Prevention of alcohol and drug misuse in adolescents: An overview of systematic reviews

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ABSTRACT
BACKGROUND – Systematic reviews have evaluated a wide variety of programmes aiming to prevent, reduce or delay substance use in adolescents. This paper presents an overview of recent systematic reviews, summarising the evidence on the effectiveness of prevention strategies which target adolescents misusing alcohol and/or drugs. METHODS – We performed a comprehensive search in major electronic databases, consulted websites and checked reference lists of relevant articles. Studies that met our inclusion criteria were critically appraised using the AMSTAR instrument. The findings from the included systematic reviews were synthesised using a vote counting procedure. RESULTS – Twenty-one systematic reviews were identified. Ten of these were rated as of high quality. There was little overlap between reviews in terms of the target group, intervention, setting and outcome measures. The components or mechanisms of the prevention programmes were poorly described. Ten reviews evaluated school-based prevention. The effects of these prevention programmes are promising, while effects of community-based, family-based and multifaceted programmes were less convincing. CONCLUSION – Based on the current evidence, there is a small but consistent positive effect of school-based prevention programmes, but it is less clear what the “active ingredient” is. For example, which group should one target, in which setting and in which circumstances? A set of standardised process and outcome measures would allow us to better compare and statistically pool the results of original studies and reviews. This overview of reviews, like similar other overviews, should encourage researchers to increase uniformity and consistency between studies. This would improve the comparability of evidence, which is needed to formulate valid recommendations for practice.

KEYWORDS – meta-review, prevention, alcohol misuse, substance use, adolescents

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Introduction
Substance misuse in adolescents is a significant problem. The most frequently used drug is alcohol. Among a representative sample of 16-year-olds in Europe, 45% reported to have consumed alcohol in the past 30 days and 17% reported to have been drunk (alcohol misuse) in this period (Hibell et al., 2012). Cannabis is the most frequently used illicit drug. About one in five European students have tried illicit drugs at some point in their lifetime, boys more often than girls (21% and 15%, respectively). Seven percent said they had used cannabis in the past 30 days. Other

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frequently used drugs include ecstasy and other amphetamines, such as speed or liquid ecstasy (Hibell et al., 2012).

Many health care practitioners and policy makers are confronted with problems that relate directly to alcohol and drug misuse. The misuse may lead to serious and irreversible physical harm and significant psychological and social problems. Adolescents are even more vulnerable due to their physical status. For example, adolescents who misuse alcohol are more likely to develop alcohol-related problems in adulthood (McCambridge, McAlaney & Rowe, 2011), and adolescents’ alcohol consumption has been shown to be associated with physical injury, health risks and violent behaviour (European Monitoring Centre of Drugs and Drug Addiction [EMCDDA], 2008a; Miller, Naimi, Brewer, & Jones, 2007). Regular cannabis misuse may also adversely affect young adults’ mental health and lead to anxiety and psychotic symptoms (Squeglia, Jacobus, & Tapert, 2009). Drug misuse is also frequently associated with medical problems such as HIV infections and risky sexual behaviour in the adolescent population.

On a policy level, the interest in preventing alcohol and drug misuse has grown substantially, mainly because of the social and economic costs linked to substance misuse. The economic cost of substance misuse in Europe in 2005 was estimated at around EUR 34 billion (EMCDDA, 2008b). Direct costs related to the misuse of illicit drugs in Finland were estimated between EUR 200 million and EUR 300 million in 2007. Nearly one third of these direct costs pertained to social welfare, followed by the enforcement of public order and safety (EMCDDA, 2008b). Indirect costs were estimated at between EUR 500 million and EUR 100 million in the same year. These costs include loss of productivity due to morbidity and mortality and costs from private stakeholders (e.g. private health care).

The impact and wide range of substance-related problems in adolescents has facilitated the development of substance misuse prevention programmes. Such programmes or interventions can be delivered in such different settings as schools, families and communities or even in multiple settings. A wide range of prevention programmes is currently available, and the programmes clearly meet a variety of different goals and target groups. This wealth in programmes, settings, contents (programme characteristics) and target groups rather complicates the whole field of prevention (Sandberg, 2011).

We present an overview of systematic reviews addressing the following research question: Which programmes (school-based, community-based, family-based, multiple components) are effective for the prevention of alcohol and/or drug misuse in adolescents? For each setting, where possible, we assess who should deliver the prevention programme, what content and delivery method is effective for the prevention programme and which groups the preventive programme should target.

