significant at the $p = .0001$) compared with dropout youth. Given the large number of variables possibly related to retention status, logistic models were run separately for five individual domains (demographics, campaign awareness, drug use, school-related factors, and psychosocial risk).⁷ Following tests of the individual domains, we culled only significant predictors and tested these in a combined model predicting retention. The final model indicated that retained youth were less at risk for marijuana use (unstandardized $b = -3.51$, $p < .0001$, $OR = .03$), engaged in more antisocial behavior (evidencing suppression: [$b = .23$, $p < .0001$, $OR = 1.26$]), spent fewer hours listening to the radio on a daily basis ($b = -.09$, $p < .01$, $OR = .91$), and were more likely to have attended school in the past year ($b = 1.05$, $p < .01$, $OR = 2.87$) compared with their dropout counterparts. Using the Cox-Snell likelihood pseudo-R^2 statistic, the model accounted for 12% of the variance in retention status, $F(14,87) = 12.127$, $p < .0001$.”,</p> <p>page 250</p>
<i>Assessment</i>		
The outcomes are clearly defined	Well covered	<p>“Assessment of alcohol and drug use relied on an Anonymous Computer Assisted Self-report Interview (ACASI). Two alcohol use items⁶ assessed being drunk or high (“How many times were you drunk or very high from alcohol in the last 12 months?”) with</p>

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		response categories ranging from "I don't use alcohol" (0) through "40 or more occasions" (7); and heavy alcohol use based on a measure of binge drinking ("How many days have you had five or more drinks in the last 30 days?") with response categories ranging from "I don't drink" (0) through "10 or more times" (6). Cigarette use was assessed with a single item ("How many cigarettes smoked a day during the last 30 days?") with response categories ranging from "None" (0) through "More than 35 per day, about 2 packs or more" (7). A single frequency item assessed marijuana involvement ("How many times have you used marijuana in the last 12 months?") with response categories ranging from "I have never used marijuana" (0) through "40 or more occasions" (6).", page 248
The assessment of outcome is made blind to exposure status	Not applicable	Blinding to exposure status was not applicable for this study
Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	Not reported	
The measure of assessment of exposure is reliable	Well covered	<p>"Turning to the campaign awareness parameters, we see two findings worth noting. First, growth in campaign awareness is positive for the earlier years (12 to 14), except for television viewing behavior, which had a slope not significantly different from zero. As these youth became older (14 to 18), their awareness declined for every media venue except specific recall (videos shown on laptops) and radio listening behavior. Also, the magnitude of the slope terms were considerably larger at the younger age for recall of stories about drugs and youth, brand awareness, specific recall, and radio listening but larger in magnitude for television (declining) as these youth transitioned to high school.", page 253</p> <p>"Figure 2 graphically presents a generic template for testing the bivariate cohort growth models. Again, two slope trends are posited to capture the different rates of</p>

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		growth for youth when they were younger versus when they were older, and this is repeated for both drug use (D) and awareness (A) measures.”, page 253
Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	Well covered	“Assessment of alcohol and drug use relied on an Anonymous Computer Assisted Self-report Interview (ACASI). Two alcohol use items ⁶ assessed being drunk or high (“How many times were you drunk or very high from alcohol in the last 12 months?”) with response categories ranging from “I don’t use alcohol” (0) through “40 or more occasions” (7); and heavy alcohol use based on a measure of binge drinking (“How many days have you had five or more drinks in the last 30 days?”) with response categories ranging from “I don’t drink” (0) through “10 or more times” (6). Cigarette use was assessed with a single item (“How many cigarettes smoked a day during the last 30 days?”) with response categories ranging from “None” (0) through “More than 35 per day, about 2 packs or more” (7). A single frequency item assessed marijuana involvement (“How many times have you used marijuana in the last 12 months?”) with response categories ranging from “I have never used marijuana” (0) through “40 or more occasions” (6).”, page 248
Exposure level or prognostic factor is assessed more than once	Well covered	Yes: 4 rounds of data collection. Table 1, page 249
<i>Confounding</i>		
The main potential confounders are identified and taken into account in the design and analysis	Not reported	
<i>Statistical analysis</i>		
Have confidence intervals been provided?	No	Page 264
<i>Overall assessment of the study</i>		
How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between expo-	-	“...there was no “intervention“ to speak of, but rather the campaign took shape as a naturalistic observational study conducted

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

sure and effect? Code ++, +, or –		at a particular point in time with no clear demarcation from various historical influences that could affect patterns of reported drug use”, page 264
Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the exposure being investigated?	No, because no adjustment for confounders was reported	
Are the results of this study directly applicable to the patient group targeted in this guideline?	Unclear	Results are applicable to US youth; it is unclear whether they are generalisable outside the US
<i>Description of the study</i>		
Do we know who the study was funded by?	No	
How many centres are patients recruited from?	USA as a whole	Same as Hornik 2008 (“90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that household.”, page 2230)
From which countries are patients selected? (Select all those involved. Note additional countries after 'Other')	USA	
What is the social setting (i.e. type of environment in which they live) of patients in the study?	Mixed	Same as Hornik 2008 (“More than 150 variables were considered possible confounders. [...] They include [...] urban-rural residency; [...]”, page 2231)
What criteria are used to decide who should be INCLUDED in the study?	4-stage selection	Same as Hornik 2008 (“Respondents were selected through a stratified 4-stage probability sample design: 90 primary sampling units-typically county size-were selected at the first stage, geographical segments were selected within the sampled primary sampling units at the second stage, households were selected within the sampled segments at the third stage, and then, at the final

