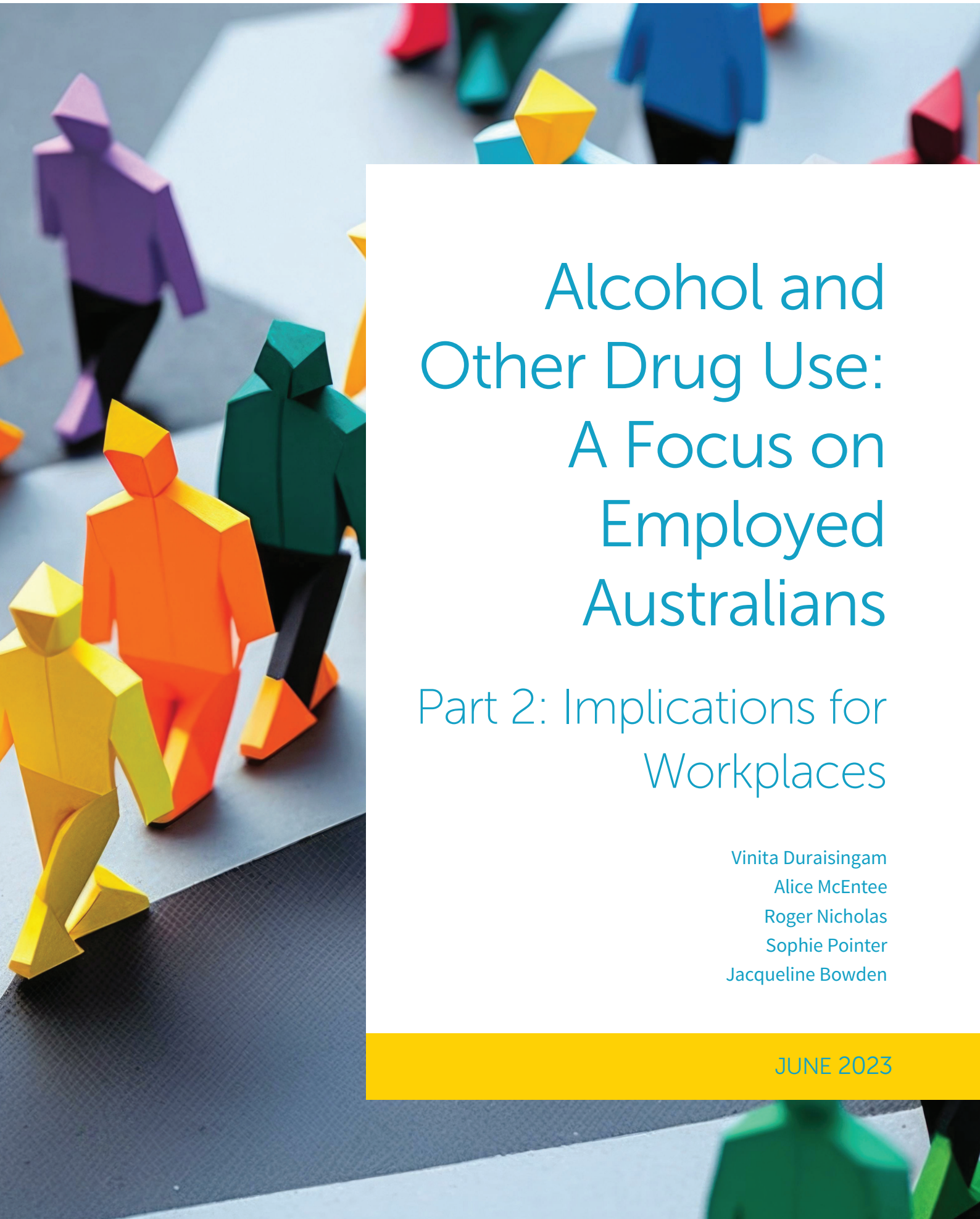


Alcohol and Other Drug Use: A Focus on Employed Australians

Part 2: Implications for Workplaces

Vinita Duraisingam
Alice McEntee
Roger Nicholas
Sophie Pointer
Jacqueline Bowden

JUNE 2023

Citation details

Duraisingam, V., McEntee, A., Nicholas, R., Pointer, S. and Bowden, J. (2023). Alcohol and other drug use: A focus on employed Australians: Part 2: Implications for Workplaces. Adelaide, South Australia: National Centre for Education and Training on Addiction (NCETA), Flinders Health and Medical Research Institute (FHMRI), Flinders University.

About NCETA

The National Centre for Education and Training on Addiction (NCETA) is based at Flinders University in South Australia and is a collaboration between the University and the Australian Government Department of Health & Aged Care. It is an internationally recognised research and training centre that works as a catalyst for change in the alcohol and other drug (AOD) field. NCETA's areas of expertise include training needs analyses, the provision of training and other workforce development approaches. We have developed training curricula, programs and resources, and provided training programs, to cater for the needs of: specialist AOD workers; frontline health and welfare workers; workers in safety-critical industries; Indigenous workers; community groups; mental health workers; police officers; and employers and employee groups. NCETA focuses on supporting evidence-based change and specialises in change management processes, setting standards for the development of training curriculum content and delivery modes, building consensus models and making complex and disparate information readily accessible to workers and organisations. NCETA aims to advance the capacity of organisations and workers to respond to AOD related problems. Our core business is the promotion of workforce development (WFD) principles, research and evaluation of effective practices; investigating prevalence, and effect of AOD use in society; and the development and evaluation of prevention and intervention programs, policy and resources for workplaces and other organisations.

NCETA respectfully acknowledges the Kaurna people as the Traditional Owners of the land and waters on which our Centre is located. We pay our respects to Kaurna elders past, present and emerging.

Contact us

National Centre for Education and Training on Addiction

Flinders University
GPO Box 2100
Adelaide SA 5001
Australia

www.nceta.flinders.edu.au
nceta@flinders.edu.au
+61 8201 7535
nceta@facebook
@NCETAFlinders

Table of contents

List of tables v
List of figures v
List of supplementary tables v
List of supplementary figures vi
Acknowledgments vii

Executive summary vii
Workplace AOD policies viii
Workplace AOD interventions viii
Workplace AOD testing viii
Other workplace interventions viii
New and emerging AOD issues ix
Recommendations x

Chapter 1: Introduction 1
Aims 2

Chapter 2: Workplace policies 3
Alcohol and drug policies 7
Industry groups 4
Alcohol and drug testing 7
Industry groups 7
Education and assistance 9
Industry groups 9
Summary 10

Chapter 3: Workplace interventions 11
Workplace AOD testing 11
Results 11
Summary 14
Other workplace interventions 15
Results 14
Summary 19

Chapter 4: New and emerging AOD issues **20**
Electronic cigarettes 20
Changes in cannabis use 21
New psychoactive substances 22
Pharmaceutical drug use and misuse 23
Cognitive enhancing drugs (nootropics) 23
Performance/image enhancing drugs (PIEDs) 24
Psychedelics or hallucinogens 25
Summary 26

Chapter 5: Implications and recommendations **27**
Policies, testing, education and assistance 27
Intervention efficacy 28
Workplace AOD testing 28
Other workplace interventions 28
Emerging issues 29
Recommendations 30
AOD policy 30
Education and assistance 30
Targeted interventions 30
Drug testing 30
Interventions that work 31
Emerging issues 31
Future research 31

Appendix A: Data sources and notes **32**
National Drug Strategy Household Survey (NDSHS) 32
Sample size 32
Weighting 32
Report notes 33

Appendix B: Supplementary information **34**
Workplace AOD testing 34
Method 34
Findings 35
Other workplace interventions 45
Methods 45
Findings 46

Glossary **67**

Symbols **69**

References **70**

List of tables

Table 1. Proportion of employed people reporting an alcohol or drug use policy in their workplace, 2019 3
Table 2. Prevalence (%) of workplace alcohol and drug policies by industry of employment, 2019 4
Table 3. Proportion of employed people reporting an alcohol or drug testing policy in their workplace, 2019 7
Table 4. Prevalence (%) of alcohol and drug testing by industry of employment, 2019 8
Table 5. Alcohol and drug access to assistance, by industry of employment, 2019 9

List of figures

Figure 1. Proportion reporting the presence of a workplace alcohol policy and prevalence (%) risky alcohol use among employed Australians aged 14+ years by industry of employment, 2019 (NDSHS) 5
Figure 2. Proportion reporting the presence of a workplace drug policy and prevalence (%) illicit drug use among employed Australians aged 14+ years by industry of employment, 2019 (NDSHS) 6

List of supplementary tables

Supplementary Table 1. Summary of studies examining the effectiveness of testing in reducing AOD use, accidents/injuries, and or absenteeism 37
Supplementary Table 2. Quality assessment of studies 43
Supplementary Table 3. Key characteristics of included reviews 49

Supplementary Table 4. Quality assessments of included systematic reviews using AMSTAR 2 55
Supplementary Table 5. Quality assessment of non-systematic reviews using SANRA 56
Supplementary Table 6. Summary of review conclusions and identified evidence gaps 57

List of supplementary figures

Supplementary Figure 1. PRISMA flow diagram for the literature search 36
Supplementary Figure 2. PRISMA flow diagram of the study selection 48

Acknowledgments

The National Centre for Education and Training on Addiction (NCETA) acknowledges the financial support for this publication provided by the Australian Government Department of Health & Aged Care. The authors would also like to thank the following people for their assistance with various aspects of this project:

- Ms Victoria Kostadinov for her invaluable expertise in reviewing, editing and formatting the content.
- Professor Ann Roche and Dr. Donna Hughes-Barton for their contributions to the systematic reviews and related manuscripts developed for submission to peer-reviewed journals.
- The Australian Institute of Health & Welfare (AIHW), the data custodians of the National Drug Strategy Household Survey (NDSHS), for access to the dataset via the Australian Data Archive.

Executive summary

There are high rates of alcohol and other drug (AOD) use among Australian workers, with prevalence of risky drinking and illicit drug use in some industries above the general population (please see Part 1[1] of the Report for further details). Consequently, the workplace presents an ideal setting for effective prevention and intervention for AOD use.

