

**A SYSTEMATIC REVIEW OF EVIDENCE-BASED WORKPLACE  
PREVENTION PROGRAMMES THAT ADDRESS SUBSTANCE  
ABUSE AND HIV RISK BEHAVIOURS**

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**ABSTRACT**

The purpose of the systematic review was to determine the effectiveness of workplace substance abuse prevention programmes that also address substance-related HIV risks. A search of major electronic databases was conducted. Two authors independently applied eligibility criteria, assessed study quality, and extracted data using a standardised data extraction form. Due to the heterogeneity of study results, a qualitative approach was applied in assessing the effectiveness of the programmes. The search yielded 14 studies. All studies presented mixed results, with the majority reporting improvements in self-reported substance abuse measures. The review highlighted paucity in the availability of good quality workplace prevention programmes and none that addressed substance abuse and HIV risk behaviours in such settings.

**Keywords:** Substance abuse, evidence-based, prevention programmes, workplace, industry

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**INTRODUCTION**

Substance abuse<sup>1</sup> in the workplace has generated considerable interest globally (Broome & Bennett, 2011; Elliott & Shel-

ley, 2006; Webb *et al.*, 2009; World Health Organisation (WHO), 2010). Surveys estimate that 1 in 10 American employees report experiencing problems related to substance abuse, while one in three em-

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<sup>1</sup>Substance abuse refers to a maladaptive pattern of use of a substance which is not considered dependent. Substances associated with this term include alcohol, amphetamines, barbiturates, benzodiazepines, cocaine, methaqualone, and opioids (American Psychiatric Association, 2000).

employees report experiencing the effects of co-worker substance abuse (Bennett *et al.*, 2004; Merrick *et al.*, 2007). Similarly, a survey of 39 companies (n=2566) in Brazil found that 12.4 per cent of employees drank at risky levels (United Nations Office on Drugs and Crime (UNODC), 2005) and 1% reported current use of illicit drugs. Although literature on substance abuse in the South African workforce is limited, the country has seen a surge in reported use of substances such as alcohol, heroin, cocaine and particularly crystal methamphetamine which has become increasingly widespread in Cape Town over the past eight years (Pithey & Parry, 2009; Pluddemann *et al.*, 2008). In 1996, Ronelle (1996) estimated that 20% of the average workforce in South Africa is likely to have ever experienced a substance-related problem.

Although South Africa has a high percentage of persons abstaining from drinking alcohol, when compared to other countries, the annual per capita consumption of pure alcohol per drinker is estimated to be at 19.5 litres (Roerecke *et al.*, 2008). Many drinkers drink at problematic levels, particularly over weekends (Parry *et al.*, 2005). A recent review of harmful drinking patterns and level of consumption in 20 African countries, ranked South Africa fourth highest in terms of the proportion of heavy drinkers as a percentage of current drinkers (Clausen *et al.*, 2009). The prevalence of risky drinking among sectors such as the mining industry in South Africa has been estimated to be at 25% (Pick *et al.*, 2003; Wilson, 1999).

This reported growth in the abuse of substances has been paralleled over the same period of time by an increase in HIV prevalence. An estimated 1.9 million people were newly infected with HIV in sub-Saharan Africa in 2010, bringing to

22.9 million the number of people living with HIV (United Nations Programme on HIV/AIDS (UNAIDS), 2011). South Africa has an estimated 5.6 million people living with HIV, an amount more than any other country in the world (United Nations Programme on HIV/AIDS (UNAIDS), 2011).

This is particularly worrisome given the body of research on the link between substance abuse and HIV globally (Parry *et al.*, 2010). In Southern Africa the majority of HIV/AIDS transmissions occur through heterosexual contact and numerous studies have demonstrated evidence of an association between substance abuse and sexual HIV risk behaviours among men, women and adolescents (Morojele, Pithey, Pule & Joubert, 2006; Parry & Pithey, 2006; Pithey & Parry, 2009). Recent studies found that two adult community populations studied in Cape Town were more likely to engage in risky sex practices, characterised as sex with multiple partners and unprotected sex (OR = 6.2, 95% CI = 3.1–12.3), if they were methamphetamine or alcohol users (Carney & Parry, 2008; Parry & Pithey, 2006; Simbayi *et al.*, 2004).

Substance abuse by employees, on or off-site, impacts on work performance resulting in decreased productivity, work errors, wasted materials, tardiness and absenteeism, all translating to substantial productivity losses each year (Garcia, 1996; Kew, 1992; Merrick *et al.*, 2007; Roman & Blum, 2002). Attempts to address these huge economic losses incurred by industry have seen a growth in research on substance abuse prevention strategies designed for use in the workplace (Cook & Schlenger, 2002; Webb *et al.*, 2009).