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		stage, 1 or 2 youths were selected within each sampled household, as well as 1 parent in that household.”, page 2229-30)
What criteria are used to decide who should be EXCLUDED from the study?	Youth living in boarding schools and college dormitories	Same as Hornik 2008 (“As mentioned previously, youth residing in group quarters were not eligible for selection in any of the three recruitment waves. Thus, youth living in boarding schools and college dormitories were excluded from the scope of the survey. This exclusion was made because it was felt that dormitory residents could not be easily interviewed at their parents’ homes and that their experiences were so”, Report, Appendix A, A-10)
What intervention or risk factor is investigated in the study? (Include dosage where appropriate)	The National Youth Anti-Drug Media Campaign	“...there was no “intervention“ to speak of, but rather the campaign took shape as a naturalistic observational study conducted at a particular point in time with no clear demarcation from various historical influences that could affect patterns of reported drug use”, page 264
What comparisons are made in the study (i.e. what alternative treatments are used to compare the intervention/exposure with). Include dosage where appropriate	Exposure versus drug use	Variou models, e.g. see page 256
What methods were used to randomise patients, blind patients or investigators, and to conceal the randomisation process from investigators?	Randomisation: not applicable Blinding of patients: not applicable Blinding of investigators: not reported Randomisation concealment: not applicable	
How long did the active phase of the study last?	September 1999 to June 2004 (58 months)	
How long were patients followed up for, during and after the study?	November 1999 to June 2004 (56 months)	
List the key characteristics of the patient population. Note if there are any significant differences between different arms of the trial	Representative of US youths aged 9 to 18	Same as Hornik 2008 (“The sample was selected to provide an efficient and nearly unbiased cross-section of US youths and their parents”, page 2229)
<i>Record the basic data for each arm of the study. If there are more than 4 arms, note data for subsequent arms at the bottom of the page</i>	Table 2, page 251	

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

<p><i>Record the basic data for each IMPORTANT outcome in the study. If there are more than 4, note data for additional outcomes at the bottom of the page</i></p>	<p>Tables 3-4-5, pages 252-7</p>	
<p><i>Notes. Summarise the authors' conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question</i></p>	<p>When they were younger, these youth accelerated their drug use and reported increasing amounts of campaign awareness. When they were older, [...] no effects for marijuana were significant but trended in the direction of increased awareness associated with declining drug use</p>	<p>“Behavior change is guided by the Theory of Reasoned Action (TRA: Ajzen & Fishbein, 1973, 1977) and draws also from social persuasion (McGuire, 1961, 1966, 1968) and communication theories (Hovland, Janis, & Kelley, 1953). According to the TRA, the influence of attitudes (i.e., subjective evaluations of behavior consequences) and beliefs (subjective norms and behavioral outcomes or expectancies) on behavior is mediated through intentions (i.e., future intent to engage the behavior). In other words, youth form impressions of whether drugs are good or bad, and they combine this information with normative beliefs (whether their close friends approve of drug use) and behavioral expectations (perceived benefits and negative consequences of drug use) toward drug use. These steps are necessary but not sufficient conditions, as the final decision to use drugs is guided by their behavioral willingness or intentions.”, page 242</p> <p>“To date, analyses of the media campaign efficacy have used traditional linear regression or correlation techniques to examine campaign effects. While this tactic has been useful to delineate the basic statistical associations between campaign awareness and drug use, a major weakness of this approach is that it fails to provide a developmental perspective and incorporate systematic features of change in either awareness or drug use.[...] Growth modelling is clearly a more definitive way to address the question of change and increasingly has been advocated as a means to assess prevention effects that unfold over time (Brown, Catalano, Fleming, Haggerty, & Abbott, 2005; Mason, Kosterman, Hawkins, Haggerty, & Spoth, 2003; Park et al., 2000; Taylor, Graham, Cumsille, & Hansen, 2000). [...] The age</p>

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		mixture within each round makes it imperative to estimate growth using age-cohort models", page 242-3
Slater 2011		
Criterion	Score/Info	Notes
<i>In a well-conducted cohort study:</i>		
The study addresses an appropriate and clearly focused question	Well covered	"...(a) provide two simultaneous tests of autonomy and aspiration perceptions as mediators of impact on marijuana use as a consequence of exposure to each of these campaigns, b) conduct the first independent assessment of the ONDCP media campaign, which did not have a formal independent evaluation in place during the years of this study, and c) assess the simultaneous impact of a national campaign and a similar community/in-school effort.", page 12-13
<i>Selection of subjects</i>		
The 2 groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation	Not reported	"3,236 students participated in at least one survey, with 48% males, 52% females and a mean age at baseline of 12.4 years (SD = 0.6); 75% were European-American, 11.5% African-American, and 13.5% of other racial backgrounds. One-quarter of the youth were of Hispanic ethnicity.", page 15
The study indicates how many of the people asked to take part did so, in each of the groups being studied	Poorly addressed	Only average: "The average rate of student participation in each school was 32% of total student enrolment, lower than the prior study because of stricter IRB requirements being imposed on recruitment procedures. 57.1% of respondents provided data at all four measurement occasions; 27.2% provided data on three, 9.4% provided data on two and 5.3% provided data on just one of the measurement occasions. Missed surveys appear to be a matter more of absenteeism or slips in getting students to survey sessions, than of panel mortality; 84.5% of participants filled out the wave 1 survey,

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		86.2% wave 2, 86.1% wave 3, and 81.3% wave 4.", page 15
The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis	Well covered	"Lifetime use of marijuana was measured at each measurement wave [..]", page 15
What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed	42.9%	"The average rate of student participation in each school was 32% of total student enrolment, lower than the prior study because of stricter IRB requirements being imposed on recruitment procedures. 57.1% of respondents provided data at all four measurement occasions; 27.2% provided data on three, 9.4% provided data on two and 5.3% provided data on just one of the measurement occasions. Missed surveys appear to be a matter more of absenteeism or slips in getting students to survey sessions, than of panel mortality; 84.5% of participants filled out the wave 1 survey, 86.2% wave 2, 86.1% wave 3, and 81.3% wave 4.", page 15
Comparison is made between full participants and those lost to follow-up, by exposure status	Not reported	
<i>Assessment</i>		
The outcomes are clearly defined	Well covered	"Autonomy and Aspirations Inconsistent With Marijuana Use Autonomy inconsistent with marijuana use was measured using responses to four items following the phrase "Not using marijuana": 1) is a way to be true to myself; 2) is an important part of who I am; 3) is a way of being in control of my life; and 4) is a way of showing my own independence, where responses ranged from 1 = definitely disagree to 4 = definitely agree. Similarly, aspirations inconsistent with marijuana use were measured using the responses to three items following the phrase "Using marijuana would: 1) keep me from doing the things I want to; 2) mess up my plans for when I am older; and 3) get in the way of what is important to me." Because responses to each