This Report (Part 2) examined:

- The proportion of employed Australians reporting they have an AOD policy in their workplace, and their impact on AOD use across industries
- The efficacy of various intervention models and methodologies on workplace drug testing and other workplace-based AOD interventions
- New and emerging AOD issues impacting the workplace
- The implications and recommendations for the design of interventions.

1 See McEntee, A., Pointer, S., Pincombe, A., Nicholas, R. & Bowden, J. (2022). Alcohol and other drug use: A focus on employed Australians: Part 1: Prevalence and consequences. Adelaide, South Australia: National Centre for Education and Training on Addiction (NCETA), Flinders Health and Medical Research Institute (FHMRI), Flinders University.

Workplace AOD policies

Examination of the National Drug Strategy Household Survey (NDSHS) data for 2019 revealed:

- Around 60% of employed Australians were aware that their workplace had an alcohol and/or drug policy. One in ten people were unaware whether their workplace had an AOD policy in place
- Knowledge of the presence of a workplace alcohol policy was unrelated to risky alcohol use among workers
- Workers in rental, hiring and real estate, and arts and recreation services sectors were less likely to report having a workplace drug policy but had relatively higher prevalence of past year illicit drug use
- One in five workers reported the presence of an AOD testing policy in their workplace. However, safety sensitive industries were more likely to report higher rates of testing (e.g., mining around 80%; electricity, gas, water and waste services around 70%; and transport, postal and warehousing around 55%)
- Only one in six workers reported having access to AOD education/information and one in five reported having access to assistance programs for staff members with AOD problems.

Workplace AOD interventions

Workplace AOD testing

A systematic review was undertaken to explore whether workplace AOD testing 1) deters employee AOD use, 2) reduces occupational accidents/injuries, and 3) reduces AOD-related absenteeism/presenteeism.

Seven studies (six assessed as methodologically weak[2]) met the inclusion criteria. Overall, the latest evidence remains scant and inconclusive to substantiate the effectiveness of drug testing as a health and safety strategy to deter use, reduce injury and absenteeism/presenteeism.

Other workplace interventions

An umbrella systematic review of reviews was undertaken to assess the efficacy and effectiveness of other workplace AOD interventions (besides drug testing)[3].

2 Studies were assessed using the Effective Public Health Practice Project Tool (EPHPP) across eight domains: selection bias, study design, confounders, blinding, data collection methods, withdrawals and dropouts, intervention integrity, and analysis. Further information can be found in Appendix B.

3 The scope of review only covered workplace-based alcohol and/or drug interventions. It did not include any tobacco-related interventions.

Thirteen reviews (five rated as high quality, two as moderate quality, and five as poor quality)[4] met the inclusion criteria. One review could not be assessed for quality. While the review was not able to definitively support the direct association between AOD interventions and behaviour change (due to lack of quality studies), some promising interventions worthy of further examination include:

- **Clear, co-designed and comprehensive AOD policy** that is enforceable throughout the organisation
- **Multicomponent** interventions to address AOD issues (e.g., policy + education, psychosocial programs + brief interventions + access to counselling)
- **Face-to-face** delivery and **regular but shorter sessions** implemented
- Interventions **tailored specifically** to the workplace culture and context
- An **AOD component embedded** within a larger health promotion or psychosocial program on health and wellbeing.

New and emerging AOD issues

Workers' use of new and emerging drugs and evolving patterns of use may impact workers health, safety, and performance. These include:

- electronic cigarettes (e-cigarettes)
- cannabis use for recreational use and medical treatment
- new psychoactive substances (e.g., synthetic cannabinoids, novel benzodiazepines, phenethylamines, synthetic cathinones, dissociative anaesthetics, novel synthetic opioids and gamma hydroxybutyrates)
- over-the counter or prescribed pharmaceuticals
- cognitive enhancing drugs (nootropics: e.g., amphetamines, methylphenidate, modafinil, and atomoxetine)
- performance and image enhancing drugs (PIEDs) (e.g., androgenic-anabolic steroids, growth hormones, anti-oestrogenic agents)
- psychedelics or hallucinogens for treatment of mental health issues.

4 The AMSTAR 2 and SANRA tools were used to assess the quality of the systematic and narrative reviews respectively. Further information can be found in Appendix B.

Recommendations

Findings	Recommendations
AOD policy	
Around **60%** of employed Australians were aware that their workplace had an alcohol and/or drug policy. **One in 10** people were unaware that their workplace had an AOD policy in place. Reviews on AOD **workplace policy** found: ■ it **could deter use** during working hours (for alcohol) ■ it is more effective if it is part of a larger suite of other AOD interventions.	**All workplaces** should have an AOD policy in place. **Workplace AOD policies** should ensure they are: ■ focused on **risks to health and safety** rather than detection of any use ■ **comprehensively developed** in consultation with AOD experts, legal and human resources management experts and employee representatives ■ **clearly communicated** to workers, alongside relevant education and training programs on the safety and health risks of AOD use ■ **enforceable** throughout the organisation ■ **regularly reviewed** in light of the evolving legal changes and medical use for certain drugs.
Education and assistance	
Only **one in six** workers reported having access to AOD education/information and **one in five** reported having access to assistance programs for staff members with AOD problems.	**Greater access** to AOD-related education and assistance for more serious AOD issues is required.
Targeted interventions	
Workers who were more likely to drink at risky levels and consume drugs include: ■ males ■ younger workers ■ those with high/very high levels of psychological distress.	**Targeted interventions** tailored for workers who are at risk are required, in addition to general measures that apply across the workplace. Workplaces also need to **monitor and address mental health issues** amongst workers who are vulnerable to AOD use.
Drug testing	

Evidence quality is poor on the effectiveness of workplace drug testing in:
■ deterring use
■ reducing accidents/injuries.
 	
There was a lack of studies examining the association between drug testing and absenteeism/presenteeism.
 	
Drug testing as a **sole strategy is not sufficient** to address AOD use and harms in the workplace and needs to be supplemented with other strategies.
 	
Disadvantages of testing include: high costs; inability to detect actual impairment or all types of drug use; could lead to punitive/discriminatory consequences; could discourage workers from reporting accidents/injuries; and ethically contentious (e.g., breaches privacy rights).
	Organisations that use workplace drug testing should:
	■ **weigh up the costs, challenges, consequences and technical limitations** of workplace drug testing when considering it as a strategy to deter use and increase safety
	■ include drug testing as **part of a comprehensive suite of strategies** to address risky AOD use amongst workers
	■ **adhere to best-practice guidelines**
	■ ensure it is conducted in nationally accredited laboratories
	■ ensure employees that test positive are:
	  ■ not discriminated against or stigmatised
	  ■ given **access to appropriate support, assessment, counselling and/or treatment.**
	■ consider opting for **general impairment or performance testing** methods which measures actual impairment.

Interventions that work	
Evidence for effectiveness of multi-component interventions in deterring use. Poor evidence on the effectiveness of single-component interventions to reduce AOD use. Mixed evidence on the effectiveness of interventions to reduce accidents/injury rates. Some support for select health promotion and psychosocial programs[5] to reduce alcohol-related absenteeism and improve knowledge and attitudes related to AOD.	Organisations implementing workplace AOD interventions should ensure interventions: ■ are **multicomponent** (e.g., policy + education + screening + brief interventions) ■ **address all spectrums of AOD use and associated risks** ■ considers the **broader fitness for work framework** (1) rather than detection of AOD only ■ are **embedded within a larger health promotion program** ■ **tailored to specific workplace culture and social** context of industry/occupation groups ■ focus on **at-risk workers** ■ are **designed in collaboration** with AOD experts and researchers.

5 Team Resilience was an example of a psychosocial program that embedded AOD use reduction messages within a context of fostering social support, personal confidence, accountability, positive coping skills and stress management.

Optimal features

Certain features of interventions that have shown some benefits (i.e., reduced use/injury rates) include:

- face-to-face delivery
- regular, shorter sessions.

Ensure that interventions:

- utilise **face-to-face** delivery
- are **regularly** conducted
- are **brief.**

Emerging issues

New and emerging issues impacting Australian workplaces include:

- e-cigarettes
- legalisation and decriminalisation of cannabis use
- new psychoactive substances
- misuse/overuse of pharmaceuticals
- cognitive and performance enhancing drugs, and
- the use of psychedelic drugs for treatment of mental health issues.

Effects and harms of these emerging issues in the context of the workplace are largely unknown.

Workplaces should consider:

- **prevalence, drivers of use and effects** within their workplace in relation to their drug policies, prevention and intervention measures.
- **regularly monitor** the evolving landscape of social perceptions and legal frameworks and review their AOD policies and strategies accordingly.

Research is needed to investigate the effects of new and emerging psychoactive substances and how they may impact workplace health and safety.

Future research

Most of the reviews examined studies mainly on workplace alcohol interventions.

Mainly poor-quality primary studies on AOD interventions prevented conclusive synthesis on the types and features of effective interventions.

- There were limited studies that provided evidence for:
- interventions that reduced absenteeism/ presenteeism
- the applicability of interventions across different countries and workplace population groups
- optimal characteristics of an effective intervention that could produce long-term benefits
- improved AOD-related knowledge/attitudes that translated sustainable behavioural change.

More **robust research designs** are required to determine the efficacy and impact of workplace AOD interventions.

The focus should be on:

- **drug-specific** interventions (other than drug testing)
- interventions that **improve performance and productivity**
- the **applicability** of interventions across different cultures and workplace settings
- **longitudinal designs** to measure sustained behaviour change
- **barriers/facilitators** to effective **implementation** of interventions.

Chapter 1

Introduction

A note on terminology

This report uses two acronyms to refer to substance use. AOD refers to the use of alcohol and other drugs, whilst ATOD refers to the use of alcohol, tobacco and other drugs. In both instances other drugs (OD) include those which are illicit to use in Australia such as cocaine, methamphetamine, and the non-medical use of cannabis and pharmaceuticals.

Australia has largely overlooked the potential for the workplace to implement cost effective strategies to prevent and ameliorate risky drinking and drug use among workers. Scope exists to redress this oversight.