Although there is widespread agreement on the need for substance abuse workplace prevention programmes glob-

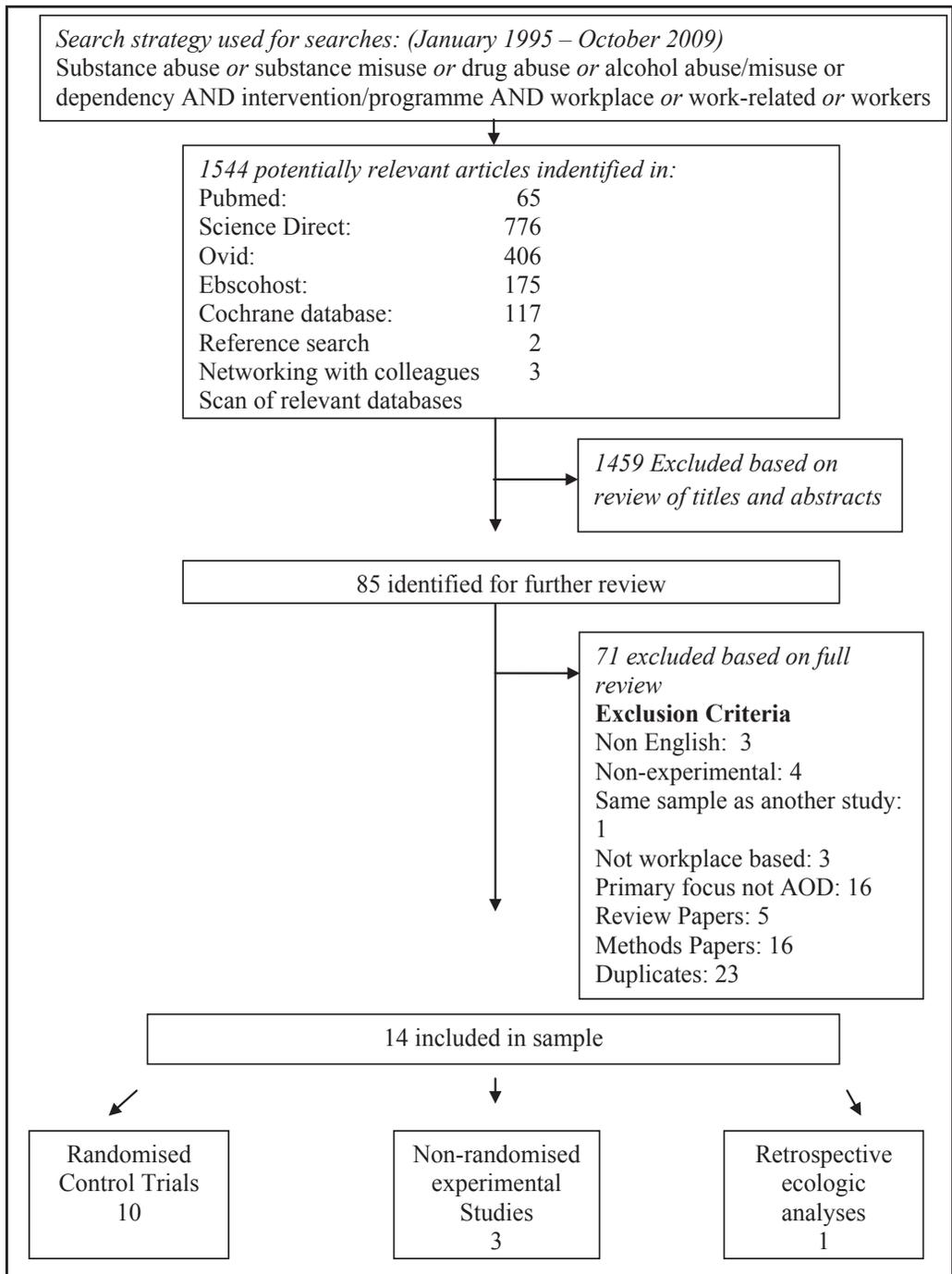
ally (Broome & Bennett, 2011; Cook & Schlenger, 2002; Webb *et al.*, 2009) and in Africa (World Health Organisation (WHO), 2010), there has been no critical review of published literature on substance abuse workplace programmes that also address HIV risk behaviours. Webb *et al.*, (2009) however conducted a systematic review of alcohol abuse prevention programmes for the workplace which did not include a focus on other substances of abuse such as illicit drug use. The review however highlighted the existence of few methodologically adequate studies of workplace alcohol interventions. Weaknesses in the ten studies included in the Webb *et al.*, (2009) review related to representativeness of samples, consent and participation rates, blinding, post-test time-frames, contamination and reliability, and validity of measures used. Despite the limitations reported the review concludes that brief interventions, interventions contained within health and life-style checks, psychosocial skills training and peer referral have the potential to be replicated and to produce beneficial results Webb *et al.*, (2009).

Given the dual burden of substance abuse and HIV in South Africa and the need for information on how best to address this burden, the objectives of the study were to assess the effectiveness of evidence-based workplace substance abuse prevention programmes from around the world that also address substance-related HIV risk behaviour and to select an intervention suitable for implementation in a South African workplace setting. This review forms part of a larger study aimed at testing the effectiveness of a substance abuse and substance-related HIV risks prevention programme at workplaces in the Western Cape province of South Africa.

## METHOD

We conducted a search of electronic databases in October 2009 to identify literature on evidence-based workplace substance abuse prevention programmes that also address substance-related HIV risk behaviours. The following key words were used: '*substance abuse*'; '*substance misuse*'; '*drug abuse*'; '*alcohol abuse*'; '*alcohol misuse*'; '*dependency*'; '*interventions*'; '*programmes*'; '*workplace*'; '*work-related*'; '*workers*'; '*employees*'; '*industry*'; '*HIV/AIDS*'; '*HIV*' and '*HIV-related*'. This first search yielded no results and a second search was executed dropping HIV/AIDS and HIV-related keywords. We searched the following databases: PubMed, MEDLINE, Science Direct, EBSCO, Ovid, Cochrane and SABINET. Our search for unpublished data involved making email contact with key informants such as the UNODC, and other local experts in the field of substance abuse in the workplace. We provided experts with a brief description of the overall aim of the review and asked if they knew of any workplace prevention programmes that fit our descriptions. All applicable information was emailed to the corresponding author. We also searched the WHO, SAMHSA and ILO websites for unpublished articles and documents. The relevant keywords were entered into the websites search engine and any documentation relating to the workplace and prevention was downloaded.