**Methods**

**Search strategy**

Prior to this review, we developed a protocol which is available on request from the first author. A comprehensive search strategy was performed in order to identify relevant systematic reviews in regard to prevention interventions for alcohol and...
drug misuse among adolescents. In May 2012, we searched the following electronic databases; MEDLINE, EMBASE, CINAHL, Psych Info, ERIC, DARE, PROSPERO and the Cochrane library of Systematic Reviews. The search was limited to reviews published from January 2000 up to May 2012, in an attempt to exclude reviews containing outdated results. The search was conducted using English terms, and all studies in English, French, Dutch and German were included. The search strategy was built using four concepts: substances (alcohol and drugs), adolescents, prevention and early intervention. Synonyms of each of these concepts (both MeSH and free-text words) were combined using the Boolean operator “OR”. We then combined the different search strings using the Boolean operator “AND”. The full MEDLINE search strategy, which was adapted for all other electronic database searches, is available via this website (http://ppw.kuleuven.be/home/english/research/msgs/documents/paper-supplements). We also searched the website of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) for systematic reviews and performed an electronic search consulting Google and Google Scholar in an attempt to detect relevant grey literature. In addition, we searched reference lists of relevant publications to identify other potential systematic reviews.

**Study selection**

The retrieved documents were screened as to whether they fulfilled the following inclusion criteria; (1) the document is a systematic review. The authors include “systematic review” in the title or show proof of a systematic search strategy to identify studies; (2) the review reports on adolescents (aged 12-18) or contains at least 90% of adolescent participants, and (3) the review addresses prevention or early intervention programmes aiming to reduce drug and alcohol misuse, or concentrates on harm reduction. Prevention is defined as deliberate initiatives that anticipate risk or act on the first signs of the problem emerging. Reviews on driving under the influence were excluded, because in most countries youth below 18 years of age are not allowed to drive.

Reviews were excluded when (a) there was no reference to the participants’ age (a review on “high school students” would be included but a review on “college students” would not), (b) participants were diagnosed as problem users or addicted users, or (c) systematic reviews included results of other reviews instead of original research. All abstracts were independently screened by two reviewers (EE, GEB). An assessment of the full text of all potentially relevant reviews was performed by the same reviewers. Disagreements between reviewers were resolved by discussion. Both reviewers approved the final selection.

**Quality assessment, data extraction and synthesis**

The quality of the systematic reviews was assessed using the AMSTAR instrument (Shea et al., 2007). The instrument contains 11 items to assess methodological quality (Table 1). Two reviewers independently assessed the methodological quality (EE, GEB). The items were scored using “yes”, “no”, “not clear” and “not applicable”. Not applicable was used when authors explicitly mentioned that a partic-
ular item was not assessed. Disagreements were resolved by discussion. To obtain further information, we contacted authors of reviews that lacked methodological details. Twenty requests for additional information were sent by email, and we received a reply from 5 authors. In order to be considered of high quality, a review had to comply with at least the following criteria: (1) a comprehensive search, (2) assessed the quality of included studies, and (3) reported the study characteristics of included studies.

Data extraction was carried out using a standard form, which was piloted beforehand by one reviewer. One reviewer (EE) performed the data extraction. It was checked by a second reviewer (GEB). The following data was extracted: general characteristics of the review (first author, year of publication), methodological features (research questions, study design), specific characteristics (target population, outcome measures, types of interventions, target domain of intervention such as school, family or community) and the results of the systematic review.

We planned to carry out meta-analyses to estimate the effectiveness of the prevention programmes across studies. However, the heterogeneous outcomes and interventions and some poor reporting of outcomes showed that this was not feasible. We therefore analysed the results of the studies as follows. First, to identify and interpret reasons for differences in results of many systematic reviews, we compared their clinical questions, the studies included and the quality of the systematic reviews based on Jadad’s (1997) guide. Subsequently, we summarised the results of the reviews using a vote-counting approach. We assigned a “+” for interventions that showed evidence of effectiveness, a “−” where no evidence of effectiveness was found and a “+/−” where results were inconclusive, when some outcomes or studies were positive and others were not. The reviews summarised the findings in two ways: either they pooled results across studies or they reported the number of studies that showed positive results. If results of multiple studies were pooled and a significant positive result was found for an intervention, we assigned a “+”. If the result was non-significant or negative, it was labelled as “−”. If only the number of studies with positive results was reported, we assigned a “+” if at least 75% of the included studies showed a positive result; “+/−” if positive results were found in 51 to 74% of the included studies; and “−” if 50% or fewer of the included studies showed positive results.