Results from Part 1[6] of the Report found high rates of alcohol and other drug (AOD) use among Australian workers compared to the general population. Over one third of employed Australians (38%) consumed alcohol at risky levels, and 19% used an illicit drug in 2019. Meanwhile, daily tobacco use prevalence did not differ from the general population (11% each). Employee's AOD use was found to cost workplaces $3.9 billion due to alcohol-related absenteeism and $2.9 billion due to illicit drug-related absenteeism. Therefore, the workplace is an important setting to address AOD use to improve employees' wellbeing and performance. Employee AOD use is associated with numerous negative consequences for both individuals and organisations (1-4) and workplaces have a duty of care to employees.

There are multiple reasons why the workplace offers potential for effective prevention and intervention for AOD use. The workplace is a setting where individuals with problematic patterns of AOD use can be identified and helped (5, 6). It also offers access to individuals who may not otherwise be exposed to prevention and intervention efforts (6, 7). Moreover, workers' patterns of AOD use are associated with and shaped by workplace culture and policies and vary according to the policy in place (8). Furthermore, among those who use AOD, the majority are employed.

Efficacious workplace interventions would make a substantial contribution to workplace safety, productivity, and the wellbeing of individual workers. In addition, social contagion theory (9) suggests that improvements to an individual worker's risky drinking patterns can positively impact the wider community. The available, albeit limited, evidence indicates that workplace responses are likely to be effective when a comprehensive and integrated approach is adopted that incorporates policy, prevention and treatment (10, 11). However, the ability of workplaces to select, adapt, and implement comprehensive and integrated responses to AOD-related harm in the workplace is limited by the lack of high-quality research.

6 See McEntee, A., Pointer, S., Pincombe, A., Nicholas, R. & Bowden, J. (2022). Alcohol and other drug use: A focus on employed Australians: Part 1: Prevalence and consequences. Adelaide, South Australia: National Centre for Education and Training on Addiction (NCETA), Flinders Health and Medical Research Institute (FHMRI), Flinders University.

Aims

The overall aims of this project were to provide information on the patterns and prevalence of ATOD use among Australian workers, examine the types of responses suitable for different workplaces, and explore the efficacy of these responses.

The first part of the Report (Part 1) provided information on the following aspects of ATOD use within the workplace:

- descriptive patterns of ATOD use (cross sectional and time series where feasible) in Australia overall, employed Australians, and by industry and occupation groups
- profile of use and relationships between ATOD use with key socio-economic factors (e.g., mental health, rurality)
- consequences of patterns of use for workers and organisations in relation to specific harms and impacts.

Part 2 of the Report provides information on the following aspects of AOD use within the workplace:

- the proportion of employed Australians reporting an AOD policy in their workplace, and policy impact on AOD use across industries
- efficacy of various intervention models and methodologies addressed through two systematic reviews: 1) on workplace drug testing and 2) an umbrella review of reviews on other workplace-based AOD interventions
- new and emerging AOD issues impacting the workplace, such as the use of e-cigarettes, synthetic drugs, cognitive and performance enhancing drugs, prescribed medications, cannabis and psychedelic drugs for the treatment of certain health conditions
- implications and recommendations for the design and implementation of evidence-informed interventions.

Chapter 2:

Workplace policies

Many contemporary workplaces have policies on AOD use that aim to reduce the harms associated with employee AOD use and promote a safe and healthy working environment. Workplace AOD policies are likely to be highly heterogenous addressing such issues as prohibiting the use of alcohol or drugs at work; guidelines for the use of alcohol at work functions; providing counselling and assistance; and/or AOD testing (12).

While many workplaces have policies on AOD use, employees' awareness and utilisation of them is largely unknown. In addition, few studies have evaluated workplace policies and their ability to reduce alcohol-related harm (13).

There is some evidence that workplace policy awareness is not only associated with employees' alcohol consumption patterns, but also with help seeking for alcohol-related problems (12). A 2016 study (12) examined the prevalence of AOD policies and their relationship to health behaviours. The majority of employed (aged 14+) participants (75%) reported the presence of at least one AOD-related workplace policy whilst a quarter (25%) indicated their workplace had no AOD policies. The most reported policy type was 'use' (40%) (which includes alcohol or drug use). A small proportion of participants (7%) reported that their workplace had an alcohol and/or drug testing policy in place (12).

Employee substance use was found to be associated with presence of AOD workplace policies. Workplaces which had an AOD policy in place corresponded with significantly lower odds of high-risk drinking (OR 0.61) (12). When types of policies were considered, policies which covered AOD use and provided information, education or assistance, resulted in much lower odds of high-risk alcohol use (OR 0.43) than policies that addressed use only (OR 0.64). Comprehensive policies (addressed use, provided information, education and assistance, and tested for AOD use) corresponded with significantly decreased odds of drug use (OR 0.72) (12).

Alcohol and drug policies

In 2019, the National Drug Strategy Household Survey (NDSHS) participants were asked 'What drug and alcohol policies, if any, does your workplace, school or college have in place?'. For employed people, 59% reported that their workplace had a policy on alcohol use and 58% reported a policy on drug use (Table 1). Among employed people, 11% reported not knowing if their workplace had an alcohol or drug use policy while 5.1% said there was no policy.

Table 1. Proportion of employed people reporting an alcohol or drug use policy in their workplace, 2019

Type of policy	Proportion with a workplace policy
Alcohol use policy	59.3
Drug use policy	57.9

Source: National Drug Strategy Household Survey, 2019.

Industry groups

An alcohol policy and a drug policy were both most commonly reported by workers employed in the mining (alcohol: 81%; drug: 80%), electricity, gas, water and waste services (alcohol: 80%, drug: 81%) and public administration and safety (alcohol: 74%, drug: 73%) industries (Table 2). The industries in which workers were least sure if an AOD policy existed in their workplaces were financial and insurance services (16%), education and training (16%), and the professional, scientific and technical services (16%) industries.

Table 2. Prevalence (%) of workplace alcohol and drug policies by industry of employment, 2019

Industry	Alcohol policy	Drug policy	Unsure if alcohol or drug policy exists
Mining	81.0	80.1	2.2
Electricity, Gas, Water and Waste Services	80.2	81.1	5.6
Public Administration and Safety	73.5	73.0	11.4
Transport, Postal and Warehousing	70.5	70.2	4.0
Manufacturing	66.1	63.6	5.4
Education and Training	62.6	60.3	16.1
Health Care and Social Assistance	62.0	60.9	11.9
Retail Trade	60.9	60.3	14.6
Accommodation and Food Services	56.1	52.7	12.2
Construction	56.0	56.4	5.5
Information Media and Telecommunications	55.9	57.6	13.2
Wholesale Trade	54.2	54.8	10.8
Rental, Hiring and Real Estate Services	53.1	39.9	12.5
Financial and Insurance Services	51.3	50.9	16.4
Agriculture, Forestry and Fishing	48.8	47.9	7.8
Arts and Recreation Services	48.4	46.8	11.3
Administrative and Support Services	48.2	48.2	5.2
Professional, Scientific and Technical Services	44.7	43.1	15.7
Other Services	46.8	47.9	6.6
Employed Total	**59.3**	**57.9**	**10.9**

Source: National Drug Strategy Household Survey, 2019.

Knowledge of the presence of a workplace alcohol policy was unrelated to prevalence of risky alcohol use (Figure 1). The highest prevalence of risky alcohol use was found among electricity, gas, water and waste services industry workers (57%) and construction workers (52%) but relatively fewer construction workers were aware of their workplace alcohol policy (56%) compared with workers in the electricity, gas, water and waste services industry (80%).

Industries least likely to have knowledge of a workplace alcohol policy were professional, scientific and technical services (45%), 'other services' (47%), and administrative and support services (48%) (Figure 1). The prevalence of risky use of alcohol in these industries was mid-range (39%, 41%, and 41% respectively).

The largest differential between knowledge of a workplace alcohol policy and risky drinking levels occurred among healthcare and social assistance industry workers with 62% having knowledge of a workplace alcohol policy with a risky drinking prevalence of 28% (Figure 1).

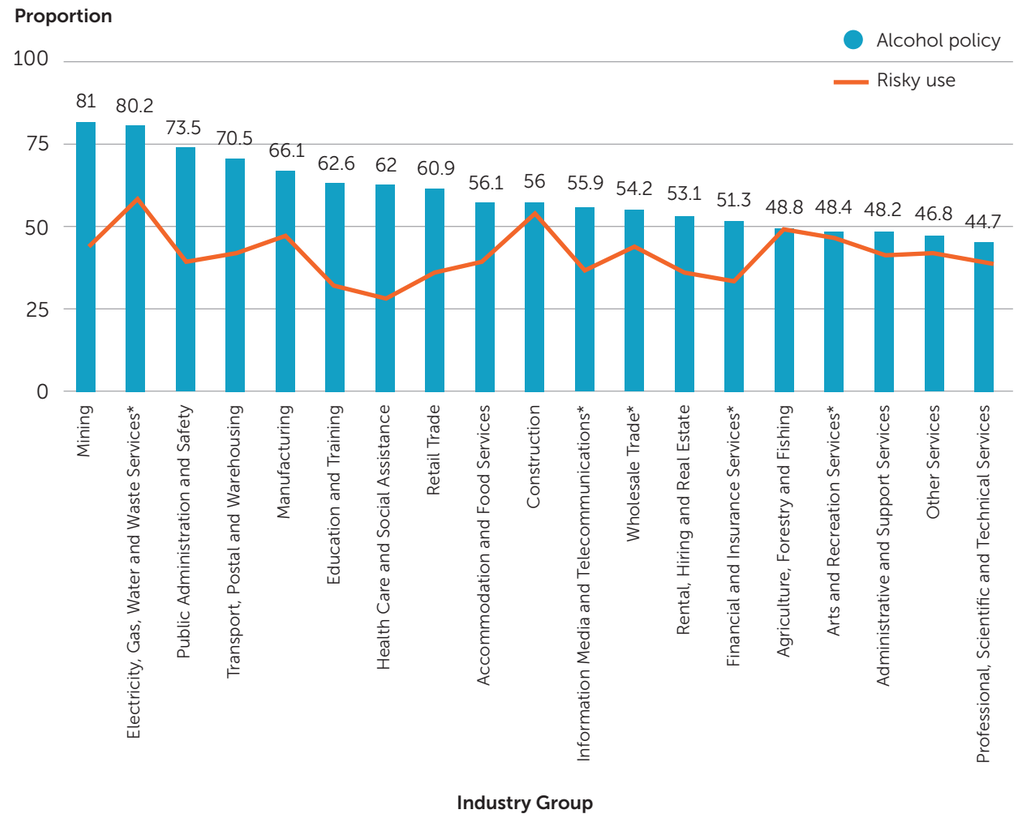


Figure 1. Proportion reporting the presence of a workplace alcohol policy and prevalence (%) risky alcohol use among employed Australians aged 14+ years by industry of employment, 2019 (NDSHS)

Source: National Drug Strategy Household Survey, 2019.