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		<p>scale's items were heavily skewed, with 82% of respondents selecting "definitely agree" for all aspiration items and 84% of respondents selecting "definitely agree" for all autonomy items, each scale was dichotomized such that a "1" was assigned if all responses to the scale items were "definitely agree" and a "0" otherwise. The Cronbach's alpha values (Cronbach 1951) for each dichotomized measure were .9 or greater at each of the four waves</p> <p>Marijuana Use Lifetime use of marijuana was measured at each measurement wave using four questions: "How old were you the first time you used marijuana?", "How often in the last month have you used marijuana?", "How often in the last 3 months have you used marijuana?", and "Have you ever tried marijuana? (pot, grass, hash, etc.)?" If a subject responded affirmatively to any one question (or indicated an age when they first used marijuana), lifetime marijuana use was scored a "1", while an indication of never using marijuana resulted in a score of "0". The reliability for the scale was above 0.7 for the first two measurement occasions, .64 on the third occasion, and .69 at the fourth occasion.", page 15</p>
The assessment of outcome is made blind to exposure status	Not applicable	Blinding to exposure status was not applicable for this study
Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome	Not reported	
The measure of assessment of exposure is reliable	Well covered	p. 15
Evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable	Well covered	= 1.7
Exposure level or prognostic factor is assessed more than once	Well covered	4 waves, page 17
<i>Confounding</i>		

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

The main potential confounders are identified and taken into account in the design and analysis	Adequately addresses	p. 16
<i>Statistical analysis</i>		
Have confidence intervals been provided?	Well covered	Standard errors, e.g. Table 1 and 2, p. 18
<i>Overall assessment of the study</i>		
How well was the study done to minimise the risk of bias or confounding, and to establish a causal relationship between exposure and effect? <i>Code ++, +, or –</i>	+	
Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the exposure being investigated?	Fairly: selectivity (do not know if representative); no propensity scoring for national media campaign	
Are the results of this study directly applicable to the patient group targeted in this guideline?	Unclear	Results are applicable to US youth; it is unclear whether they are generalisable outside the US
<i>Description of the study</i>		
Do we know who the study was funded by?	Public Funds (NIDA)	"This research was supported by grant DA12360 from the National Institute on Drug Abuse (NIDA) to the first author.", page 12
How many centres are patients recruited from?	20 communities	
From which countries are patients selected? (Select all those involved. Note additional countries after 'Other')	USA	
What is the social setting (i.e. type of environment in which they live) of patients in the study?	Mixed	p. 14
What criteria are used to decide who should be INCLUDED in the study?	IRB requirements	"The average rate of student participation in each school was 32% of total student enrolment, lower than the prior study because of stricter IRB requirements being imposed

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

		on recruitment procedures", page 15
What criteria are used to decide who should be EXCLUDED from the study?	Exaggerators	"Students who responded that they had tried all drugs listed including one that had been invented were considered exaggerators and were excluded from analyses; there were no more than 0.4% of such exaggerators in any given wave of data collection.", page 15
What intervention or risk factor is investigated in the study? (Include dosage where appropriate)	(a) school- and community-based media intervention 'Be Under Your Influence' and (b) national anti-drug media campaign 'Above the Influence'	p. 12
What comparisons are made in the study (i.e. what alternative treatments are used to compare the intervention/exposure with). Include dosage where appropriate	Exposure versus drug use/aspirations/autonomy; exposure x time versus drug use/aspirations/autonomy	
What methods were used to randomise patients, blind patients or investigators, and to conceal the randomisation process from investigators?	Randomisation: not applicable for mass media campaign, but done for 'Be Under Your Own Influence' school- and community-based media intervention	
How long did the active phase of the study last?	Autumn 2005 to Spring 2009 (~42 months)	
How long were patients followed up for, during and after the study?	24 months	
List the key characteristics of the patient population. Note if there are any significant differences between different arms of the trial	48% males, 52% females and a mean age at baseline of 12.4 years (SD = 0.6); 75% were European-American, 11.5% African-American, and 13.5% of other racial backgrounds One-quarter of the youth were of Hispanic ethnicity	p. 15
<i>Record the basic data for each arm of the study. If there are more than 4 arms, note data for subsequent arms at the bottom of the page</i>		Table 1 and 2, page 18
<i>Record the basic data for each IMPORTANT outcome in the study. If there are more than 4, note data for additional outcomes at the bottom of the page</i>		Table 1 and 2, page 18

Table 2. 'Risk of bias' assessment of cohort studies (Hornik 2006, Scheier 2010, Slater 2011) (Continued)

Notes. Summarise the authors' conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question	Results indicate that earlier effects of the 'Be Under Your Own Influence' intervention replicated only in part and that the most plausible explanation of the weaker effects is high exposure to the similar but more extensive ONDCP 'Above the Influence' national campaign. Self reported exposure to the ONDCP campaign predicted reduced marijuana use, and analyses partially support indirect effects of the 2 campaigns via aspirations and autonomy	
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SD: standard deviation

IRB= Institutional Review Board, is a [committee](#) that has been formally designated to approve, monitor, and review [biomedical](#) and [behavioral research](#) involving [humans](#)

Table 3. Measurement scales used in included studies

Study	Was a specific scale developed? (Yes/no/unclear)	Measurement scale(s) used	Reference	Was the scale adapted? (Yes/no/unclear)
Palmgreen 1991	No	Sensation seeking Scale, Form V	Zuckerman, M (1979) . Sensation seeking: beyond the optimal level of arousal. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc	No
	No	Instruments used in a continuing survey of young people by the Institute for Social Research at the University of Michigan (NB to measure levels of use of illicit drugs)	Johnston LD, Bachman JG, O'Malley PM (1982). Monitoring the future: questionnaire responses from the nations' high school seniors, 1981. Ann Arbor: University of Michigan, Survey Response Centre, Institute for Social Research	Yes
	Yes	Behavioural Intention Index p. 221 "immediately after the second viewing of the PSA, subjects were asked "If you wanted information about alterna-	n/a	n/a