We classified the programmes per setting. For each setting, we assessed (a) who should deliver the prevention programme, (b) what content and delivery method was effective for the prevention programme, and (c) which groups should be targeted in the prevention programme.

Results
Twenty-one systematic reviews were included in this overview of reviews (Figure 1). Nine systematic reviews evaluated school-based interventions, four evaluated family-based interventions, four reviews assessed community-based interventions and two addressed multi-component interventions. Three reviews did not present any quantitative data (Roe & Becker, 2005; McBride, 2003; Cuijpers, 2002a) and were omitted from this review. The main char-
Figure 1. Flow chart of information retrieval.

Records identified through database searching (n=4663)
Records after duplicates removed (n=4342)
Records excluded based on title or abstract (n=4120)
Reviews included in the review (n=21)
Full-text articles assessed for eligibility (n=222)
Full-text articles excluded (n=201)
Duplicate study (n=2)
Not on alcohol or drugs (n=10)
Language (n=2)
Not on adolescents or age not reported (n=69)
Not on prevention (n=83)
No systematic review (n=20)
Published before 2000 (n=8)
No substance use as outcome (drunk driving) (n=7)
Additional records identified through other sources (n=5)

Characteristics of the included reviews as well as a list of excluded reviews are available in the additional materials provided online: http://ppw.kuleuven.be/home/english/research/mesrg/documents/papersupplements.

Methodological quality of included reviews
In 16 reviews, one or more quality items were not (clearly) addressed (see Table 1). Ten reviews, all published in 2006 or later, were judged to be of high quality. Of these, six were Cochrane reviews.

School-based prevention programmes
Effectiveness
School-based prevention programmes were assessed in nine reviews (Buckley & White, 2007; Cuijpers, 2002b; Faggiano, Vigna-Taglianti, Versino, Zambon, Borraccino, & Lemma, 2008; Foxcroft & Tsirtsavadze, 2011a; Gottfredson & Wilson, 2003; Lemstra et al., 2010; Pan & Bai, 2009; Porath-Waller, Beasley, & Beirness, 2010; Teesson, Newton, & Barrett, 2012), two of which were judged to be of high methodological quality (Faggiano et al., 2008; Foxcroft & Tsirtsavadze, 2011a) (see Table 1). The results of the lower-quality reviews suggest, in general, that school-based programmes are effective, but the reported effect sizes are rather small. The results are summarised in Table 2. Detailed results are available in the additional materials provided online at http://ppw.kuleuven.
be/home/english/research/mesrg/documents/paper-supplements.

The research questions for the two high-quality reviews differ: one review focuses on illicit drug misuse and compares the effect of school-based programmes to other school-based programmes (including standard curriculum) (Faggiano et al., 2008), whereas the second review compares school-based programmes to those in any setting to decrease alcohol misuse (Foxcroft & Tsertsvadze, 2011a). The high-quality reviews did not provide an overall answer to whether school-based programmes are effective. Faggiano et al. (2008) reported results for subgroups of studies, based on provider and content types (see below), and Foxcroft & Tsertsvadze (2011a) presented the number of studies with positive results, concluding that school-based prevention could be effective.

Programme moderators
We found 5 systematic reviews (Buckley & White, 2007; Cuijpers, 2002b; Faggiano et al., 2008; Gottfredson & Wilson, 2003; Porath-Waller et al., 2010) evaluating the effect of different moderators of school-based prevention programmes. Of these reviews one is of high quality (Faggiano et al., 2008). This review examined school-based illicit drug prevention and found inconclusive results for peer educators compared to external educators.

The lower-quality reviews differ in focus: Buckley & White (2007) and Gottfredson & Wilson (2003) have a broad focus evaluating school-based programmes for alcohol and drug misuse, and both include a large number of studies. The focus of the other reviews is narrower: Porath-Waller et al. (2010) evaluates programmes to reduce cannabis misuse, while Cuijpers (2002b) includes studies that evaluate the same intervention, implemented by adults versus peers. The results of reviews of lower quality showed that programmes delivered by persons other than teachers (Cohen’s d = 0.74 95% CI 0.61; 0.87) (Cuijpers, 2002b) have larger effects on outcomes such as