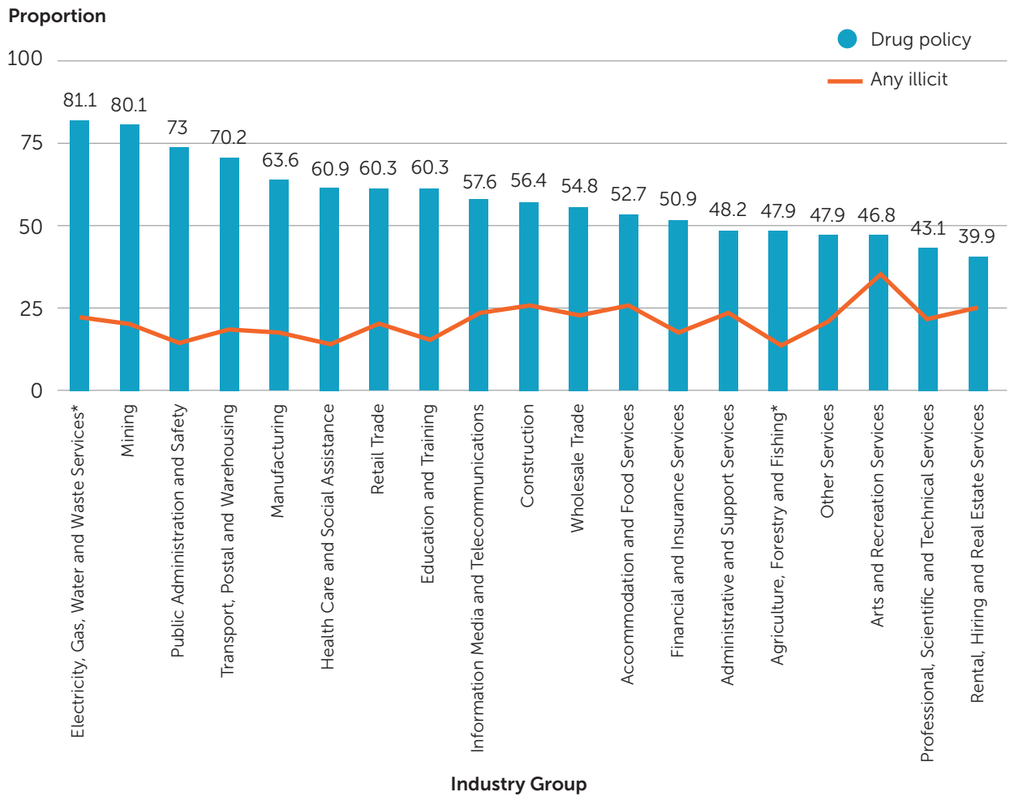
Notes.

1. Analysis only includes those who selected their main employment status as employed (e.g., excludes full-time students who work part time).
2. Australian and New Zealand Standard Industrial Classification (ANZSIC) codes were used for coding responses relating to industry.

Rental, hiring and real estate (40%), professional, scientific and technical services (43%), and arts and recreation services (47%) were the three industries where the fewest workers reported a drug policy in place (Figure 2). Notably, arts and recreation services – which had the third lowest ranking of having a drug policy in place, reported the highest prevalence of past year illicit drug use (35%). Rental, hiring and real estate had the lowest drug policy prevalence and the fourth highest prevalence of illicit drug use (26%).

The construction industry reported the second highest prevalence for illicit drug use (26%). However, only around half of construction workers reported the presence of a drug policy (56%) which was relatively lower compared to other safety sensitive industries such as mining and transportation sectors.

Figure 2. Proportion reporting the presence of a workplace drug policy and prevalence (%) illicit drug use among employed Australians aged 14+ years by industry of employment, 2019 (NDSHS)



Source: National Drug Strategy Household Survey, 2019.

* Estimate has a relative standard error of 25% to 50% and should be used with caution.

Notes.

1. Analysis only includes those who selected their main employment status as employed (e.g., excludes full-time students who work part time).
2. Australian and New Zealand Standard Industrial Classification (ANZSIC) codes were used for coding responses relating to industry.
3. Any illicit drug use refers to use of at least one of the following illicit drugs: cannabis, ecstasy, amphetamines, cocaine, hallucinogens, inhalants, heroin, ketamine, GHB, synthetic cannabinoids, emerging psychedelic substances, painkillers/opioids, tranquilisers/sleeping pills, steroids, methadone/buprenorphine, and any drug which is injected (non-medical use).

Alcohol and drug testing

In 2019, NDSHS participants were asked to indicate whether their workplace had an alcohol or drug testing policy in place. For employed people, 19% reported that their workplace had an alcohol testing policy in place and 20% reported a drug testing policy (Table 3). Workplace drug testing policies are far less common than broader AOD policies.

Table 3. Proportion of employed people reporting an alcohol or drug testing policy in their workplace, 2019

Type of policy	Proportion with a workplace policy
Alcohol testing policy	18.6
Drug testing policy	19.7

Source: National Drug Strategy Household Survey, 2019.

Industry groups

Among the industry groups, mining had the highest prevalence of alcohol (80%) and drug (77%) testing policies, followed by the electricity, gas, water and waste services industry (alcohol testing: 65%; drug testing: 71%) and transport, postal and warehousing (alcohol or drug testing: 56%). Alcohol (2.0%) and drug (2.2%) testing policies was least commonly reported by workers employed in the education and training industry. This may be explained by less need due to their employees' use of risky alcohol (31%) and illicit drugs (15%) being below the employed national averages (38% and 19%, respectively) (Table 4).

Table 4: Prevalence (%) of alcohol and drug testing by industry of employment, 2019

Industry	Alcohol testing	Drug testing
Mining	80.2	77.0
Electricity, Gas, Water and Waste Services	65.1	71.3
Transport, Postal and Warehousing	55.8	56.4
Public Administration and Safety	39.3	42.9
Manufacturing	31.5	34.8
Construction	27.4	28.8
Wholesale Trade	19.8	21.4
Administrative and Support Services	16.1	17.3
Agriculture, Forestry and Fishing	14.8	17.2
Information Media and Telecommunications	11.6*	9.9*
Retail Trade	11.0	12.0
Health Care and Social Assistance	10.3	11.1
Professional, Scientific and Technical Services	9.4	10.7
Accommodation and Food Services	8.2	6.8
Arts and Recreation Services	6.0*	21.1
Financial and Insurance Services	3.2*	4.4*
Rental, Hiring and Real Estate Services	3.2*	3.9*
Education and Training	2.0	2.2
Other Services	10.8	27.2
Employed Total	**18.6**	**19.7**

Source: National Drug Strategy Household Survey, 2019.

* Estimate has a relative standard error of 25% to 50% and should be used with caution.

Education and assistance

Among Australian workers, 16% reported that they had access to AOD education/information and 21% reported having access to assistance programs for staff members with AOD problems.

Industry groups

Among the industry groups, the mining industry had the highest prevalence of AOD education/information (41%) and assistance (57%), followed by public administration and safety (31% and 41%, respectively) (Table 5).

Table 5: Alcohol and drug access to assistance, by industry of employment, 2019

Industry	AOD education / information	Access to any type of assistance with AOD problems
Mining	41.1	57.3
Public Administration and Safety	30.9	41.2
Electricity, Gas, Water and Waste Services	29.0	33.2
Transport, Postal and Warehousing	23.5	27.8
Health Care and Social Assistance	21.3	25.5
Manufacturing	18.8	23.9
Education and Training	18.3	19.2
Construction	15.5	18.8
Accommodation and Food Services	13.8	10.1
Information Media and Telecommunications	13.7	24.0
Agriculture, Forestry and Fishing	13.1*	8.1*
Arts and Recreation Services	11.9*	18.9
Wholesale Trade	10.0	12.6
Retail Trade	9.2	12.7
Professional, Scientific and Technical Services	8.2	14.9
Financial and Insurance Services	6.9*	21.8
Administrative and Support Services	4.3*	10.6
Rental, Hiring and Real Estate Services	1.2**	4.9*
Other Services	7.0	11.2
Employed Total	**16.3**	**20.8**

Source: National Drug Strategy Household Survey, 2019.

* Estimate has a relative standard error of 25% to 50% and should be used with caution.

**Estimate has a relative standard error greater than 50% and is considered too unreliable for general use.

Summary

Based on analysis of the latest cross-sectional national data (2019 NDSHS dataset), around 60% of employed Australians were aware that their workplace had an alcohol or drug policy in place. Approximately 80% of workers in mining and electricity, gas, water and waste services; and three-quarters in public administration and safety reported having a workplace alcohol and/or drug policy. Knowledge of the presence of a workplace alcohol policy was unrelated to risky alcohol use. Workers in rental, hiring and real estate, and arts and recreation service sectors were less likely to report having a workplace drug policy and had relatively higher prevalence rates of past year illicit drug use. Workplace AOD testing policies were less commonly reported among Australian workers. Mining, electricity, gas, water and waste services, and transportation workers were more likely to report AOD testing policies at their workplace. Around one in six workers had access to AOD education/information and one in five workers had access to assistance programs for AOD issues. The industries with higher rates of testing policies appeared to have greater access to education and assistance programs for AOD issues.

Chapter 3:

Workplace interventions

Efficacious workplace AOD interventions have the potential to make a substantial contribution to workplace safety, workplace productivity, and the wellbeing of individual workers. A range of potential interventions have been implemented in workplaces to address AOD issues, however, evidence on their effectiveness as a deterrent to use and/or a safety measure to reduce accidents/injuries remain mixed and inconclusive.