Table 3. Measurement scales used in included studies (Continued)

		tives to drug use, how likely it is, on a scale of 1 to 5, that you would call na 800 hotline?"		
	Yes	Attitude towards drug use p. 222 "After behavioural intention was measured, subjects were asked to indicate on a scale of 1 to 5 how they felt about their personal use of drugs in relation to each of six adjectives word pairs."	n/a	n/a
Kelly 1992	Unclear	Not mentioned	n/a	n/a
Polansky 1999	No	Drug Attitude Scale (12 items on a Likert scale)	Swisher JD, Horan JJ (1973). The Pennsylvania State University Evaluation Scales. In LA Abrams, E Garfield & JD Swisher (eds). Accountability in drug education: a model for evaluation (pp 87-99). Washington, DC: Drug Abuse Council	Unclear (: in the text is mentioned "updated version" but no further clarification)
	No	Tentative Drug Use Scale (10 items scale)	Horan JJ, Williams JM (1975). The tentative drug use scale: a quick and relatively problem free outcome measure for drug abuse prevention projects. Journal of Drug education; 5: 381-4	No
	Yes	Help-Seeking Questionnaire and Knowledge Questionnaire p. 190 "two 10-items achievement rests were developed for this study"	n/a	n/a

Table 3. Measurement scales used in included studies (Continued)

	No	Drug Conformity Scale (16 questions reflecting varying levels of assertive competency)	Horan JJ, Williams JM (1982) . Longitudinal study of assertion training as a drug abuse prevention strategy. American Educational Research Journal; 19: 341-51	No
Palmgreen 2001 (Stephenson 1999)	Yes	Beliefs 12 marijuana-related beliefs about occasional use of marijuana and 12 belief items about regular marijuana use were assessed on a 4-point scale with the response options of disagree strongly, disagree somewhat, agree somewhat and agree strongly	n/a	n/a
	Yes	Attitudes Seven marijuana-related attitudes about occasional use and 7 items about regular use were assessed on a 4-point scale, with the response options of disagree strongly, disagree somewhat, agree somewhat and agree strongly	n/a	n/a
	Yes	Intentions Participants were asked their intent to engage in experimental or regular marijuana use in the future. With 2 items on a 3-point scale with the response options probably will not, probably will and definitely will	n/a	n/a
Miller 2000	Yes	Use Recent drug use was measured by asking respondents about the fre-	n/a	n/a

Table 3. Measurement scales used in included studies (Continued)

		quency and recency with which they used 10 types of drugs (using commonly recognised names): cannabis, cocaine, other stimulants, tranquillisers, sedative-hypnotics, hallucinogens, opioids, phencyclidine, amyl and butyl nitrates and inhalants such as glue, paint or gasoline (4- point scale ranging from 1 = never to 4 = at least once in the past month)		
	Yes	Risks perception Risk assessment included 13 items regarding the extent to which students perceived risk or consequences related to alcohol or other drug use. Personal risk for alcohol and other drug problems was judged relative to students' perceptions of "most people" (ranging from 1 = higher than most people to 3 = lower than most people)	n/a	n/a
Palmgreen 2001	No	Brief Sensation Seeking Scale	Hoyle RH, Stephenson MT. The sensation seeking scale for adolescents. In: Lennox RD, Scott-Lennox JA, Cutler BL, eds. Applied Psychometrics for Health Outcomes Research. Chapel Hill, NC: Health Statistics Lab.	No
Fishbein 2002	Yes	Specifically developed instrument p. 241 "the instrument for the study consisted	n/a	n/a

Table 3. Measurement scales used in included studies (Continued)

		<p>of questionnaire with 3 parts.”</p> <p>First: demographic questions</p> <p>Second: series of questions on realism/content/recall of intervention</p> <p>Third: assessment of the respondent perceptions of the danger and harmful effects of engaging in 8 risky behaviours</p> <ul style="list-style-type: none"> - perceived danger = 1 item per behaviour on yes/no basis - perceived harmfulness = 1 item per behaviour on a 5-point scale - perceived norms = 1 item per behaviour on a 5-point scale 		
Yzer 2003	Yes	<p>A specific questionnaire was developed for the study. Available upon request by the authors (p. 135)</p> <p>Intention to use marijuana: 1 to 2 (depending on the first answer) items using a 4-point scale</p> <p>Attitude: 4 items using a 7-point scale</p> <p>Outcome beliefs: 36 items using a 5-point scale</p>	n/a	n/a
Slater 2006	No	<p>Selected items from the American Drug and Alcohol Survey</p> <p>Alcohol lifetime score: 3 items</p> <p>Smoking lifetime score: 3 items</p> <p>Marijuana lifetime score: 5 items</p>	American Drug and Alcohol Survey, with permission by the Rocky Mountain Behavioural Science Institute	No

Table 3. Measurement scales used in included studies (Continued)

Zhao 2006	Yes	Intentions not to use/to reduce use/to stop use	n/a	No
	Unclear	Attitudes towards illicit drug use: 7-point scale from -3 (bad/foolish/...) to +3 (good/wise/...)	n/a	n/a
	Yes	Perceptions (including perceptions of peer norms and perceptions about illicit drug use): 5-point scales from -2 to +2. "Although we did some analyses at the level of individual beliefs, we generally used two types of belief clusters in our analyses"	n/a	No
Czyzewska 2007	Unclear	Declared intention to use marijuana		n/a
	Unclear	Attitudes towards illicit drug use (pre-test explicit attitudes): 10-point Likert scales		n/a
	Yes	Attitudes towards illicit drug use (post-test implicit attitudes): IAT test. "Two computerized Implicit Association Tests (IAT) were designed to assess implicit attitudes to tobacco and marijuana. [...] The only difference to the standard IAT procedure was the extended number of practice trials to 40 in order to reduce the typical effect of order in which the combined categorization tasks are performed"	See Table 1 for IAT test content Scale was adapted from: Greenwald AG, McGhee DE, Schwartz JLK (1998). Measuring individual differences in social cognition: The Implicit Association Test. <i>Journal of Personality and Social Psychology</i> ; 74: 1464-80 With updates from: Greenwald AG, Nosek BA, Banaji MR (2003). Understanding and using the Implicit Association Test: An improved scoring algorithm. <i>Jour-</i>	Yes