**Table 1. Methodological quality of the included reviews.**

| AMSTAR Item                                                                 | Altena | Buckley | Cuijpers a (NQR) | Cuijpers b | Faggiano (CSR) | Foxcroft b (CSR) | Foxcroft c (CSR) | Gates (CSR) | Hoppe | Lamanna | McBride (NQR) | Pan | Perese | Porath-Waller | Petrie | Semm | Thomas (CSR) | Werch | Werch |
|---------------------------------------------------------------------------|--------|---------|------------------|------------|----------------|------------------|------------------|-------------|-------|---------|----------------|-----|--------|---------------|--------|-------|---------------|-------|-------|
| Developed an ‘a priori’ design                                            | N      | Y       | Y                | ?=unclear | N              | Y                | N                | ?=unclear    | N     | Y       | Y              | N   | Y      | Y              | N      | Y     | Y              | N     | Y     |
| Performed a duplicate study selection                                      | Y      | Y       | Y                | ?=unclear | N              | Y                | N                | ?=unclear    | N     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Performed a comprehensive literature search                                | Y      | Y       | Y                | ?=unclear | N              | Y                | N                | ?=unclear    | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Reported on the status of publication                                      | N      | N       | N                | N          | N              | Y                | N                | N           | N     | N       | N              | N   | N      | N              | N      | N     | N              | N     | Y     |
| Reported a list of studies (included and excluded)                         | Y      | Y       | Y                | ?=unclear | N              | Y                | N                | ?=unclear    | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Described the characteristics included studies                             | N      | N       | N                | N          | N              | Y                | N                | ?=unclear    | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Assessed the scientific quality included studies                          | N      | N       | Y                | Y          | Y              | Y                | Y                | Y           | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Considered the scientific quality in formulating conclusions               | N      | N       | N                | Y          | Y              | Y                | Y                | Y           | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Used the appropriate methods to combine the findings of studies            | N      | N       | N                | N          | N              | Y                | N                | ?=unclear    | Y     | Y       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Assessed likelihood of publication bias                                    | Y      | N       | N                | Y          | Y              | N                | Y                | N           | N     | N       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |
| Documented potential conflict of interest                                  | N      | N       | N                | Y          | Y              | N                | Y                | N           | N     | N       | N              | N   | N      | N              | Y      | Y     | Y              | N     | Y     |

Abbreviations: Y=yes; N=no; ?=unclear; NA=not applicable; CSR=Cochrane Systematic Reviews; NQR=reviews without quantitative results
the frequency of drug/alcohol misuse or drug knowledge measured, in comparison to programmes delivered by teachers (d = 0.57 95% CI 0.54; 0.61). However, results were significant for both types of implementers (Porath-Waller et al., 2010). There is no clear evidence to support the statement that certain provider types are more effective than others, but programmes delivered by peers, health educators, theatre groups and nurses do seem to generate good results in some cases (Buckley & White, 2007; Gottfredson & Wilson, 2003). Peer-led programmes (d = 0.44 95% CI 0.08; 0.80) were found to be more effective than teacher-led programmes, but no differences were evident between peer-led and expert-led programmes (Cuipers, 2002b; Gottfredson & Wilson, 2003).

Programme content and delivery
We found four systematic reviews (Faggiano et al., 2008; Foxcroft & Tsertsvadze, 2011a; Lemstra et al., 2010; Teesson et al., 2012) evaluating the content of school-based prevention programmes, two of which were of high methodological quality (Faggiano et al., 2008). The high-quality reviews established that affective-based programmes (compared to usual curricula) appear to be effective (OR drug knowledge 1.88 95% CI 1.27, 2.50), while the results of knowledge-based or skills-based programmes are inconclusive (Faggiano et al., 2008). No differences were found in effectiveness between skill-based programmes and knowledge-based or affective-based programmes, but results of affective-based programmes were better than those of knowledge-based programmes (Faggiano et al., 2008). Foxcroft and Tsertsvadze (2011a) reported inconclusive results for the effectiveness of alcohol-specific or generic programmes.

The lower-quality reviews addressed a different set of questions. Universal programmes to prevent cannabis and alcohol misuse and comprehensive-based programmes (Overall mean usage ratio (MUR) 0.91 95% CI 0.88; 0.95) yielded positive effects in 10–15-year-olds (Lemstra et al., 2010). Results from knowledge-based programmes were inconclusive. Teesson et al. (2012) found generally favourable results for alcohol-specific programmes in the Australian context.