Workplace AOD intervention efficacy was investigated in two separate systematic reviews. The first review examined the latest evidence on the efficacy of workplace drug testing. The second review aimed to collate the evidence relating to workplace-based or employer-led interventions other than AOD testing. These include health promotion education provided to workers or their supervisors, employee assistance programs (EAPs) and counselling, brief interventions, peer-based interventions and written workplace policies.

Workplace AOD testing

A systematic review was undertaken to examine the latest research evidence (since 2013) centred on the effectiveness of workplace drug testing. Specifically, three key research questions were examined:

1. Does workplace drug and alcohol testing deter employee AOD use?
2. Does workplace drug and alcohol testing reduce occupational accident or injury rates?
3. Does workplace drug and alcohol testing reduce AOD-related absenteeism and/or presenteeism?

This work follows on from a previous systematic review undertaken in 2014 (10) which found limited or inconclusive evidence linking testing with reduced use, accidents or injuries, largely due to the use of poorly designed studies. The purpose of the review was to determine whether changes to the legal landscape, societal perspectives and trends and prevalence of AOD consumption around the world since the 2014 review has impacted upon the efficacy and effectiveness of workplace AOD testing.

For additional detail regarding the methodology of the systematic review please refer to Appendix B.

Results

After an extensive search strategy utilising eight electronic databases, seven studies met the studies inclusion criteria (12, 14-19). Six of the seven studies were assessed as methodologically weak using the Effective Public Health Practice Project Tool (EPHPP) (20). One study was assessed to be of moderate quality (15). See Supplementary Table 1 for detailed study characteristics and Supplementary Table 2 for quality information and assessment in Appendix B.

Studies examining workplace AOD testing as a deterrent to AOD use

Four studies examined workplace AOD testing as a deterrence to AOD use (12, 14, 16, 18). Mixed results were found in relation to the impact of testing on AOD use. Two cross-sectional studies (both rated as weak in quality) examined the relationship between self-reported AOD use and the awareness of workplace drug prevention programs and policies, in which a question on testing was included as a component (12, 16). A US study (16) found AOD testing was associated with lower non-medical prescription drug use among workers aged 18-25 years, after controlling for demographics such as age, gender, race, and education. However, this association was not significant after controlling for past-month tobacco smoking and marijuana use. Drug testing was significantly associated with lower rates of marijuana use after controlling for demographics and past-month risky alcohol consumption (16). Pidd et al. (12) found that comprehensive policies that combined drug testing with employee education, written policy, employee assistance programs in Australian workplaces were associated with significantly lower risk odds of illicit drug use. However, no association was found between illicit drug use and workplaces that just had a written policy plus drug testing or drug testing alone. Testing type and frequency were not identified in these surveys (12, 16).

In an Italian study (18), where drug testing was mandated by law and was part of an annual health screening for transportation workers, laboratory tests recorded a decrease in positive results for illicit drug use over four years. The authors suggested the reduction in positive tests may have been due to workers being informed well in advance of the date of testing (18). In a non-randomised, single-arm study undertaken across 12 service centres in Spain, Gómez-Recasens et al. (14) investigated changes in annual proportions of positive drug testing results over three years following a combined intervention of health education, health monitoring and secondary intervention. A significant decline in drug use was found in the second year compared to the first but no other significant changes were observed at any other time. However, any significant decreases in risky alcohol/drug use were not consistently observed across all centres (14) and AOD testing was used as a measure of screening and detection. It is unknown how much of a distinct effect testing had on drug use as it formed part of a combined program. Both studies had weak designs.

Studies examining workplace AOD testing as an accident/injury prevention measure

Three studies examined workplace AOD testing as an accident/injury prevention measure (15, 17, 19). The review found variable results in relation to the effects of drug testing on reducing workplace accidents/injuries, A retrospective cohort study from Portugal (rated moderate for quality), examined the frequency of drug testing and its impact on workplace accidents over a 5.5-year period and compared accident rates of employees of a railway company who were drug tested versus those who were not (15). The study found that employees who were randomly tested were significantly less likely to have accidents compared to untested employees. Specifically, untested employees were 3.7 times more likely to have an accident compared to tested employees. The higher risk rate of accidents for untested workers occurred across all occupational risk groups but was strongest for white-collar untested employees compared to their tested counterparts (7.8 times higher odds of having accidents) (15).

The study also calculated the optimal testing frequency that balanced testing costs and accident reduction for each occupational group. Only a few cases had high testing frequencies and tests were not distinguished between alcohol or alcohol and drugs.

A US study which examined workers' compensation claims from small-sized construction companies over a 6-year period found that a combination of pre-employment plus post-accident testing, or pre-employment, post-accident, random plus reasonable cause testing, tended to yield lower injury rates (although generally non-significant), compared to no testing (17). The results varied by trade, union status and type of testing program. Lastly, a US study (19) reported a significant reduction in the risk of no loss of work (NLW) injuries among companies surveyed for antidrug programs and workplace injuries in 1988/89. The reductions were significant in transportation, communication and utilities organisations. However, there was no significant association found between drug testing policies and injuries that resulted in work loss (19). Both studies were of low quality.

Studies examining the effects of workplace AOD testing in reducing absenteeism/presenteeism

The relationship between absenteeism and workplace AOD testing was examined in one cross-sectional survey (12). The study, which included Australian workers, found no significant association between self-reported drug-related absenteeism and workers who reported that their workplaces had policies for drug testing (12). The review found no studies that examined the effects of workplace AOD testing on presenteeism.

Summary

This systematic review examined the latest evidence on the effectiveness of workplace AOD testing as a health (deter AOD use), safety (reduce accidents/injuries) and performance (reduce absenteeism/presenteeism) strategy.

Overall, six of the seven studies were assessed as methodologically weak (12, 14, 16-19) so findings need to be interpreted with caution. None of the studies were randomised controlled trials, with some studies implementing cross-sectional designs, utilising self-report measures of drug consumption and information on drug testing or workplace policies that involved drug testing. Other studies used aggregate data from retrospective records to examine associations between testing and outcomes. Moreover, the specifics of testing such as frequency and types of testing undertaken were either unknown or not reported for a number of these studies. There was also poor to moderate control for confounders and limited generalisability due to small, unrepresentative sample sizes. Due to the variations in study designs, effect and outcome measures, a meta-analysis could not be conducted.

This systematic review highlights the continual paucity of good quality evidence to indicate workplace AOD testing practices are an effective workplace safety and health strategy. Studies based on retrospective records of testing and self-report surveys are unable to provide definitive results regarding the associations between testing, drug use and accident/injury prevention. Despite the prevalence of workplace AOD testing practices in organisations in Australia and internationally, the number of well-designed research studies on the subject remain scant as previous reviews have similarly indicated (12, 21, 22). More rigorous studies are required to substantiate the prevailing interest, investment and implementation of workplace AOD testing as a measure to address AOD use in the workplace.

Other workplace interventions

An umbrella systematic review of reviews was undertaken to assess and synthesise the cumulative evidence on the effectiveness of different types of workplace AOD interventions (other than workplace drug testing) to identify key knowledge gaps for future research. Specifically, the umbrella review was designed to answer four key questions:

1. Which workplace-based AOD interventions reduce AOD use, and AOD-related occupational accidents, injury rates, absenteeism and presenteeism?
2. Is the workplace AOD intervention evidence base applicable to all workplace population groups and workplaces in different countries?
3. What are the optimal characteristics (type, length, frequency, content) of workplace AOD interventions and do they show long-term beneficial outcomes?
4. Do the interventions influence employee and manager knowledge and attitudes towards AOD?

For additional detail regarding the methodology of the systematic review, please refer to Appendix B.

Results

After an extensive search across eight databases and data screening process, 13 reviews met the inclusion criteria. There were 10 systematic reviews and three narrative/descriptive reviews. One review was unable to be assessed for quality due to lack of information. Four systematic reviews and one narrative review were assessed as high quality, two systematic reviews were of moderate quality and the remaining five reviews were of poor quality. The "A Measurement Tool to Assess Systematic Reviews, version 2" (AMSTAR 2) (23) and Scale for Assessment of Narrative Review Articles (SANRA) (24) tools were used to assess the quality of the systematic and narrative reviews respectively.

Refer to Appendix B for additional information and supplementary tables for information on search results and review characteristics (Supplementary Table 3) and quality assessment (Supplementary Table 4 and Supplementary Table 5).

Review findings

Supplementary Table 6 reports the key findings of the papers against each review question.

Which workplace-based drug and alcohol interventions reduce drug and alcohol use?

All 13 reviews reported results of primary evaluation studies of AOD use. The types of workplace AOD interventions included in these studies were education, EAP, brief intervention, counselling, policy, health promotion, supervisory training, web-based and peer-based interventions. There were mixed results for each type of intervention, with outcomes from some primary studies showing a reduction in AOD use, and others showing no reduction. The only meta-analysis in the included systematic reviews (25) reported poor evidence for workplace interventions (of any type) to reduce alcohol consumption amongst heavy drinkers specifically (i.e., those that consumed 15+ standard drinks per week). This review was of high quality but the authors reported an

inability to tease out those intervention elements likely to have had the most impact in reducing alcohol consumption.

The current umbrella review was also unable to clearly identify the types of workplace interventions that could reduce use because the interventions, industries and worker characteristics varied across all the collated reviews. It is likely that a combination of intervention types may be beneficial.

Six reviews (25-30) reported results indicating some degree of success in reducing AOD use in workplace interventions that combined intervention types. There is emerging evidence that combining drug testing with education and written policy, with or without EAP could help reduce drug use (30), or combining alcohol screening or testing with brief interventions (face-to-face via counsellor or online) may help reduce alcohol use (26, 27). One review (29) also found that integrating alcohol interventions into workplace health promotion programs (involving elements of education, counselling, brief intervention) showed some promise in reducing use in women and reducing intentions (not behaviour) in heavy drinkers. However, the overall quality of the evidence base is weak at present (26, 29, 30) and the authors suggested that further research of intervention combinations to deter or reduce AOD use is needed.

Which workplace-based AOD interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?