Eligibility criteria included the following: articles had to be in English; the associations between substance abuse and/or substance-related HIV risks prevention programmes and the workplace needed to be stated clearly and concisely (for example, the mean difference in number of



**Figure 1:** Flow chart indicating search strategy and process

days using alcohol or drugs, effect sizes); verifiable quantitative measures appropriate for inferring relationships between the intervention and outcomes were used; published in the 15 year period 1995 – 2009 (inclusive).

Two review authors (NB and AM) independently i) screened the results of the searches to select potentially relevant studies, ii) applied eligibility criteria, iii) extracted data on the methods, participants, interventions, and outcomes from each eligible study into a specially designed extraction form, iv) compared data in respect of intervention effectiveness, quality and key findings using Babor *et al.*, (2003) Objective Decision Model approach. This approach uses a systematic procedure to evaluate the evidence, compare alternate interventions and assess the societal/community or population benefits of an intervention (Babor *et al.*, 2003). Babor and colleagues propose that interventions be rated according to four major criteria: evidence of effectiveness, breadth of research support, extent of testing across diverse countries and cultures, and relative cost of the intervention in terms of time, resources and money (Babor *et al.*, 2003). Evidence of effectiveness refers to the quality of the scientific evidence and intervention effectiveness. Breadth of research support goes beyond considering the quality of science and looks at the consistency of the available evidence. Cross-cultural testing suggests that an intervention applies well to different cultural settings and further considers possibility for intervention replication. Cost to implement and sustain refers to the monetary costs associated with the intervention. The rationale for using the objective decision model approaches by Babor *et al.*, (2003) for assess-

ing the effectiveness of the programmes was firstly, due to the variability of studies and secondly to facilitate the choice of an intervention for implementation. Any differences in assessment of eligibility were resolved through interactive discussion.

The selected studies (14 studies) were rated (by NB and AM) on the following seven criteria: standards of evidence, breadth of research support, cross-cultural applicability, target group representation, cost to implement, methodological strength of study, and other practical influences (Babor *et al.*, 2003; Leff *et al.*, 2009). The authors added target group representation to the list of criteria since it was deemed important to identify the target population in the identified studies. A programme targeting the general workforce would be more suited to the purposes of the study. Based on these ratings, the 3 studies with the best scores were chosen for further review and possible implementation in a South African setting.

To further facilitate the task of choosing a quality study for replication in South Africa, a group of 6 experts were identified to further rate the selected interventions on the seven criteria (Babor, *et al.*, 2003; Leff *et al.*, 2009). The experts were selected on the basis of their experience in the substance abuse field and/or Employee Assistance Programmes. The experts comprised of 3 academics, 2 EAP consultants (1 a specialist in substance abuse) and a medical doctor knowledgeable on alcohol and the workplace.

Each member of the expert panel was mailed a rating sheet which contained the categories described by Babor *et al.*, (2003). Using the categories, experts were asked to rate the studies as being least suited, moderately suited or most suited for implementation in South Africa.

Studies rated as being least suited were given a rating of '1' and studies most suited were afforded a rating of '3', with '2' given to those that were categorized as moderately suited. The ratings provided were summed and the intervention with the highest result was chosen for implementation (see Table 3).

## RESULTS

### Description of studies

#### *Study selection*

The systematic review identified 1544 potentially eligible studies that met inclusion criteria. For the published studies where abstracts matched the study inclusion criteria, 85 corresponding full articles were retrieved and further reviewed to determine eligibility. Of the 85 articles, 71 were further excluded through a second review. Following this process of reviewing the titles and abstracts, removing duplicates and articles not meeting inclusion criteria (see Figure 1), 14 potentially eligible intervention studies were subject to further analysis. One ecological study was included in the review. The decision to include the retrospective ecologic analysis was based on the type of intervention tested. Despite the lack of a control, the author (Spicer & Miller, 2005) used cross-sectional time-series data to examine the association between PeerCare implementation and occupational injury over a 13 year period.

The initial aim of the study was to search for substance abuse and substance related HIV workplace interventions. The search yielded no results, which led to the adaptation of the search and a search for only substance abuse workplace prevention programmes. Of the 14 identified studies, 10 were randomized control tri-

als (RCTs), three were non-randomised experimental studies and one study was a retrospective ecologic analysis. The 14 studies selected are described in Table 1.

#### *Participants and location*

Twelve of the identified studies were conducted in the USA. One study was conducted in Australia and one study in Iran. The target populations were all adults (>18 years), and the majority of studies had both male and female participants whilst three studies did not report a gender breakdown. Seven studies provided a description of participant race classifications. The worksites included were all medium to large enterprises, with eight workplaces in the services industry (Anderson & Larimer, 2002; Bennett *et al.*, 2004; Billings *et al.*, 2008; Cook *et al.*, 1996; Deitz *et al.*, 2005; Dumas & Hannah, 2008; Richmond *et al.*, 2000; Snow *et al.*, 2002), four in the manufacturing industry (Cook *et al.*, 2004; Heirich & Sieck, 2000; Moradi *et al.*, 2009; Walters & Woodall, 2003), one in the transport industry (Spicer & Miller, 2005) and one industry chose to remain anonymous (Matano *et al.*, 2007). The mean age of employees was reported in only six studies (see Table 1).