Three systematic reviews (Faggiano et al., 2008; Gottfredson & Wilson, 2003; Porath-Waller et al., 2010) evaluated delivery methods in school-based prevention programmes; one of these was of high methodological quality (Faggiano et al., 2008). This review compared interactive and passive delivery methods but found no differences in effect sizes between these delivery methods. The lower-quality reviews revealed that interactive delivery methods (d = 0.57 95% CI 0.54; 0.61) have larger effects compared to didactic methods (d = 0.02 95% CI -0.15; 0.19) and programmes based on mixed learning models (d = 1.27 95% CI 1.22; 1.33) have more profound effects than those exclusively adopting a social learning model (d = 0.19 95% CI 0.14; 0.23) (Porath-Waller et al., 2010). Results of duration show that longer is not necessarily better (Gottfredson & Wilson, 2003; Porath-Waller et al., 2010). Prevention programmes in which the programme fidelity is monitored (to ensure all programme elements are delivered) show larger effects (d = 0.93 95% CI 0.89; 0.98) compared to
Table 2. Summary of characteristics and results of included reviews.

| 1st author, year | Focus | Number and type of studies | Intervention and comparison | Main results | School-based | Direction |
|------------------|-------|-----------------------------|----------------------------|--------------|--------------|------------|
| Buckley, 2007    | Substance use education | 114 reports | Providers | Police, psychologist, youth worker, health and legal worker, drug agency, Health educators, theatre groups, nurses, Peers | – | – |
| Cuijpers, 2002b  | Drug use prevention | 12 studies | Providers | Peer (vs teacher-led), Peer (vs expert-led) | + | +/– |
| Faggiano, 2008   | Illicit drug use prevention | high, 32 studies (29 RCTs and 3 CPSs) | Content programme | Peers (vs external educators) | – | – |
|                  |       |                            |                           | Affective-based or social skills vs curriculum, Social skills less effective than knowledge or affective-based, affective-based more effective than knowledge-based, Interactive vs passive | +/– | +/– |
| Foxcroft, 2011a  | Alcohol use prevention | high, 53 RCTs | Content programme | Alcohol-specific programme, Generic programme, Universal programmes on alcohol and cannabis, drugs and alcohol or tobacco | +/– | +/– |
| Gottfredson, 2003 | Substance use prevention | 94 studies | Providers | Peers, Teacher, police | + | – |
| Lemstra, 2010    | Cannabis and alcohol use prevention | 6 studies (RCTs or cohort studies) | Delivery methods, Content programme | Knowledge-based; effect on alcohol, Knowledge-based; effect on drugs, Comprehensive-based; effect on alcohol, effect on drugs | + | – |
| Porath-Waller, 2010 | Cannabis use prevention | 15 (quasi-) experimental studies | Providers, Delivery methods | Teachers, Not teachers, Mixed learning model, Social learning model, Interactive, Didactic, <15 sessions, >15 sessions | + | – |
| Teesson, 2012    | Alcohol and other drug use prevention | 8 trials of 7 programmes | Content programme | Alcohol programme, Cannabis programme | + | – |
| Community-based |       |                            |                           |              |              |            |
| Alfonsa, 2010    | Various interventions for homeless youth, including substance use prevention | high, 11 intervention studies | Different interventions | Cognitive/behavioural intervention, Brief intervention/motivational interviewing, Living skills; intensive case management, Supportive housing; peer-based intervention | + | – |
| Gates, 2006      | Drug use prevention in non-school settings | high, 17 (cluster) RCTs | Community-based interventions | Brief intervention/motivational interviewing, Educational and skills training | + | – |
| Thomas, 2011     | Mentoring for deprived youth | high, 4 (cluster) RCTs | Effect mentoring | Alcohol use, Drug use, Substance use | +/– | – |
| Werb, 2011       | Public service announcements | high, 7 RCTs and 4 observational studies | Effect PSA | PSA (RCT data) | +/– | – |
| Family-based     |       |                            |                           |              |              |            |
| Foxcroft, 2011b  | Alcohol use prevention | High, 12 RCTs | Universal prevention | Parenting programme | + | – |
| Gates, 2006      | Drug use prevention in non-school settings | High, 17 (cluster) RCTs | Family-based interventions | Intervention to improve family functioning or parenting skills | – | – |
| Petrie, 2007     | Alcohol and drug use prevention | High, 46 reports on 20 studies (RCTs and CBA) | Target group | Primary school, Transition, Adolescents | + | – |
| Smit, 2008       | Drug use prevention | High, 9 RCTs | Interventions delivered to family of parent(s) | Family intervention/parenting programme | + | – |

Abbreviations: RCT = randomised controlled trials; CBA = controlled before/after studies; CPS = controlled prospective studies; PSA = public service announcement. Direction of results: +: evidence of effectiveness (≥75% of the studies show positive effects); −: no evidence of effectiveness (≤50% of the studies show positive effects); +/–: unclear result/mixed results (51–74% of the studies show positive effects).
programmes where programme fidelity is not actively monitored ($d = 0.06$ 95% CI 0.01; 0.12) (Porath-Waller et al., 2010).