Eight of the reviews included outcomes aimed at reducing AOD-related occupational accidents and injuries (26, 28, 30-35) and three of these, investigated absenteeism and presenteeism (33-35). Across the reviews, short and longer-term workplace programs encompassing education (for workers or supervisors), EAP, peer-care or brief interventions showed mixed results for the reduction of accidents or injuries. One study reviewed by Akanbi and colleagues (30) found that combining employee education, EAP and drug testing significantly reduced opioid-related workplace injuries. Workplace team awareness programs (34) and longer-term programs (35) or programs with a psychosocial focus (33) found some association with reduced alcohol-related absenteeism. Only one review (33) examined presenteeism and found that a brief intervention was successful in reducing alcohol-related presenteeism, but not absenteeism.

Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?

Most of the reviews comprised studies in a variety of industry and workplace settings across different countries. The primary studies were commonly based in developed/higher income countries such as USA, Australia, UK, the Nordic countries in Europe, Germany, Switzerland, Belgium, and some countries across Asia (Taiwan, Japan) and the Middle East (Iran). A few of the earlier reviews (29, 32, 36) did not report source countries of their primary studies. Due to significant heterogeneity across the primary studies, the evidence base is unclear at present regarding its application to all workplace groups and different countries.

What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?

Due to the high variation in workplace-intervention type as well as industry and worker characteristics, this review was unable to determine any definitive optimal characteristics of the interventions. However, there are several features of interventions that warrant further investigation and consideration. For example, one review (25) concluded in the meta-analysis that some characteristics that could be more effective were face-to-face interventions completed in the shorter-term (less than six months) and with high frequency (e.g., twice a week).

Authors of six other reviews also attempted to tease out some intervention features that could be optimal when designing interventions. Four of these (28-30, 35) suggested that combining interventions such as education and brief interventions (29, 35) or tackling AOD use with a multilevel approach incorporating, for example, worker education, supervisor training, discussion of policy and peer support (28, 30) could help maximise any beneficial effects of workplace interventions. Other intervention characteristics that could be useful include: embedding an AOD component into a larger, general workplace health promotion program to reduce any stigma associated with solely focusing on AOD (34); tailoring interventions to the specifics of the workplace (33); or targeting supervisors with education. As one review (35) found, alcohol policy uptake may be more effective among workers if they perceive it will be enforced by their supervisors.

The same review also suggested that workplace alcohol policies would be more effective if they are: developed in consultation with employees; target all patterns of alcohol consumption and not just alcohol dependence; form part of a more comprehensive intervention program that features harm reduction education, brief intervention and counselling to promote and improve health; and incorporate monitoring and evaluation processes (35).

Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?

Nine reviews (26, 27, 29, 31-36) examined primary studies that assessed employee/manager knowledge and attitudes towards alcohol/drugs as an outcome. The existence of an alcohol workplace policy had mixed results – one review (35) reported improved attitudes towards alcohol, particularly around corporate events but had limited influence on subcontracting workers' attitudes and behaviours towards alcohol.

Studies on workplace policy mainly focused on the awareness, understanding, and existence of a policy and how that impacted knowledge, attitudes and behaviours concerning alcohol.

Prevention programs that focus on general health promotion (i.e., healthy lifestyle behaviours) or psychosocial programs (such as stress management and resilience-building), have shown significant improvements in the attitudes and perceptions towards AOD-related risks and the desire to reduce consumption in some studies (29, 34, 36). This was the case when AOD prevention was embedded within these programs but is not the main focus or a separate identifiable component (see (36)). Psychosocial interventions have also shown an improvement in knowledge concerning risky alcohol consumption and alcohol-related consequences (33).

In the review by Kolar et al. (33), one study using a brief educational intervention reportedly increased the knowledge of risks associated with alcohol use in the intervention group. However, this knowledge did not translate with a corresponding reduction in reported alcohol use. Alcohol and other drug education/training programs for employees and supervisors led to some improvement in related knowledge and attitudes towards AOD but were inconclusive regarding the extent of long-term impacts (26, 32). In a study reviewed by Schulte and colleagues (27), it was found that face-to-face educational interventions were more effective in increasing knowledge and attitudes towards alcohol consumption, compared to an e-mail intervention. Mailed feedback on drinking patterns showed an increase in levels of perceived risks of alcohol use and consequences in a study reviewed by Webb and colleagues (31).

Evidence quality and gaps

This review found that several types of AOD interventions have been evaluated across varied organisations and industries over the past 25 years. These interventions included education, EAP, brief intervention, counselling, policy, health promotion, psychosocial (e.g., stress reduction), web-based and peer-based interventions. Significant heterogeneity across the studies included in the reviews meant that key characteristics of the different types of AOD interventions that are effective to change behaviour and workplace incidents cannot be conclusively determined at this stage.

Over a third of the included reviews were of high quality and published within the past three years (25, 26, 30, 35, 37). The evidence from these five reviews yields preliminary support for some intervention characteristics that may be effective in reducing AOD use, accidents and injury rates. These characteristics include combining different types of interventions (e.g., AOD policy, education, brief interventions, testing), embedding AOD interventions into more general health promotion interventions, tailoring interventions to the specifics of the organisation and conducting high frequency, short-term, face-to-face interventions. However, the quality of primary studies in these reviews were rated as low quality of evidence, therefore, the findings remain inconclusive and cannot be extrapolated.

There was limited research with mixed findings on interventions to help improve rates of absenteeism and presenteeism related to AOD use. These issues are important to reduce organisational costs associated with AOD-related absenteeism and presenteeism (12, 38-41).

The results highlighted some preliminary evidence that workplace AOD interventions such as education programs and brief interventions can influence workers' knowledge and attitudes towards risky AOD use. However, whether this improvement in knowledge and attitudes translates to sustained behaviour change remains questionable as evaluation of any long-term effects were not conducted or examined. Efforts to inculcate healthy behaviour change should also account for the social and cultural environment within which the behaviour occurs (42, 43). According to social practice theory, behaviours such as AOD use need to be considered within the cultural/social context of groups and organisations because these behaviours can be largely socially motivated (44). Thus, it would be beneficial to incorporate education and training on risks and harms of AOD use as a supplementary component of a broader AOD workplace intervention program that is designed in consideration with the culture and norms of the workplace.

Almost all the reviews included in this umbrella review focused on alcohol-related interventions. Only one systematic review examined interventions related to other drug use (30), specifically opioid and non-prescription medication use. The lack of drug-specific workplace intervention studies may be reflective of workplaces opting for drug-testing, which may still be a more popular option to deter drug use, particularly in safety-sensitive industries such as construction and transportation (22).

Summary

The umbrella systematic review attempted to compile and consolidate current evidence on the efficacy of workplace AOD interventions, other than drug testing, and identify the gaps in the evidence base which can inform future research and organisational endeavours. Due to significant heterogeneity, it was difficult to identify intervention type and components likely to effect sustained positive change in different settings and working populations. Most of the reviews included studies that focused mainly on alcohol-related interventions, and not drugs. Limited evidence suggests that comprehensive, multifaceted interventions may have greater impact. However, more robust research is needed to examine the effectiveness of multi-level interventions.

Chapter 4:

New and emerging AOD issues

Over time, emerging issues and evolving AOD use have occurred in Australian society, including the rise of e-cigarettes, new psychoactive substances and once illicit drugs now being used for the treatment of certain health issues. This Chapter discusses these new and emerging AOD issues that may have an impact on Australian workplaces.

Electronic cigarettes

A key change in nicotine consumption in Australia has been the increase in the use of electronic cigarettes (e-cigarettes). E-cigarettes are a diverse group of battery-powered devices that aerosolise a liquid – often referred to as an 'e-liquid' – for inhalation. Not all e-cigarettes contain nicotine, but evidence reveals that most do, even if claiming not to do so (45, 46). In 2013, 4.5% of Australians aged 14 years and over had ever used an e-cigarette. By 2019, this had grown to 11%. This increase was most pronounced among those aged 18-24 years (9.5% in 2013 and 26% in 2019) (47).

Among non-smokers, there is strong evidence that use of e-cigarettes is harmful to health, with multiple health harms and no discernible health benefits. Given that the use of e-cigarettes is a relatively new phenomenon, the evidence concerning the overall level of associated harm is still emerging. Nicotine e-cigarettes are highly addictive, which underpins increasing and widespread use among children and adolescents in many settings (45, 46). A recent study which involved chemical assessment of 65 Australian e-liquids identified a wide range of potentially harmful chemicals in these liquids, both in their purchased forms and after simulated vaping (48).

The most common pattern of e-cigarette use in many countries, including Australia, is dual tobacco smoking and e-cigarette use (45). Therefore, users are exposed to the combined adverse effects of both substances. The available evidence also suggests that the use of nicotine e-cigarettes increases the risk of a range of adverse health outcomes, including: poisoning; toxicity from inhalation; addiction; trauma and burns; lung injury; and smoking uptake, particularly among youth. The effects of e-cigarettes on a range of other adverse health outcomes are largely unknown. This includes those related to cardiovascular disease, cancer, respiratory conditions (other than lung injury), mental health, child and adolescent development, reproduction, sleep, wound healing, neurological conditions other than seizures, and endocrine, olfactory, optical, allergic and haematological conditions (45).

In addition, the evidence on the efficacy of using e-cigarettes for smoking cessation is limited. On the contrary, there is evidence that e-cigarettes may generate new tobacco smokers. For example, there is strong evidence that never smoked who use e-cigarettes are approximately three times as likely as those who do not use e-cigarettes to initiate cigarette smoking. In this context, high and increasing use of e-cigarettes among young Australians, is concerning (45).

Smoking is already associated with substantial human and productivity burdens in Australia. Owen and colleagues (49) estimated that, at current levels of smoking in Australia, more than three million years of life will be lost to smoking, as well as six million quality-adjusted life years (QALYs)[7]. Owen et al., (2019) also used a novel measure of productivity loss, namely productivity adjusted life years (PALYs)[8]. The authors estimated that smoking in Australia reduced PALYs by 2,475,144 representing a cost of $388 billion over the working life of the current Australian population. Since most Australian smokers are also employed, the increase in e-cigarette use in Australia is an issue that warrants close monitoring by workplaces. Not only is e-smoking harmful to health of itself, but as is often the case, likely to be more harmful when combined with cigarette smoking. There is potential that the use of e-cigarettes may also lead to an increase in the prevalence of cigarette smoking. For all these reasons, cigarette smoking and more specifically, e-cigarette smoking should remain a key focus of workplace preventive efforts.