Table 3. Measurement scales used in included studies (Continued)

			nal of Personality and Social Psychology; 85(2):197-216	
	Unclear	Attitudes towards illicit drug use (post-test explicit attitudes): 3 sets of 7 5-point scales (= 21 5-point scales)		n/a
Hornik 2006	No	National Survey of Parents and Youth (NSPY). 3 types of measures: recalled exposure to anti-drug messages aired by the campaign and other sources; cognitions and behavior related to marijuana, as outcomes; and individual and household characteristics, including a wide range of variables known to be related to drug cognitions and use and to exposure to anti-drug messages	http://archives.drugabuse.gov/initiatives/westat/	No
Scheier 2010	Yes	Alcohol and Drug Use Assessment of alcohol and drug use relied on an Anonymous Computer Assisted Self-report Interview (ACASI)	n/a	n/a
Fang 2010	No	Occasions of use in the past 30 days \pm standard error, SE	None, but it is a standard question in this field	No
	Unclear	Intentions not to use/to reduce use/to stop use: 5-point scales; higher scores are better. No additional information		Unclear
Lee 2010	No	90-day marijuana use: "items were adapted from the Global Appraisal of Individual Needs-I"	Dennis ML, Titus JC, Diamond G, Donaldson J, Godley SH, Tims FM. The CYT Steering Committee (2002)	Yes

Table 3. Measurement scales used in included studies (Continued)

			. The cannabis youth treatment (CYT) experiment: Rationale, study design and analysis plans. <i>Addiction</i> ; 97 (Suppl 1): 16-34	
	No	Intentions not to use/to reduce use/to stop use: 4-point score (higher = more "contemplation"). "Contemplation to change marijuana use was assessed with four items (alpha = 0.79) adapted from the Readiness to Change Questionnaire (RTCQ)"	Heather N, Gold R, Roll-nick S (1991). <i>Readiness to change questionnaire: User's manual</i> . (Tech. Rep. 15). Kensington, Australia: National Drug and Alcohol Research Center, University of New South Wales	Yes
	No	Knowledge about the effects of illicit drugs on health: negative consequences due to marijuana use. 5-point score (from 0 = never to 4 = more than 10 times). "Consequences of marijuana use were assessed using the Rutgers Marijuana Problem Index (RMPI)"	White HR, Labouvie EW, Papadaratsakis V (2005). Changes in substance use during the transition to adulthood: A comparison of college students and their non-college age peers. <i>Journal of Drug Issues</i> ; 35: 281-306	Unclear
Newton 2010	No	Frequency of cannabis use: times per week \pm SE in the past 12 months "Cannabis use was assessed from a questionnaire in the 2007 National Drug Strategy Household Survey (NDSHS) that identified the frequency of use of cannabis [1]."	Australian Institute of Health and Welfare. 2007 National Drug Strategy Household Survey: First Results. Canberra: AIHW; 2008	Yes
	No	Attitudes towards illicit drug use: score \pm SE "Attitudes towards cannabis were measured by four items from the Life Skills	National Health Promotion Associates (NHPA) Incorporated. Life Skills Training Questionnaire-	Unclear

Table 3. Measurement scales used in included studies (Continued)

		Training Questionnaire [37], which has acceptable internal consistency ($\alpha = 0.86$)."	Middle School. New York: NHPA; 2004	
	No	Knowledge about the effects of illicit drugs on health: score \pm SE "The cannabis knowledge questionnaire was adapted from the Cannabis Quiz and included 16 items [33]."	Bleeker A, Malcolm A. The Cannabis Quiz. Sydney: Manly Drug Education and Counselling Centre; 2001	Yes
	No	Knowledge about the effects of illicit drugs on health: score \pm SE "Cannabis harms were assessed with six questions derived from the Adolescent Cannabis Problems Questionnaire (test-retest reliability, $r = 0.91$) [35]."	Martin G, Copeland J, Gilmour S, Gates P, Swift W. The adolescent cannabis problems questionnaire (CPQ-A) : psychometric properties. Addictive Behaviors 2006; 31: 2238-48	No
Schwinn 2010	No	Past 30-day drug use (marijuana) : occasions of use (0 to 40) "...adapted from the CDC's Youth Risk Behavior Survey (YRBS; Centers for Disease Control and Prevention 2005), asked girls to report how many times in the past month and week they used alcohol, cigarettes, marijuana, cocaine, inhalants, methamphetamines, and ecstasy. Response options ranged from "0 times" to "40 or more times." Test-retest reliability for YRBS items is 0.82 to 0.95 (Centers for Disease Control and Prevention 2004)"	Centers for Disease Control and Prevention. (2005). Youth Risk Behavior Survey. Retrieved February 20, 2009, from http://www.cdc.gov/healthyyouth/yrbs/	Yes

Table 3. Measurement scales used in included studies (Continued)

	No	Past 30-day drug use, poly drug use (cigarettes, marijuana cocaine, inhalants, met., ecstasy): 7-point score (0 to 6). Same as above	Same as above	Yes
	No	Past 30-day drug use, total substance (= poly drug use + alcohol): 8-point score (0 to 7). Same as above	Same as above	Yes
Idaho Meth 2010; Colorado Meth 2011; Georgia Meth 2011; Hawaii Meth 2011; Wyoming Meth 2011	No	Past-year and past-month use of methamphetamine: "Have used meth in past year"; "Have used meth in past month"	n/a	Unclear
	Unclear	Attitudes towards illicit drug use: "Please indicate how much you approve or disapprove of the following activities." (Strongly disapprove, strongly/somewhat approve)	n/a	Unclear
	Unclear	Perceptions (including perceptions of peer norms and perceptions about illicit drug use: binary and categorical questions, such as "How difficult, or easy, do you think it would be for you to get each of the following types of drugs?" (easy, difficult) and "Please indicate how much risk, if any, you think there is involved in each of the following activities." (Great risk, great/moderate risk, little/no risk)	n/a	Unclear

Table 3. Measurement scales used in included studies (Continued)