Target groups
The two reviews addressing the question which group should be targeted by school-based prevention types were both of lower quality, with one evaluating all prevention programmes (Gottfredson & Wilson, 2003) and the other evaluating cannabis use prevention only (Porath-Waller et al., 2010). Gottfredson and Wilson (2007) found that with programmes targeting late elementary or middle school children, universally-based and cognitive behavioural-based programmes were effective both for general students and for high-risk populations. Cognitive behavioural-based programmes reported larger effect sizes for high-risk populations (ES 0.20 vs 0.05). Porath-Waller and colleagues (2010) showed that prevention effects in children older than 14 years is much larger ($d = 0.39$ 95% CI 0.30; 0.49) when compared to the group younger than 14 years ($d = 0.17$ 95% CI 0.13; 0.21).

Effectiveness of community-based programmes
Four high-quality reviews examined the effects of community-based prevention (Gates, McCambridge, Smith, & Foxcroft, 2006; Altena et al., 2010; Thomas, Lorenzozetti, & Spragins, 2011; Werb, Mills, Debeck, Kerr, Montaner, & Wood, 2011), addressing a variety of questions. One focused on homeless youth (Altena et al., 2010). Werb et al. (2011) and Thomas et al. (2011) examined the effects of specific prevention interventions, Public Safety Announcements (PSAs) and mentoring, respectively. Gates et al. (2006) assessed prevention programmes in non-school settings more generally. The results of the reviews are summarised in Table 2. Gates et al. (2006) found brief interventions to be effective but found no clear evidence for the effect of education and skills training. There is no substantial evidence to support the claim that specific interventions are effective for homeless adolescents. However, there is some evidence for the effectiveness of cognitive behavioural interventions and supportive housing (for drug use) (Altena et al., 2010). The effects of mentoring in deprived adolescents to prevent alcohol and drug use were inconclusive (Thomas et al., 2011). Although pooled results of four observational studies suggested that PSAs were effective, high heterogeneity between these studies was observed ($I^2=100\%$) (Werb et al., 2011). We question the appropriateness of the authors’ attempt to statistically synthesise these results. The pooled effect measure of the RCTs included in the same review showed no benefit of PSAs in preventing substance misuse.

Effectiveness of family-based programmes
All reviews addressing family-based prevention are of higher methodological quality (Gates et al., 2006; Foxcroft & Tsertsvadze, 2011b; Petrie, Bunn, & Byrne, 2007; Smit, Verdurmen, Monshouwer, & Smit, 2008). The two more recent reviews assess alcohol misuse, and there is reasonable overlap as 7 studies are reported in both reviews (Foxcroft & Tsertsvadze, 2011b; Smit, Verdurmen, Monshouwer, & Smit, 2008). Five new studies had been published and were added to Foxcroft and Tsertsvadze’s (2011b) review. The older re-
views (Petrie et al., 2007; Gates et al., 2006) focused mainly on drug misuse. Results of the reviews are tabulated in Table 2. Only one review pooled outcomes across studies (Smit et al., 2008), concluding that family interventions are effective in reducing alcohol initiation (OR 0.71 95% CI 0.54; 0.94) and use of alcohol at follow-up (d=-0.25 (95% CI -0.37; -0.12). No difference was found in last month’s alcohol use (OR 0.70 (95% CI 0.33; 1.53). Foxcroft & Tsertsvadze (2011b) reported that 75% of trials reported beneficial effects. In Petrie’s review (2007), about half of the studies showed positive effects. Interventions targeting children in transition are more often associated with positive results (3 studies on alcohol, all found a reduction) compared to programmes during primary school or adolescence.

Effectiveness of multi-component programmes
We found 2 high-quality systematic reviews (Gates et al., 2006; Foxcroft & Tsertsvadze, 2011c) on multi-component prevention programmes, both with inconclusive results. Foxcroft & Tsertsvadze (2011c) reported that of 20 trials, 12 showed significant benefits, 1 showed non-significant benefit and 7 found no benefits. Gates et al. (2006) focused on community-based multi-component programmes including 5 trials of which some showed benefits, whereas other studies did not.