Changes in cannabis use

Cannabis is the most commonly used illicit drug in Australia with 12% of Australians reporting cannabis consumption in 2019 (50). Around 14% of employed Australians reported using cannabis, a trend which is increasing. Based on secondary analyses of NDSHS data by Roche et al. (51), workers' cannabis consumption increased by 17.4% between 2010 and 2019. According to the findings, workers who are more likely to use cannabis are younger males (14-24 years), tobacco smokers and those with very high levels of psychological distress. Those employed in arts and recreation services sector and trade workers had the highest prevalence of cannabis use. However, the increased prevalence occurred across different workforce populations, with industries where prevalence rates were traditionally lower showing the largest relative increases (51).

These findings may be reflective of the emerging changes in the legal landscape and social perceptions of cannabis use, which have important implications for workplaces. While cannabis is largely illegal in Australia, the ACT was the first state to decriminalise cannabis for personal recreational use in 2020. Medicinal cannabis can also be legally prescribed in Australia since 2016, with the number of medicinal cannabis prescriptions increasing each year (52). Concomitantly, community acceptance and support for cannabis use has been growing. Roche et al. (51) found that in the last decade, approval of use increased from 8% to 20%, and support for cannabis legalisation increased from a quarter to 41%.

These evolving patterns of use highlight the need to have a more nuanced approach to addressing cannabis use within the workplace. On the one hand, cannabis use has been associated with cognitive and physical impairment (e.g., slower reaction times and poor coordination), which can increase health and safety risks in the workplace (53, 54). It has also been estimated to cost Australian workplaces around $560m a year in cannabis-related absenteeism (41). On the other hand, research has indicated that medical cannabis use may be beneficial in the treatment of chronic pain, anxiety and insomnia (55, 56). The COVID-19 pandemic has seen an increase in mental health burden (57) which has also been reflected in an increase in medicinal cannabis prescriptions for mental health and behavioural issues (52).

7 The quality-adjusted life year (QALY) is generic measure of the burden of disease. It includes both the quality and the quantity of life lived.

8 The productivity-adjusted life year (PALY) is a similar construct to the QALY, but with a measurement of reduced work productivity as a result of ill health.

Thus, there is a need for Australian workplaces to review their current drug policies and interventions to cater for these emerging and conflicting issues concerning cannabis use. Currently, workplace drug policies are based on detection of any use of a drug, regardless of quantity or frequency. Further, associated drug tests cannot identify actual impairment effects from a drug; they can only detect if the substance has been consumed at some point prior. It would be more practical to view AOD use through a macro lens of fitness for work, rather than purely on the detection of drug use. In addition, policy and intervention responses should also be designed to address associated mental health issues that appear to be influencing prevalence of cannabis use.

New psychoactive substances

Over the past decade, a range of new psychoactive substances have arrived on the Australian market. These are often marketed using names such as: legal highs (despite not necessarily being legal); synthetic drugs; herbal ecstasy; NBOMes; bath salts; plant food; herbal incense; room deodorisers; aphrodisiac tea; or research chemicals. They are sold in stores or online and marketed as legal and safe and are often developed to replace or mimic drugs that are illegal. This can involve relatively minor changes to chemical structures so that the manufacturers can try and outpace relevant legislation.

There are several different types of these substances, including:

- *Synthetic cannabinoids,* known as K2, herbal smoking blends, kronik, spice, northern lights, natural high. These substances are intended to mimic (or are promoted as mimicking) the effects of THC, the active ingredient in cannabis
- *Novel benzodiazepines,* belong to the same chemical family of drugs as sedative hypnotic medicines such as diazepam (Valium®), alprazolam (Xanax®) and nitrazepam (Mogadon®). The novel benzodiazepine group includes etizolam, bromazolam, clonazolam, flualprazolam and flubromazepam. These drugs may be sold in a form that mimics the appearance of legitimate benzodiazepines, particularly (Xanax®)
- *Phenethylamines* are a class of drugs with stimulant effects. This includes 2C, 2C-B, NBOMe, PMMA and benzodifurans
- *Synthetic cathinones* are closely related to phenethylamines and include: M1, Mephedrone (4-MMC; Meow Meow; M-CAT); Methylone (bk-MDMA); MDPV (Ivory wave); alpha-PVP ('flakka'), bath salts
- *Dissociative anaesthetics* are intended to mimic the effects of ketamine and include methoxetamine (MXE)
- *Novel synthetic opioids* can be categorised into two groups, fentanyl analogues (e.g., carfentanil, furanylfentanyl) and other novel synthetic opioids. These drugs produce a range of effects including sedation, short-term pain relief and depression of respiration
- *Gamma hydroxybutyrate (GHB)* is a depressant drug that has a sedative-hypnotic effect that is commonly used within the dance party scene or nightlife settings.

The use of these substances remains relatively uncommon in the Australian community (and therefore presumably among working Australians). In 2019, 0.2% of Australians aged 18 years and over reported using synthetic cannabis in the past year and 0.1% reported using other emerging psychoactive substances. One percent of Australians reported last year use of ketamine (58). Nevertheless, there may be subgroups of the population which have higher levels of use and the influence of the use of these substances on workplaces warrants ongoing monitoring. It is also noteworthy that current workplace drug testing methods may not detect the presence of some of these drugs which could cause impairment (59).

Pharmaceutical drug use and misuse

Like alcohol and illicit drugs, over-the-counter or prescribed pharmaceutical drugs can:

- reduce worker productivity
- impair workers' physical and mental performance and wellbeing
- increase workplace health and safety risks.

The impacts of pharmaceutical drug use are not limited to primarily psychoactive medicines. Medicines that treat blood pressure, nausea, allergies, inflammation and fungal infections, some diet pills and some cold and flu medicines can also impact work safety and performance.

The misuse of these substances to experience their psychoactive effects can lead to increased risks of workplace accidents or other harms. However, these adverse impacts on workplaces can occur even if the medicines are taken as directed. In addition, workers may inadvertently misuse pharmaceuticals, for example by doubling up on prescribed dosages. These risks can increase if workers:

- are in safety sensitive situations (e.g., operate machinery, drive)
- have not used these drugs before
- are taking more than one type of medication
- do not follow directions for use
- drink alcohol with their medication.

The extent to which the use of prescribed medicines impacts on workplace accidents is unclear, but there has been some evidence that the use of certain medicines increases the risk of other accidents. For example, use of prescription opioids by drivers is associated with significantly increased risks of vehicle crash involvement and crash culpability (60). Prescription opioid use is also associated with a significantly increased risk of fatal crash involvement independently of alcohol use. Concurrent use of prescription opioids and alcohol is associated with a 21-fold increased risk of fatal crash involvement (61).

Cognitive enhancing drugs (nootropics)

Cognitive-enhancing drugs, or nootropics, are pharmaceutical drugs claimed to improve mental performance, particularly executive functions such as focus, concentration, memory or motivation. Some nootropics are also associated with claims to improve the acquisition of motor skill, or affective skills.

There is a range of drugs that can be used as nootropics. These include:

- *Amphetamines* which are stimulants used to treat attention deficit hyperactivity disorder and narcolepsy

- *Methylphenidate* which is a central nervous system stimulant used for treating ADHD and narcolepsy
- *Modafinil/Armodafinil* are central nervous system stimulants which promote wakefulness
- *Atomoxetine* which is also used for attention deficit hyperactivity disorder when other drugs are unsuitable (62).

The extent of use of these drugs in Australian workplaces is largely unknown, although among a sample of more than 2,000 Western Australian tertiary students, 7.9% reported use of a prescription drug for cognitive enhancement purposes in the preceding 12 months (63). The use of these substances may be perceived by workers as a way to cope with monotony or to keep up with the demands of machine and electronically paced work. Other factors which may promote the use of nootropics include:

- the precarious nature of the 'gig economy'[9]
- a lack of social and individual control over work conditions
- a growing degree of fragmentation of working times and spaces
- the difficulty in striking a balance between gainful employment and roles outside of work (64).

There are some occupational categories that are more liable to use or misuse nootropics while working. These include:

- military personnel
- transportation workers
- emergency services and health care workers
- workers in high-pressure, competitive environments, such as financial traders and lawyers
- frequent international travellers (to assist with jetlag).

The long-term consequences arising from the use of these substances in the workplace context are still unknown (64). For that reason, their use and impact on Australian workplaces should be monitored.

Performance/image enhancing drugs (PIEDs)

Performance and image enhancing drugs (PIEDs) refer to a group of substances that are mainly used to build muscle and/or decrease body fat. Types of PIEDs include:

- human and veterinary anabolic-androgenic steroids (AAS) (e.g., synthetic derivates of testosterone)
- growth hormone and other reproductive hormones
- dieuretics and stimulants
- anti-oestrogenic agents
- beta-2 agonists (e.g., clenbuterol)
- creatine monohydrate
- insulin and thyroxine (65).

9 The "gig economy" comprises temporary, flexible, casual or freelance jobs that allow organisations to hire independent contractors for short-term work instead of having workers on permanent contracts. Examples of services in a gig economy include ride-sharing or delivery services.

AAS are the most commonly used PIEDs. People who use AAS such as testosterone typically consume higher doses that exceed natural levels in the body and without medical guidance (66). AAS use can cause a range of negative physical and psychological side effects such as high blood pressure, stunted growth, hair loss, mood swings, aggression and dependence (67). AAS can also cause irreversible heart muscle damage when used in high doses for prolonged periods (67). Those who inject PIEDs also have higher risks of contracting blood-borne viruses (BBV), particularly hepatitis-C (68). Adverse health consequences can also arise when using AAS in combination with alcohol or other drugs (69).

Reliable data on prevalence of PIEDs in Australia is scarce but there has been a reported increase of PIED users accessing needle and syringe programs and services (70). People who are more likely to use PIEDs are younger and older males, amateur athletes, recreational bodybuilders and those with certain fitness or endurance focused occupations such as personal trainers, security guards, soldiers, and construction workers (71).

As with the use of nootropics, the effects and impacts of PIED use in the workplace are unknown and should be investigated particularly amongst at-risk population groups.