Slater 2011	Yes	Description of study measures and survey components (p. 15) Autonomy inconsistent with marijuana use: 4 items on a 4-point scale Aspirations inconsistent with marijuana use: 3 items on a 4-point scale Lifetime marijuana use: 4 items Exposure to ONDCP's campaign: 1 item on a 3-point scale	n/a	n/a
Carpenter 2011	No	Lifetime marijuana use	n/a	Unclear
	No	Past-month marijuana use	n/a	Unclear
	No	Alcohol use	n/a	Unclear

IAT: Implicit Association Test

n/a: not applicable

ONDCP: Office of National Drug Control Policy

SE: standard error

APPENDICES

Appendix I. CENTRAL search strategy

ID	Search	Hits
#1	MeSH descriptor: [Substance-Related Disorders] explode all trees	10,355
#2	((stimulant* or polydrug* or drug* or substance) near/3 (abuse* or abusing or consumption or addict* or disorder* or intoxicat* or misus* or use*)):ti,ab	14,750

(Continued)

#3	(abuse* or abusing or consumption or addict* or disorder* or intoxicat* or misus* or use*):ti,ab	198,966
#4	MeSH descriptor: [Narcotics] explode all trees	681
#5	heroin:ti,ab	762
#6	MeSH descriptor: [Street Drugs] explode all trees	196
#7	MeSH descriptor: [Amphetamine] explode all trees	632
#8	(amphetamine* or dextroamphetamine* or methamphetamine or Methylamphetamine*):ti,ab,kw (Word variations have been searched)	1442
#9	(ecstasy or MDMA or hallucinogen*):ti,ab,kw (Word variations have been searched)	234
#10	MeSH descriptor: [Cocaine] explode all trees	576
#11	(crack or cocaine):ti,ab,kw (Word variations have been searched)	1953
#12	MeSH descriptor: [Cannabis] explode all trees	245
#13	(cannabis or marijuana or marihuana or Hashish):ti,ab,kw (Word variations have been searched)	1158
#14	(Lysergic next Acid):ti,ab,kw	76
#15	LSD:ti,ab,kw (Word variations have been searched)	131
#16	(benzodiazepine* or barbiturate* or ketamine or solvent or inhalant):ti,ab,kw (Word variations have been searched)	6370
#17	(benzodiazepine* or barbiturate* or ketamine or solvent or inhalant):ti,ab,kw (Word variations have been searched)	6370
#18	#4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17	11,919
#19	#3 and #18	6547
#20	#1 or #2 or #19	26,077
#21	MeSH descriptor: [Mass Media] explode all trees	1337
#22	MeSH descriptor: [Internet] explode all trees	1248

(Continued)

#23	MeSH descriptor: [Videotape Recording] explode all trees	790
#24	“TV”:ti,ab,kw (Word variations have been searched)	386
#25	(media or communication* or audiovisual or telecommunication* or radio or television or internet or campaign* or advert* or twitter or facebook) (Word variations have been searched)	27,766
#26	#21 or #22 or #23 or #24 or #25	28,828
#27	MeSH descriptor: [Adolescent] explode all trees	68,885
#28	adolescen* or preadolescen* or child* or teen* or youth* or young or kid* or juvenile* or minors or boy* or girl*:ti,ab,kw (Word variations have been searched)	157,753
#29	#27 or #28	157,753
#30	#20 and #26 and #29	566

Appendix 2. PubMed (MEDLINE) search strategy

Search	Query	Items found
#16	Search (((#3) AND #4) AND #11) AND #15	5877
#15	Search ((#12) OR #13) OR #14	3,041,802
#14	Search adolescen*[tiab] OR preadolescen*[tiab] OR child*[tiab] OR teen*[tiab] OR youth*[tiab] OR young[tiab] OR kid*[tiab] OR juvenile*[tiab] OR minors[tiab] OR boy*[tiab] OR girl*[tiab]	1,662,519
#13	Search “Child”[Mesh]	1,457,004
#12	Search “Adolescent”[Mesh]	1,498,465
#11	Search (((#5) OR #7) OR #8) OR #9) OR #10	797,788
#10	Search media[tiab] OR Communication*[tiab] OR audiovisual[tw] OR telecommunication*[tw] OR Educat*[tiab] OR radio[tw] OR television[tw] OR TV[tiab] OR internet[tw] OR campaign*[tw] OR advert*[tw] OR twitter[tw] OR facebook[tw] OR “instant messaging”[tw]	751,996

(Continued)

#9	Search “Telecommunications”[Mesh]	54,815
#8	Search Videotape Recording[Mesh]	9970
#7	Search “Internet”[Mesh]	43,359
#5	Search “Mass Media”[Mesh]	37,325
#4	Search “heroin”[Mesh] OR heroin[tiab] OR “Street Drugs”[Mesh] OR “Designer Drugs”[Mesh] OR “Crack Cocaine”[Mesh] OR “Lysergic Acid Diethylamide”[Mesh] OR drug*[tiab] OR polydrug[tiab] OR substance[tiab] OR hallucinogen*[tw] OR cocaine[tw] OR amphetamine*[tw] OR “lysergic acid diethylamide”[tw] OR LSD [tiab] OR ketamine[tw] OR cannabis[tw] OR marihuana[tw] OR marijuana[tiab] OR hashish[tw] OR steroid*[tw] OR morphine[tiab] OR ecstasy[tw] OR MDMA[tw] OR benzodiazepine[tw]	1,136,251
#3	Search (#1) OR #2	1,812,638
#2	Search abus*[tiab] OR consumption[tiab] OR misus*[tiab] OR use*[tiab] OR addict*[tiab] OR disorder*[tiab]	1,570,344
#1	Search “Substance-Related disorders”[Mesh]	344,574

Appendix 3. EMBASE search strategy

ID	Query
#1	'substance abuse'/exp
#2	'drug abuse'/exp
#3	abus*:ab,ti OR consumption:ab,ti OR misus*:ab,ti OR use*:ab,ti OR addict*:ab,ti OR disorder*:ab,ti
#4	#1 OR #2 OR #3
#5	heroin:ab,ti OR drug*:ab,ti OR polydrug:ab,ti OR substance:ab,ti OR hallucinogen*:ab,ti OR cocaine:ab,ti OR amphetamine*:ab,ti OR 'lysergic acid diethylamide':ab,ti OR lsd:ab,ti OR ketamine:ab,ti OR cannabis:ab,ti OR marihuana:ab,ti OR marijuana:ab,ti OR hashish:ab,ti OR steroid*:ab,ti OR morphine:ab,ti OR ecstasy:ab,ti OR mdma:ab,ti OR benzodiazepine:ab,ti
#6	'diamorphine'/exp