#### *Interventions*

Interventions differed in respect of the type of strategies used to deliver prevention messages. In five of the included studies, alcohol and drug messages were embedded in a health promotion framework which focused on topics such as healthy eating, weight management, smoking, depression and anxiety and other wellness aspects (Anderson & Larimer, 2002; Billings *et al.*, 2008; Cook *et al.*, 1996; Cook *et al.*, 2004; Deitz *et al.*, 2005; Heirich &

Sieck, 2000). Five of the studies (Bennett *et al.*, 2004; Cook *et al.*, 2004; Moradi *et al.*, 2009; Snow *et al.*, 2002; Spicer & Miller, 2005) provided psychosocial skills training paying particular attention to peer referrals, team building, self-efficacy, coping mechanisms, resistance skills and stress management, whilst Dumas & Hannah, (2008), Matano *et al.*, (2007) and Walters & Woodall, (2003) provided alcohol and drug information. The majority of interventions were provided in a group setting (Bennett *et al.*, 2004; Billings *et al.*, 2008; Cook *et al.*, 1996; Cook *et al.*, 2004; Deitz *et al.*, 2005; Moradi *et al.*, 2009; Snow *et al.*, 2002; Spicer & Miller, 2005), but one study used both a group setting and provided individual feedback (Heirich & Sieck, 2000). Three studies presented alcohol and drug prevention information via an internet website (Billings *et al.*, 2008; Dumas & Hannah, 2008; Matano *et al.*, 2007) and one offered a free confidential check-up by mail (Walters & Woodall, 2003). Two interventions took place in a brief intervention format (Anderson & Larimer, 2002; Richmond *et al.*, 2000). In their comparisons all studies included a control group; however, some studies had a no-treatment control group, while others compared two different experimental treatments to each other as well as comparisons with a control group (Bennett *et al.*, 2004; Dumas & Hannah, 2008; Heirich & Sieck, 2000; Matano *et al.*, 2007; Walters & Woodall, 2003).

The programme presenters comprised researchers, peer educators, EAP staff and three studies used the internet as the intervention agent. The duration of the interventions ranged from two sessions in total to 15 sessions in total over a four week to one year time period. The web-based interventions provided access

to the website which ranged between 30 and 90 days.

### Outcomes

The substance abuse outcome measures chosen varied between studies, although the most frequently chosen outcomes were changes in alcohol or drug use behaviours and attitudes, changes in drinking patterns, reductions in binge drinking and quantity and frequency of consumption of either alcohol or drugs. The majority of studies assessed alcohol use patterns with only two studies (Cook *et al.*, 2004; Moradi *et al.*, 2009) assessing frequency of use of drugs. All studies used self-report measures and two studies (Cook *et al.*, 2004; Spicer & Miller, 2005) confirmed self-reports biochemically. Many of these outcomes were measured at different time points which ranged from immediately following pre-testing to two weeks after pre-testing; on completion of the intervention and after a four week to six month follow-up period. Some studies also assessed other outcomes such as cardiovascular disease and alcohol risk presence (Heirich & Sieck, 2000) and association between the intervention and risk of occupational injury (Spicer & Miller, 2005).

### Ratings of Interventions

While the primary outcome was reduction in substance abuse (alcohol and drug) consumption measures, we could not perform a meta-analysis because of the heterogeneity in studies with respect to study design and a wide variation of outcomes reported. Instead the 14 studies have been rated on different dimensions using criteria used by Babor *et al.*, (2003) (see Table 3).

### Evidence of effectiveness

The included studies yielded mixed results with the majority of studies report-

**Table 1.** Study characteristics of the 14 studies identified

Author	Country	Target Industry	Design	Sample Size (n)	Participation Rate	Sex	INSTRUMENTS USED and OUTCOMES
Matano et al., (2007)	USA	Anonymous	RCT	8567	2.7%	Male: 22.1% Female: 77.9%	The Audit questionnaire The Cage questionnaire
Spicer & Miller, (2005)	USA	Transport Industry	Time series design	Not indicated	86%	Not indicated	Company Injury Records
Deitz et al., (2005)	USA	Insurance company	Quasi-experimental design.	1167	46% - 47%	Not indicated	Health Behaviour Questionnaire - Heavy drinking ( 5 or more days having 5 or more drinks in past 30 days) - Binge drinking (1 day with 5 or more drinks in past 30 days)
Bennett et al., (2004)	USA	Safety Sensitive Jobs	RCT	587	73%	Male: 83%	Own measures developed Four consumption (frequency and drunkenness) questions; 5 questions relating to hangovers; 6 questions relating to problems as a result of use; 7 questions related to work drinking climate and co-worker use.
Richmond et al., (2000)	Australia	Postal service workers	RCT	1206	61%	62% male and 38% female	Health and Fitness Questionnaire (HFQ). Mean # of standard drinks per week; regular excessive drinking (quantity/frequency index); binge drinking in previous 3 months
Anderson & Larimer, (2002)	USA	Food and Retail	RCT	155	77%	51 men & 31 women & 26 women	Alcohol Dependence Scale; Inventory of drug taking situations; Comprehensive effects of alcohol questionnaire. Frequency of consumption and peak BAL; # of drinks consumed per day in previous 3 months; Typical BAL (typical # of drinks consumed per occasion and period of time over which drinking occurred during past 3 months).
Doumas & Hannah, (2007)	USA	Not indicated	RCT	124	63%	73% male 27% female	Daily Drinking Questionnaire. 3 measures of alcohol consumption (drinking quantity, peak consumption, freq of drinking to intoxication); Binge drinking measures (frequency of binge drinking).