Safety of programmes (iatrogenic effects)
One systematic review (Werch & Owen, 2002) focused specifically on iatrogenic effects of prevention programmes. Forty-three negative outcomes were found in 17 studies. Ten of these studies evaluated social influence-based programmes (59%). Four studies evaluated knowledge/attitudes/value-based programmes. Nine drug prevention programmes reported a total of 24 harmful effects. Of these, the majority (87%) were behavioural measures such as multiple drug use, marijuana use or increased alcohol consumption. Eight alcohol prevention programmes reported a total of 19 harmful effects, most of which were non-behavioural measures (58%) such as increased estimates of alcohol, marijuana offers or pro-alcohol attitudes (Werch & Owen, 2002).

Discussion
This overview of reviews has summarised evidence on the effectiveness of programmes to prevent alcohol and drug misuse in adolescents provided by 21 systematic reviews. In what follows, we discuss some of the methodological limitations we came across in our attempt to create an overview that would support policy makers and practitioners working in the field and highlight some areas where more research is needed.

We started this review in the context of an adaptation process of guidelines on the prevention of alcohol and drug misuse in adolescents. The potential findings of the overview of reviews were meant to provide answers to questions for which there was no evidence available in the existing guidelines. However, none of the remaining questions formulated by the guideline panel could be answered by this review. The failure of the overview to render useful results for the guideline adaptation procedure was largely related to the lack of relevance of the answers provided by the overview of reviews for the set of
(clinical) questions of the panel involved in the guideline adaptation process as well as the methodological shortcomings of the included reviews. The overview did not meet our expectations of being complementary to the content of existing guidelines. One of the strategies that could tackle this problem is to pair up with relevant Cochrane and Campbell groups to ensure that clinical questions of important stakeholders are listed on the agenda. The failure of the overview to render useful results for the guideline adaptation procedure was also related to the heterogeneity of populations, interventions and outcomes, and the poor reporting of outcomes that prohibited any pooling of data. A number of actions can be undertaken to facilitate synthesis processes in future reviews. First, more studies should address the important question whether or not the intervention works and for whom. Second, more attention should be given to comparing different participant types or populations. Third, primary studies should report standardised outcomes to be able to statistically pool results. And fourth, detailed reports on the process and implementation aspects impacting on the prevention interventions should be provided. This would enable the development of tailored recommendations which would take into account factors such as who should provide the programme when and how it should be implemented.

This overview showed the strongest evidence for school-based programmes. However, we do not want to suggest that policy makers should only invest in this type of prevention programme. This finding is most likely caused by the fact that more reviews (and primary studies) were conducted on this topic. Also, the results of these studies were more often quantitatively summarised, with more details reported on the different components of the intervention. It should be mentioned though that the methodological quality of the included reviews may affect the conclusions and that reviews on school-based interventions were more often of poorer quality compared to reviews of non-school-based interventions. We agree with Amato et al. (2011) that the quality of Cochrane reviews in the addiction field appears to be more adequate compared to non-Cochrane reviews. Out of 9 reviews on school-based prevention there were only 2 Cochrane reviews. This is one of the reasons why we did not embark on a comprehensive search of grey literature. We did not expect a significant gain in terms of quality from, for example, review projects produced in the context of master’s thesis projects stored in the universities’ electronic depositories.

A theoretical advantage of an overview of reviews over traditional systematic reviews is that the first type enables users to directly compare treatment effects of different interventions, where appropriate. However, we mentioned earlier that a lack of quantitative summary data prevented us from statistically pooling results. Authors used a wide variety of outcome measures in their evaluation of prevention programmes, including alcohol initiation age, drunkenness initiation age, alcohol misuse (quantity, frequency, ...), incidence of drunkenness, reduction in alcohol/drug misuse, and drug-related behavioural measures. Such heterogeneity in study results (and reporting) prohibits review authors from calculating overall effect es-
timates within and subsequently across studies. Without quantitative summary, it is difficult to judge whether or not an intervention is effective. To accommodate the lack of uniform quantitative results we used “vote-counting” as a means of summarising results of reviews. This method refers to counting and comparing the number of studies with positive (or negative) results, and it might be considered when standard meta-analysis cannot be applied (Deeks, Higgenb, & Altman, 2008). In our attempt, we encountered three problems. First, the choice to make categories out of the numbers is subjective. By setting this cut-off point high, e.g. at least 75% of all studies included in a review should report positive effects to get a “+”, we attempted to be conservative about our summary. We found no standard for encoding the different outcomes as “+” and “−”, so we developed our own system to depict the results in a congruent way. Future research should give more attention to these kinds of difficulties. Second, we experienced difficulties in judging studies that showed positive results on one outcome and negative on another. In addition, we were not able to take study size and study quality into account. By reporting results of reviews together with our “summary estimate”, we feel that we achieved the best possible level of transparency. To increase the comparability of studies in the field of prevention, there should be agreement on the main outcome measurements to be used in primary evaluation studies. Standardising the outcome measures in the field of prevention and addiction was already suggested a decade ago by Bukstein & Winters (2004) in order to achieve some level of uniformity and consistency between studies. This observation remains valid today.