(Continued)

#7	'designer drug'/exp
#8	'street drug'/exp
#9	'cocaine'/exp
#10	'cannabis smoking'/exp
#11	#5 OR #6 OR #7 OR #8 OR #9 OR #10
#12	'mass medium'/exp
#13	'internet'/exp
#14	'videorecording'/exp
#15	'telecommunication'/exp
#16	media:ab,ti OR communication*:ab,ti OR audiovisual:ab,ti OR telecommunication*:ab,ti OR educat*:ab,ti OR radio:ab,ti OR television:ab,ti OR tv:ab,ti OR internet:ab,ti OR campaign*:ab,ti OR advert*:ab,ti OR twitter:ab,ti OR facebook:ab,ti
#17	#12 OR #13 OR #14 OR #15 OR #16
#18	'adolescent'/exp
#19	'child'/exp
#20	adolescen*:ab,ti OR preadolescen*:ab,ti OR child*:ab,ti OR teen*:ab,ti OR youth*:ab,ti OR young:ab,ti OR kid*:ab,ti OR juvenile*:ab,ti OR minors:ab,ti OR boy*:ab,ti OR girl*:ab,ti
#21	#18 OR #19 OR #20
#22	#4 AND #11 AND #17 AND #21 AND [embase]/lim

Appendix 4. EPOC criteria for quality assessment of interrupted time series

The following seven standard criteria should be used to assess the methodological quality of ITS designs included in EPOC reviews. Each criterion is scored DONE, NOT CLEAR or NOT DONE. The results of the quality assessment for each study are reported in the [Characteristics of included studies](#) table in RevMan. Examples can be obtained from the EPOC Group Co-ordinator.

Criterion	Score		
	DONE	NOT CLEAR	NOT DONE
<i>a) Protection against secular changes</i>			
The intervention is independent of other changes	If the intervention occurred independent of other changes over time	If not specified (will be treated as NOT DONE if information cannot be obtained from the authors)	If reported that intervention was not independent of other changes in time
There are sufficient data points to enable reliable statistical inference	(a) If at least 20 points are recorded before the intervention AND the authors have done a traditional time series analysis (ARIMA model) OR (b) If at least 3 points are recorded pre and post intervention AND the authors have done a repeated measures analysis OR (c) If at least 3 points are recorded pre and post intervention AND the authors have used ANOVA or multiple t-tests AND there are at least 30 observations per data point	If not specified in paper, e.g. number of discrete data points not mentioned in text or tables (will be treated as NOT DONE if information cannot be obtained from the authors)	If any of the above conditions are unmet
Formal test for trend. Complete this section if authors have used ANOVA modelling	If formal test for change in trend using appropriate method is reported (e.g. see Cook & Campbell 1979)	If not specified in the paper (will be treated as NOT DONE if information cannot be obtained from the authors)	If formal test for change in trend has not been done
<i>b) Protection against detection bias</i>			
Intervention unlikely to affect data collection	If the investigators report that the intervention itself was unlikely to affect data collection (for example, sources and methods of data collection were the same before and after the intervention)	If not reported (will be treated as NOT DONE if information cannot be obtained from the authors)	If the intervention itself was likely to affect data collection (for example, any change in source or method of data collection reported)
Blinded assessment of primary outcome(s)*	If the authors state explicitly that the primary outcome variables were assessed blindly OR the outcome variables are objective, e.g. length of hospital stay,	If not specified (will be treated as NOT DONE if information cannot be obtained from the authors)	If the outcomes were not assessed blindly

(Continued)

	drug levels as assessed by a standardised test		
c) <i>Completeness of data set</i>	If data set covers 80% to 100% of the total number of participants or episodes of care in the study	If not specified (will be treated as NOT DONE if information cannot be obtained from the authors)	If data set covers less than 80% of the total number of participants or episodes of care in the study
d) <i>Reliable primary outcome measure(s)**</i>	If 2 or more raters with at least 90% agreement or kappa greater than or equal to 0.8 OR the outcome is obtained from some automated system, e.g. length of hospital stay, drug levels as assessed by a standardised test	If reliability is not reported for outcome measures that are obtained by chart extraction or collected by an individual (will be treated as NOT DONE if information cannot be obtained from the authors)	If agreement is less than 90% or kappa is less than 0.8

*Primary outcome(s) are those variables that correspond to the primary hypothesis or question as defined by the authors. In the event that some of the primary outcome variables were assessed in a blind fashion and others were not, score each separately.

**In the event that some outcome variables were assessed in a reliable fashion and others were not, score each separately.

Appendix 5. Quality Criteria for Cohort Controlled Studies (SIGN)

SIGN		Methodology Checklist 3: Cohort studies	
Study identification (<i>include author, title, year of publication, journal title, pages</i>)			
Guideline topic:		Key Question No:	Reviewer:
<p>Before completing this checklist, consider:</p> <p>1. Is the paper really a cohort study? If in doubt, check the study design algorithm available from SIGN and make sure you have the correct checklist</p> <p>2. Is the paper relevant to key question? Analyse using PICO (Patient or Population Intervention Comparison Outcome). IF NO REJECT (give reason below). IF YES complete the checklist</p>			
Reason for rejection: 1. Paper not relevant to key question <input type="checkbox"/> 2. Other reason <input type="checkbox"/> (please specify):			
Please note that a retrospective study (i.e. a database or chart study) cannot be rated higher than +			
Section 1: Internal validity			
<i>In a well-conducted cohort study:</i>		Does this study do it?	
1.1	The study addresses an appropriate and clearly focused question. ^[i]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/>

(Continued)