Author	Country	Target Industry	Design	Sample Size (n)	Participation Rate	Sex	INSTRUMENTS USED and OUTCOMES
Heirich & Sieck, (2000)	USA	Industrial workers	RCT	2000	-	Not indicated	Self-report drinking levels Biometric measures of CVD risks ; Quantity and Frequency
Cook et al., (1996)	USA	Printing company workers	Quasi experimental	108	-	60 males and 47 females	Health Behaviour Questionnaire Heavy drinking ( 5 or more days having 5 or more drinks in past 30 days); Binge drinking (1 day with 5 or more drinks in past 30 days)
Walters & Woodall, (2003)	USA	Manufacturing workers		48	7.4%	56% female	Measures Used: Quantity/Frequency of Consumption Measure; Short Index of Problems - Recent; Importance-Confidence Indicators; Perceived Risk of Alcohol
Snow et al., (2002)	USA	Secretarial	RCT	239		All females	Work and Family Stress Questionnaires. # of drinks drank per month and; the extent to which alcohol was used to reduce tension
Moradi et al., (2009)	Iran	Petrochemical workers	RCT	181		Not indicated	Trans -Theoretical Model based on Prochaska's processes of change. Outcomes measured: Knowledge on drug abuse; Attitudes towards drug abuse; Resistance skills
Cook et al., (2004)	USA	Construction workers	Quasi experimental	374		98% male	Questionnaire composed of items in National Household Survey on Drug Abuse. Bioassay data was also used. Outcomes measured: Alcohol use quantity/frequency; Drinking stages of change; Illicit drug use
Billings et al., (2008)	USA	Technology company	RCT	309	-	29.4% males and 70% females	Stage of Change; Past 30 day use

**Table 2.** Study Ratings of Interventions

Author and Year	Standards of Evidence <sup>1</sup>	Methodological Strength of Study	Intervention Integrity <sup>2</sup>	Breadth of Research Support <sup>3</sup> Author and Year	Cross Cultural Applicability <sup>4</sup>	Cost to Implement <sup>5</sup>	Target Group <sup>6</sup>	Practicalities <sup>7</sup>	Overall Assessment
Matano, et al., 2007	++	RCT	0	+	+	Low	GW	Web-based Low participation	Web-based Not Suited
Spicer et al., 2005	++	Time Series Design	0	+	+	High	GW	Indirect measure of alcohol	Time frame Not suited
Deitz, D et al., 2005	++	Non-randomized experimental	0	+++	+	High	GW	Mailed surveys	Mailed self-report survey – good results
Bennett et al., 2004	++	RCT	0	+++	+	High	GW		
Richmond et al., 2000	+	RCT	0	0	+	moderate	Low -moderate risk users		Not suited (Average results and Brief Intervention)
Anderson et al., 2002	+	RCT	++	+	+	Low	GW		Not suited (Average results and Brief Intervention)
Dourmas et al., 2007	++	RCT	+	+	+	Moderate	Young Adults	Web-based; target group young people	Not suited (see practicalities)
Heirich et al., 2000	++	RCT	0	++	+	High	GW	Would require medical personnel. Weak method	Not suited (see practicalities)
Cook et al., 1996	++	Non-randomized experimental	0	++	+	Moderate	HR		
Walters et al., 2003	++	RCT	0	+	?	Low	Light to moderate drinkers	Mailed feedback, may not work BC	Not suited (see practicalities)
Snow et al., 2002 (Book Chapter)	++	RCT	0	++ (Trinidad and Tobago)	0	Moderate	Women only	Women only	Considered but rejected because women only focus

Author and Year	Standards of Evidence <sup>1</sup>	Methodological Strength of Study	Intervention Integrity <sup>2</sup>	Breadth of Research Support <sup>3</sup> Author and Year	Cross Cultural Applicability <sup>4</sup>	Cost to Implement <sup>5</sup>	Target Group <sup>6</sup>	Practicalities <sup>7</sup>	Overall Assessment
Moradi et al., 2009	+	RCT	0	+	+	Moderate	GW but males only	Alcohol not the primary outcome Males only	Not suited (see practicalities)
Cook et al., 2004	+	Non-randomized experimental	0	++	+	Moderate	HR	Poor results	Not Suited (see practicalities)
Billing et al., 08	++	RCT	0	+	+	Low	GW	Web-based	Not suited Web-based

**Key: Ratings of Interventions**

- 1 0 Evidence indicates a lack of effectiveness; + Evidence for limited effectiveness; ++ Evidence for moderate effectiveness; +++ Evidence of a high degree of effectiveness
- 2 0 Consistency of intervention not reported on; + Implemented with a low degree of fidelity; +++ Implemented with a high degree of fidelity
- 3 0 No studies of effectiveness have been undertaken; + Only one well designed study of effectiveness completed; ++ Two to four studies of effectiveness completed; +++ Five or more studies of effectiveness completed
- 4 0 Not tested adequately across cultures; ? Not reported on; + Studied in only one country; ++ Studied in two or more countries; +++ Studied in five or more countries
- 5 Low: Low cost to implement and sustain; Moderate: Moderate cost to implement and sustain; High: High cost to implement and sustain
- 6 GW General Workforce; HR High Risk Users; MR Moderate Risk Users; LR Low Risk Users
- 7 This column considers the practicalities and implementability of the programme in the SA context