Prevention interventions intend to change the behaviour of individuals or groups and can be seen as complex interventions. They consist of multiple elements which all seem necessary for the intervention to work, yet the “active ingredient” is difficult to specify (Campbell et al., 2000). In order to improve the description and conceptual understanding of the content of a complex intervention for the purpose of a systematic review, typologies can be used that classify the interventions (Sheppard, 2009). Initiatives to develop classifications of prevention interventions, both for substance misuse (Hansen, Dusenbury, Bishop, & Derzon, 2007) and for behavioural changes techniques (Michie et al., 2013) have been performed. However, to be able to use such classifications, a rather detailed reporting of the intervention is needed. Standard templates for the reporting of systematic reviews, for example the PRISMA Statement, emphasise the transparency of presenting all the review steps (http://www.prisma-statement.org). However, in order to fully understand the process of the interventions, we need more detailed information on the intervention, including the level of fidelity. The TREND Statement supports authors in better describing their intervention. Its use should be promoted among researchers (http://www.cdc.gov/trendstatement). We agree with Hannes, Lockwood and Pearson (2010) that the use of standard reporting templates will most likely not increase the study quality in itself. However, it would help researchers in assessing whether or not authors of systematic reviews have conducted their study according to the methodological
state of the art. More attention should be given to important process and implementation characteristics that can indicate “how, for whom and in what particular situation” an intervention works. For example, studies should provide a detailed description on the frequency or length of the intervention (sessions), on the dose delivered and the dose received, information on recruitment of participants, group sizes in pre- and post-test and on fidelity during the intervention in order to fully understand a complex intervention such as prevention (Hannes, 2014).

We agree with the conclusion of Foxcroft & Tsertsvadze (2011b) that the most likely interpretation of our review with inconsistent results for prevention interventions is that some programmes are effective in particular settings or in particular populations. Currently it is not clear which interventions are effective in which circumstances. To resolve this issue we believe that, in addition to pooled estimates of the effectiveness, qualitative studies are also warranted in this field. These tend to focus on contextual factors influencing effectiveness and will aid our understanding of the appropriateness, meaningfulness and perceived effectiveness of prevention programmes for adolescents. (Hannes et al., 2013).

Implications for research
Twenty-one reviews were included in this overview of reviews. Of these, 10 were of high methodological quality. The gaps in quality and uniformity between reviews hampered the drawing of firm conclusions. Improved design and reporting of primary studies is therefore needed to increase knowledge on this complex field.

Researchers and professionals should try and reach international consensus on a) the preferred outcome measures (including potential negative effects and longer term outcomes), b) the preferred characteristics of the intervention, and c) the minimum requirements defining higher quality primary studies, so that the risk of bias is reduced as much as possible. Subsequently, these standards should be implemented in study designs.

Implications for practice
The results of this overview of systematic reviews suggest a small but consistent positive effect of school-based prevention programmes. Such programmes may be more effective if they are delivered by peers. Also affective-based and comprehensive programmes (multifactorial and combining knowledge with skills, including social skills) and programmes based on various learning models seem to yield promising results. There is little evidence that PSAs are useful for the prevention of alcohol and drug misuse among adolescents. Family-based prevention (with transition between primary and secondary school as a propitious timing) and community-based prevention programmes are likely to be effective. Clear evidence for the effectiveness of multi-component interventions is nevertheless currently lacking. We need more research to better understand which programmes are effective in terms of service delivery, setting, provider type and participant type. Policy makers have an important responsibility toward the field of prevention. They should encourage researchers to increase uniformity and consistency between studies, facilitate the use of validated checklists and reporting

Unauthenticated
standards and should stimulate them to consider process and implementation aspects. This would improve the quality of evidence needed to formulate useful recommendations for practice and policy.

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