Selection of subjects			
1.2	The 2 groups being studied are selected from source populations that are comparable in all respects other than the factor under investigation.[ii]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
1.3	The study indicates how many of the people asked to take part did so, in each of the groups being studied.[iii]	Yes <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
1.4	The likelihood that some eligible subjects might have the outcome at the time of enrolment is assessed and taken into account in the analysis.[iv]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
1.5	What percentage of individuals or clusters recruited into each arm of the study dropped out before the study was completed. [v]		
1.6	Comparison is made between full participants and those lost to follow-up, by exposure status.[vi]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>

ASSESSMENT			
1.7	The outcomes are clearly defined.[i]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/>
1.8	The assessment of outcome is made blind to exposure status. If the study is retrospective this may not be applicable.[ii]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
1.9	Where blinding was not possible, there is some recognition that knowledge of exposure status could have influenced the assessment of outcome. [iii]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
1.10	The method of assessment of exposure is reliable.[iv]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/>
1.11	Evidence from other sources is used to demonstrate that	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>

(Continued)

	the method of outcome assessment is valid and reliable.[v]		
1.12	Exposure level or prognostic factor is assessed more than once.[vi]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/> Does not apply <input type="checkbox"/>
CONFOUNDING			
1.13	The main potential confounders are identified and taken into account in the design and analysis.[vii]	Yes <input type="checkbox"/> Can't say <input type="checkbox"/>	No <input type="checkbox"/>
STATISTICAL ANALYSIS			
1.14	Have confidence intervals been provided?[viii]	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Section 2: OVERALL ASSESSMENT OF THE STUDY			
2.1	How well was the study done to minimise the risk of bias or confounding?[ix]	High quality (++) <input type="checkbox"/> Acceptable (+) <input type="checkbox"/> Unacceptable - reject 0	
2.2	Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, how strong do you think the association between exposure and outcome is?		
2.3	Are the results of this study directly applicable to the patient group targeted in this guideline?	Yes <input type="checkbox"/>	No <input type="checkbox"/>
2.4	Notes. Summarise the authors' conclusions. Add any comments on your own assessment of the study, and the extent to which it answers your question and mention any areas of uncertainty raised above		

[i] This relates to the risk of **detection bias**.^{*} Once enrolled in the study, participants should be followed until specified end points or outcomes are reached. In a study of the effect of exercise on the death rates from heart disease in middle aged men, for example, participants might be followed up until death, or until reaching a predefined age. **If outcomes and the criteria used for measuring them are not clearly defined, the study should be rejected.**

[ii] This relates to the risk of **detection bias**.^{*} If the assessor is blinded to which participants received the exposure, and which did not, the prospects of unbiased results are significantly increased. Studies in which this is done should be rated more highly than those where it is not done, or not done adequately.

[iii] This relates to the risk of **detection bias**.^{*} Blinding is not possible in many cohort studies. In order to assess the extent of any bias that may be present, it may be helpful to compare process measures used on the participant groups - e.g. frequency of observations, who carried out the observations, the degree of detail and completeness of observations. If these process measures are comparable between the groups, the results may be regarded with more confidence.

[iv] This relates to the risk of **detection bias**.^{*} A well-conducted study should indicate how the degree of exposure or presence of prognostic factors or markers was assessed. Whatever measures are used must be sufficient to establish clearly that participants have or have not received the exposure under investigation and the extent of such exposure, or that they do or do not possess a particular prognostic marker or factor. Clearly described, reliable measures should increase the confidence in the quality of the study

[v] This relates to the risk of **detection bias**.^{*} The primary outcome measures used should be clearly stated in the study. **If the outcome measures are not stated, or the study bases its main conclusions on secondary outcomes, the study should be rejected.** Where outcome measures require any degree of subjectivity, some evidence should be provided that the measures used are reliable and have been validated prior to their use in the study.

[vi] This relates to the risk of **detection bias**.^{*} Confidence in data quality should be increased if exposure level is measured more than once in the course of the study. Independent assessment by more than one investigator is preferable.

[vii] Confounding is the distortion of a link between exposure and outcome by another factor that is associated with both exposure and outcome. The possible presence of confounding factors is one of the principal reasons why observational studies are not more highly rated as a source of evidence. The report of the study should indicate which potential confounders have been considered, and how they have been assessed or allowed for in the analysis. Clinical judgement should be applied to consider whether all likely confounders have been considered. If the measures used to address confounding are considered inadequate, the study should be downgraded or rejected, depending on how serious the risk of confounding is considered to be. **A study that does not address the possibility of confounding should be rejected.**

[viii] Confidence limits are the preferred method for indicating the precision of statistical results, and can be used to differentiate between an inconclusive study and a study that shows no effect. Studies that report a single value with no assessment of precision should be treated with extreme caution.

[ix] Rate the overall methodological quality of the study, using the following as a guide: **High quality** (++): Majority of criteria met. Little or no risk of bias. Results unlikely to be changed by further research. **Acceptable** (+): Most criteria met. Some flaws in the study with an associated risk of bias. Conclusions may change in the light of further studies. **Low quality** (0): Either most criteria not met, or significant flaws relating to key aspects of study design. Conclusions likely to change in the light of further studies.

CONTRIBUTIONS OF AUTHORS

Marica Ferri and Fabrizio Faggiano conceived the systematic review and overviewed study inclusion and exclusion, methodological assessment of studies, and wrote the review. Marica Ferri and Elias Allara selected the studies for inclusion. Alessandra Bo and Elias Allara extracted the data from the studies and contributed to writing the review; Elias Allara contacted the trial authors for further information. Along with Alessandra Bo, Elias Allara input data for meta-analysis into Review Manager. Antonio Gasparrini and Elias Allara did the meta-analysis of interrupted time series studies.

Marica Ferri, Fabrizio Faggiano, Elias Allara and Alessandra Bo regularly discussed each step of review process and equally participated in each decision regarding the studies and the analysis.

Marica Ferri, Gregor Burkhardt and Fabrizio Faggiano conceived the protocol, Elias Allara and Alessandra Bo performed the preliminary search strategy and participated in writing the protocol. Anna V Gyarmathy provided input to the protocol for the theories description and editing of the text.

DECLARATIONS OF INTEREST

None of the authors report conflict of interest.

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