**Table 3.** Expert Reviewer Ratings for three selected interventions (number of raters indicating that the intervention rates adequately for a particular category)

Categories and Ratings	Cook et al, 1996	Deitz et al, 2005	Bennett et al, 2004
	A	B	C
Ratings			
Interventions Descriptions	9	13	15
Focus (Alcohol only or AOD)	7	16	17
Length	14	11	11
Material	11	13	15
Topics Addressed	9	18	13
Effectiveness	9	13	16
Methodological Strength of Study	9	17	12
Intervention Integrity	9	9	9
Breath of research support	11	17	13
Cross Cultural Applicability	11	11	12
Cost of implement	15	8	12
Target group	10	7	16
Practicalities	16	7	15
<b>TOTAL</b>	<b>140</b>	<b>160</b>	<b>178</b>

ing significant effects. Cook *et al.*, (2004) reported no significant differences between the experimental group and the control group on any of the two alcohol consumption and one illicit drug use measure. In contrast, Bennett *et al.*, (2004) found that employees receiving the Team Awareness intervention significantly reduced problem drinking from 20% to 11% as compared to control subjects who showed no significant change at pre and post-test (13% respectively):  $F=6.78$ ,  $p=0.01$ ). Bennett *et al.*, (2004) also reported significant reductions in working with a hangover or missing work because of a hangover from 16% to 6% as compared to control subjects who showed no change at pre and post-test (9% respectively) ( $F=7.34$ ,  $p=0.007$ ). Similar results were recorded by Cook *et al.*, (1996), where the programme group significantly reduced the average number of days in the past 30 days on which they had a drink from 7.9

to 4.1, as compared to the off-site control group which showed a slight increase from 7.4 to 8.1 drinks ( $t=3.17$ ,  $p=0.002$ ). The programme group also significantly reduced the average number of days on which the employee drank five or more drinks as compared to the off-site control group ( $t=2.15$ ,  $p=0.035$ ).

Matano, *et al.*, (2007) found that the mean number of beer binges by moderate-risk participants dropped significantly among participants receiving the Coping Matters intervention, an internet delivered alcohol education programme, from 1.36 (SD 0.84) to 0.71 (0.91), per week, compared to an increase of 1.00 (0.00) to 1.13 (0.64) binges per week for the controls (Mann Whitney  $U$  test = 25.00,  $p=0.01$ ). Similarly, low-risk participants showed a significantly greater reduction in mean number of beer binges (1.00 (0.00) to 0.59 (0.50) (Mann Whitney  $U$  test = 95.50,  $p=0.02$ ), as well as hard liquor binges 1.00

(0.00) – 0.57 (0.51) (Mann Whitney *U* test = 133.50,  $p=0.05$ ) compared to the controls. Participants in Billings *et al.*, (2008) study adopted a more healthy approach to drinking as compared to controls by showing a positive movement on the binge drinking stage of change measure (from 4.54 (1.91) at baseline to 4.89 (1.72) after intervention;  $F=7.57$ ,  $p=0.006$ ). Although Deitz *et al.*, (2005) reported a decrease in heavy drinking among participants in the intervention group in comparison to those in the control ( $p=0.020$ ), differences for binge drinking were not significant ( $p=0.070$ ). Significant decreases in alcohol consumption were also reported by Walters & Woodall (2003) and Doumas & Hannah (2008).

Spicer & Miller (2005) used an indirect measure of alcohol use and found a significant association between the percentage of employees covered under the PeerCare contract, a programme that promotes peer referral systems, and injury rates ( $RR=0.9984$ , 95% CI: 0.9975–0.9994). These findings imply that a 1% increase in the workforce covered; resulted in a 0.16% decrease in monthly injury rates (Spicer & Miller, 2005). Moradi *et al.*, (2009) found a significant improvement in most of the resistance skills against peer pressure to use drugs among those exposed to the intervention group ( $p=0.0006$ ), improved attitude towards drug abuse ( $t= 5.55$ ;  $p=0.000$ ) and improved knowledge about drug abuse ( $t= 0.42$ ,  $p= 0.000$ ) when compared to the control group. Anderson & Larimer (2002) evaluated differential treatment effects across time, condition and gender and found that female drinkers were more likely to benefit from the intervention when compared to male drinkers ( $F = 4.01$ ,  $p< 0.055$ ). Similarly, Richmond *et*

*al.*, (2000) found a significant decline in the number of drinks per week amongst women in the experimental group as compared to controls ( $F = 39.98$ ,  $p=0.01$ ). Although men also showed a decline in the number of drinks over time, the result was not statistically significant.

### Methodological strength of the studies

The studies also varied on methodological adequacy. Ten studies were RCTs, three were non-randomised experimental studies and one study employed an ecological time series analysis. All ten RCTs were reported as randomised, yet none of the RCTs elaborated on sequence generation. Allocation concealment was clearly described in only three of the 10 RCTs (Anderson & Larimer, 2002; Doumas & Hannah, 2008; Walters & Woodall, 2003). Blinding was generally not reported on in any of the included studies except for the study by Deitz *et al.*, (2005). Three studies reported on possible contamination of the intervention due to major policy changes at the time of the study (Bennett *et al.*, 2004; Deitz *et al.*, 2005; Heirich & Sieck, 2000). In the latter study the control group gained access to the intervention which resulted in changes to the study design, whilst the other studies were single-site interventions and therefore failed to obtain an off-site comparison group.

The main measures used were self-report measures, although two studies used specific biomarkers (Spicer & Miller, 2005; Cook *et al.*, 2004). Five studies reported on the reliability and validity of measurement tools used (Anderson & Larimer, 2002; Bennett *et al.*, 2004; Cook *et al.*, 1996; Matano *et al.*, 2007; Walters & Woodall, 2003). Studies also rated poorly on withdrawals and dropouts, with the exception of Walters & Woodall

(2003) and Spicer & Miller (2005), where 80% of participants completed the study. Spicer & Miller (2005) ecological time series analysis also included a long follow-up time period which strengthened the study and facilitated monitoring change over time.

#### *Intervention integrity*

Thirteen studies did not describe methods used to ensure intervention integrity and fidelity monitoring and were judged as weak in relation to meeting this criteria. Although Anderson & Larimer (2002) indicated the use of checklists and feedback protocols to promote consistency in programme delivery, no formal evaluation method was reported.

#### **Breadth of research support**

Bennett *et al.*, (2004), Deitz *et al.*, (2005), Heirich & Sieck (2000), Cook *et al.*, (1996), Cook *et al.*, (2004) and Snow *et al.*, (2002) have continued conducting field tests of the studies covered in the review which have shown repeated effectiveness.

#### **Cross-Cultural, Gender and Population Applicability**

The studies included in the review did not speak to cross-cultural applicability of the interventions, although there is anecdotal evidence (the corresponding author contacted the programme developers to establish cross-cultural applicability of the interventions) that the intervention reported on by Snow *et al.*, (2002) and Bennett *et al.*, (2004) were respectively replicated in Trinidad and Tobago, and Guan. All studies gave details on gender profiling of participants. Twelve studies were heterogeneous for gender with the exception of Snow *et al.*, (2002) and Mo-

radi *et al.*, (2009). Studies were representative of various population groups.

#### *Target Group*

Of the 14 studies included in the review, eight studies targeted the general workforce. Two studies targeted light to moderate risk users (Richmond *et al.*, 2000; Walters & Woodall, 2003) and a further two studies focused on high risk users (Cook *et al.*, 1996; Cook *et al.*, 2004). Bennett *et al.*, (2004) and Richmond *et al.*, (2000) incorporated both white and blue collar workers whereas Deitz *et al.*, (2005) focused solely on white collar workers while Cook *et al.*, (1996), Moradi *et al.*, (2009) and Cook *et al.*, (2004) targeted only blue collar workers. The remaining 8 studies did not classify workers into these categories.

#### *Cost to implement*

The costs associated with implementing the 14 included studies varied. Studies by Billings *et al.*, (2008); Dumas & Hannah (2008) and Matano *et al.*, (2007) used e-learning methods as a preventative tool as the internet offers a cheaper method of delivering prevention messages. Similarly, Walters & Woodall (2003) and Deitz *et al.*, (2005) used mailed self-report surveys as their data collection tool, which are also cost effective. The study by Heirich & Sieck (2000) focused mainly on cardiovascular disease and alcohol and required the use of medical personnel for data collection purposes, while Anderson & Larimer (2002) and Richmond *et al.*, (2000) mostly used individualised feedback sessions, both requiring the expertise and service of highly skilled personnel. The study by Spicer & Miller (2005) employed the use of a fairly unique longitudinal design which may be difficult to replicate. The studies by Bennett *et al.*,

(2004); Cook *et al.*, (1996) and Deitz *et al.*, (2005) are not costly to sustain in the long term, but require consultant input for programme development, which may require high initial financial outlay.

#### *Findings of the ratings provided by key experts*

Following the rating of the 14 studies on the different dimensions supplied, two authors (NHB and AM) studied the 14 interventions. They selected the interventions which rated strongly on all or most of the dimensions discussed previously. Additional comments and an overall assessment of the feasibility of using the interventions by the two authors are given in the last column of Table 2. The interventions by Bennett *et al.*, (2004); Cook *et al.*, (1996) and Deitz *et al.*, (2005) were considered for further review. A copy of the ratings sheet was sent to each member on the expert panel and they were asked to further provide their ratings on each of the studies and related categories. Table 3 provides a breakdown of the ratings supplied by the 6 experts. The study by Cook *et al.*, (1996) was rated most suited in respect of programme length, cost to implement. Deitz *et al.*, (2005) rated most suited on the diversity of topics covered, methodological strength and breath of research support. Bennett *et al.*, (2004) was rated strongly on target group, cross cultural applicability, intervention integrity, effectiveness, focus on alcohol and drugs and material availability. Once the results were tallied, the intervention by Bennett *et al.*, (2004) rated the strongest overall.

## DISCUSSION

Despite the large number of studies identified, the review highlighted the

scarcity of evidence, with only 14 studies evaluating the effectiveness of substance abuse workplace prevention programmes. In addition, the review highlighted the dearth of substance abuse prevention programmes in developing countries and also the variability in study design, methodology and programme content. The review also highlights the lack of intervention integrity monitoring in prevention research, and further brings to light factors that might hinder replication of programmes in developing countries.

The fact that no substance abuse workplace prevention programmes were found that address substance and HIV in one single programme is worthy of note considering the growing understanding of the nexus between substance abuse and HIV, and academic consensus on the intersection between substance abuse and risky sexual behaviour (Morojele *et al.*, 2006; Parry & Pithey, 2006; Parry *et al.*, 2005; Wechsberg *et al.*, 2008). This finding is not surprising given that similar findings were also reported in a study examining the extent to which South African substance abuse treatment services provide HIV risk reduction services to patients. Limited availability of such services was reported (Myers, 2010). This is most concerning for developing countries where HIV prevalence rates are highest.

Most of the 14 studies originate from the USA. This may partly explain the absence of a substance-related HIV risks component found in this review. Developed countries like the USA are more likely to integrate substance abuse prevention into stress and coping-based interventions, peer-to-peer approaches, and other wide-ranging health promotion programmes that aim to reduce the health risks such as cardiovascular diseas-

es which are more germane to first world societies (Bray *et al.*, 2011). Although potential biases of this nature can be addressed by customising or adapting the intervention for replication in a different setting, there is still a need for local programmes that are not only cost effective, easy to implement in differing contexts and sustainable (Veniegas, 2009), but also address the reality of substance related – HIV risks which are more marked in many developing countries.

From the review it is also evident that various direct and indirect approaches are used for delivering substance abuse prevention messages. Scholars in the field of workplace substance abuse prevention have found programmes embedded in less stigmatized topics such as employee health and wellness to be less of a threat to corporate sectors, and often receive more attention in a relation to a programme that focus solely on substance related issues (Bennett *et al.*, 2000; Cook & Schlenger, 2002; Heirich & Sieck, 2000). Similarly the use of a study design that ascribes to evidence-based practices and shows the medium to long term effects of any intervention should be encouraged. Programmes ensuring sustained effects over a period of time remain valuable to the prevention science field (Rossi *et al.*, 2004).

Although the review produced a wide range of studies, variability in study design and methodology was significant. Webb *et al.*, (2009), in a review of alcohol abuse prevention programmes cites this variability as a challenge calling for the standardization of methods used for evaluating substance abuse interventions in the workplace.

It is also important to discuss intervention integrity which remains a fundamental construct to understand and evaluate

when considering prevention literature (Leff *et al.*, 2009). Intervention integrity is defined as the degree to which the interventions were implemented as they were prescribed. In a literature review on the degree to which intervention studies report on intervention integrity conducted Leff *et al.*, (2009) found that intervention integrity is only recorded in a handful of studies ranging from 3.5% to 28% of studies they reviewed. This contributes to the need for the development of a set of guidelines for reporting on implementation integrity of interventions in general (Foxcroft *et al.*, 2005; Webb *et al.*, 2009).

Furthermore, the relative monetary costs to implement and sustain an intervention as well as intervention feasibility issues are all important facts to consider when evaluating an intervention (Babor *et al.*, 2003). Consequently, the criteria for selection of an intervention for implementation should not only include studies reporting significant results with good methodological and other strengths, but also evidence of cost-effectiveness, practical implementable and representativeness of the target audience. For example, although recent literature (Billings *et al.*, 2008; Matano *et al.*, 2007) report on the effectiveness of e-learning methods as a preventative tool, it raises a concern which is related to accessibility considering that computers are possibly only accessible to skilled employees (Richmond *et al.*, 2000). In addition, a further barrier to utilising web services, specifically in developing countries, may be literacy levels. This could be a barrier in South Africa for instance, where the mean reading level is the sixth grade (Centres for Disease Control and Prevention, 2008). Additional factors that should be considered include the use of mailed self-report surveys as a data col-

lection tool. This may also pose difficulties considering the realities of informal housing and lack of formal postal addresses in certain areas of South Africa and other developing countries (Wilkinson, 2000).

Findings from this study should however be considered in the light of some limitations. Firstly, there was substantial heterogeneity between the studies which did not allow for meta-analyses. In addition, the studies reviewed are weighed down by methodological inadequacies highlighting the need for more rigorous study designs. Although RCTs remain costly to implement, they are the gold standard and their implementation should be encouraged. In instances where RCTs are not practical to implement, Foxcroft et al., (2005) suggests the use of longitudinal or time series study designs with sufficient measure points. The majority of studies were small scale, once-off studies which compromise the generalisability of results and do not add to the breath of research support which is valuable in motivating for study replication. Ideally future interventions should be larger scale and replicated in multiple settings to ascertain whether adapted versions of the study will have similar effects. Similarly, studies failed to report on intervention integrity considering that evaluating the degree to which study processes were followed is an important indicator to determining success or failure of a study. In addition future research should consider the use of outcome measures other than only using self-report measures. Consideration should also be given to developing single outcome measures that can be used to predict substance abuse. The development of cost effectiveness assessment tools will also be advantageous for study replication in resource poor settings.

A final limitation is that all the included studies are from developed country settings and therefore it is unclear whether these findings can be generalised to low- and middle-income countries.

## CONCLUSIONS

Despite the systematic search for methodologically sound workplace prevention programmes, the search yielded, for inclusion in the review, no intervention studies aimed at addressing both substance abuse and substance related HIV in the workplace and only 14 studies involving interventions to address substance abuse in the workplace. Wide-ranging variability in study design, study results and outcome measures resulted in an inability to compare the 14 studies but three promising interventions were identified for implementation in South Africa.

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