Psychedelics or hallucinogens

Psychedelics or hallucinogens, which are a class of psychoactive drugs, can result in changes in perception, mood and cognitive processes. Types of hallucinogens that may affect workplace performance include:

- lysergic acid diethylamide (LSD)
- psilocybin ("magic mushrooms")
- mescaline/peyote
- diemethyltryptamine (DMT) (72).

According to the 2019 NDSHS, 1.6% of Australians reported using hallucinogens in the past year, with younger people in their 20s more likely to use (5%) (50). Frequency of hallucinogen consumption on a monthly basis had also increased from 3.0% in 2016 to 10.3% in 2019 (50). There has also been an increase interest in using psychedelics for the treatment of certain mental health conditions. For example, successful clinical trials have been conducted in the treatment of depression using psilocybin (73). As more clinical trials are conducted, it is predicted that the medicinal use of psychedelics could follow a similar trajectory as medical cannabis use, which would carry comparable implications for workplaces in relation to their policies and programs concerning health and safety.

In addition to medicinal psychedelic use, there is also the increasing acceptance of "microdosing" psychedelics to improve creativity, productivity and general wellbeing (74). Microdosing refers to the self-administration of small amounts of a psychoactive substance. Psychedelic drugs remain illicit but microdosing of LSD and psilocybin appear to be culturally and socially acceptable particularly for certain occupational groups such as workers in arts and recreation, business and IT professionals (75). Currently, there is a paucity of research that has examined the effects and impacts of using psychedelics within the workplace. As such, like the consumption of nootropics, psychedelic use needs further examination and monitoring.

Summary

The precise nature of psychoactive substances impacting on workplaces will continue to evolve over time and will require further investigation. Consequently, the fundamental approaches to minimising the harms associated with these substances should be sufficiently flexible to cater for these changes. These approaches should focus on the actual and potential levels of harm associated with these substances; and utilise evidence-based approaches to minimise them. Organisations should also examine legal, cultural, social and other influencing drivers of drug use, with particular attention directed to vulnerable or at-risk groups within the workplace.

Chapter 5:

Implications and recommendations

The findings of this Report have reiterated the importance of addressing AOD-related use and harms in the workplace. Most Australians who consume alcohol or illicit drugs are employed. Thus, the workplace is an opportune setting to promote prevention and implement intervention strategies to reduce AOD-related health and safety risks and impacts.

This Chapter provides an overview of the relevant findings from this Report and discusses the implications for the design and implementation of evidence-based interventions in the workplace. Recommendations are provided on how best to address AOD issues and harms in the workplace.

Policies, testing, education and assistance

Workplace AOD policies generally address issues such as prohibiting AOD consumption at work; guidelines for the use of alcohol at work functions; providing counselling and assistance; and/or AOD testing. In 2019, almost 60% of employed Australians reported having a policy on alcohol use or drug use at their workplace. Approximately 80% of workers in mining and electricity, gas, water and waste services; and three-quarters in public administration and safety, reported having a workplace alcohol and/or drug policy. Knowledge of the presence of a workplace alcohol policy was unrelated to risky alcohol use. Workers in rental, hiring and real estate, and arts and recreation service sectors were less likely to report having a workplace drug policy and had relatively higher prevalence rates of past year illicit drug use.

Workplace AOD testing policies were less commonly reported among Australian workers. Around one in five workers reported having an alcohol or drug testing policy in their workplace. Mining, electricity, gas, water and waste services, and transportation workers were more likely to report AOD testing policies at their workplace. Only one in six workers had access to AOD education/information and one in five workers had access to assistance programs for AOD issues, which was a concerning finding given the high rates of worker AOD use. The industries with higher rates of testing policies appeared to have greater access to education and assistance programs for AOD issues.

Given the high prevalence rates of AOD use among Australian workers, all workplaces should consider having a co-developed, well-communicated and enforceable AOD policy in place in addition to effective prevention and intervention programs to protect and promote worker health and safety. In addition, improvements can be made to increase access to education and information programs; including assistance and support for workers experiencing AOD-related issues.

Intervention efficacy

Workplace AOD testing

In relation to the effectiveness of drug testing as a deterrent to workplace drug use and an accident/injury prevention measure, mixed results were found with some studies reporting significant reductions in drug use or injuries in some work settings, but most of the studies lacked methodological rigour (six of the seven studies were assessed as methodologically weak). One study was identified that examined the association between workplace drug testing and absenteeism but the study only measured awareness of a testing policy. As a result of substantial poor-quality research, the findings of these studies were thus inconclusive and need to be interpreted with caution.

The evidence available to-date remains insufficient to make definitive conclusions that workplace drug testing is an effective strategy to deter drug use and minimise or prevent accidents, injuries or other adverse outcomes such as increased absenteeism or presenteeism. Until further research with rigorous study designs using objective, reliable measures are conducted, the utility and effectiveness of drug testing remain questionable. In addition, there are substantial technical, ethical and legal challenges to workplace drug testing programs, which will remain prominent in light of increasing misuse of prescribed medications, performance enhancing drugs, and legalisation and decriminalisation of cannabis use around the world. It would be more feasible, fair and progressive to consider other workplace AOD prevention and intervention strategies to promote workplace safety, productivity and health.

Other workplace interventions

Significant heterogeneity across the studies included in the reviews meant that key characteristics of the different types of AOD interventions that are effective to reduce AOD use and minimise AOD-related workplace impacts cannot be conclusively determined. The examination of evidence from five high quality reviews yields preliminary support for some intervention characteristics that may be effective in reducing AOD use, accidents and injury rates. These characteristics include combining different types of interventions (e.g., policy, education, brief interventions, testing), embedding AOD interventions into more general health promotion interventions, tailoring interventions to the specifics of the organisation and conducting high frequency, short-term, face-to-face interventions. However, the quality of primary studies reviewed were generally rated as low, therefore, the findings remain inconclusive and cannot be extrapolated.

There was also limited research that examined interventions likely to help improve rates of absenteeism and presenteeism related to AOD use. In addition, the results highlighted some preliminary evidence that workplace AOD interventions such as education programs and brief interventions can influence workers' knowledge and attitudes towards risky AOD use. However, whether this improvement of knowledge and attitudes translates to sustained behaviour change remains questionable as evaluation of any long-term effects were not conducted or examined.

Most of the reviews identified studies primarily addressing alcohol-focused interventions. The lack of drug-specific workplace intervention studies may be reflective of workplaces opting for drug-testing as an intervention, particularly in safety-sensitive industries such as mining and transportation as indicated in the 2019 NDSHS data (see Chapter 2). Furthermore, changing social perceptions of drug use, the growing decriminalisation and legalisation of cannabis use, and the emergence of new psychoactive substances (see Chapter 4) that can evade current drug testing techniques warrant better alternatives to current drug testing regimes (51).

Emerging issues

There has been an increase in the rates of electronic cigarettes (e-cigarettes) and cannabis use more recently which may increase the risk of a range of adverse health outcomes that could impact workers. The increasing legalisation and social acceptance of cannabis use as well as increasing medical cannabis use need to be taken into consideration when designing interventions to address AOD use in the workplace. In addition to this, new psychoactive substances such as synthetic cannabinoids, novel benzodiazepines, phenethylamines, and gamma hydroxybutyrates have emerged which may not be detected by current drug testing methods but could cause impairment among workers who use them. Over-the-counter and prescribed pharmaceutical drugs used by workers can also impair performance and increase workplace safety risks.

Cognitive enhancing drugs (nootropics) such as amphetamines, methylphenidate, modafinil and atomoxetine are being taken to improve mental performance or affective skills. Certain occupations may be more liable to use or misuse nootropics such as workers in the military, transportation, emergency services and healthcare, and those in high-pressure, competitive environments. Similarly, the use of performance and image enhancing drugs (PIEDs) such as anabolic-androgenic steroids (AAS), which are taken to increase muscle mass and endurance, are more likely to be used by males in fitness-dependent professions such as personal trainers, soldiers and security guards. The physical and psychological effects of taking these drugs for prolonged periods can be serious. The long-term impacts within the context of the workplace remain unknown and need to be closely monitored.

The use of psychedelics or hallucinogens as an increasingly acceptable form of treatment for certain mental health conditions will also have implications on workplace AOD policies and regulations. Similar to the increasing use of medicinal cannabis, workplaces may need to revise their policies and mitigation strategies to accommodate these emerging legal and social changes concerning the use of these specific drugs.

There are different drivers at play that influence AOD use such as the changing legal and social context of drug use, as well as availability and affordability (76). It is crucial that workplaces consider these influences when developing interventions and prevention strategies to address these evolving patterns of AOD use amongst workers.

Recommendations

The following recommendations are suggested to improve responses to AOD use and related impacts in the workplace.

AOD policy

All workplaces should have an AOD policy in place. Workplace AOD policies should ensure they are:

- focused on risks to health and safety rather than only detection of any use
- comprehensively developed in consultation with AOD experts, legal and human resources management experts and employee representatives
- clearly communicated to workers, alongside relevant education and training programs on the safety and health risks of AOD use
- enforceable throughout the organisation
- regularly reviewed in light of the evolving legal changes and medical use for certain drugs.

Education and assistance

Organisations should provide greater access to AOD-related education and information and assistance programs for employees seeking help and support for AOD-related issues.

Targeted interventions

Targeted interventions tailored for workers who are at risk are required, in addition to general measures that apply across the workplace. Workplaces could tailor prevention and mitigation strategies specifically directed at vulnerable and at-risk populations who are more susceptible to use and effects of these drugs (51). Policy responses should also address mental health issues, given the concomitant increases in drug use associated with increases in anxiety, depression and psychological distress.

Drug testing

Organisations should weigh up the costs, challenges, consequences and technical limitations of workplace drug testing when considering it as a strategy to deter use and increase safety, and if the decision is to implement AOD testing, then it should be done as part of a comprehensive suite of other strategies to address AOD use amongst workers. Furthermore, testing practices should adhere to best-practice guidelines and conducted in nationally accredited laboratories.

Organisations should ensure that employees that test positive or non-negative are not discriminated against or stigmatised. Rather, if they are experiencing problematic AOD issues, then they should be directed to appropriate support, assessment counselling and/or treatment. If drug testing is not feasible or practical, organisations can consider opting for general impairment or performance testing methods which measure current impairment.

Interventions that work

Organisations implementing workplace AOD interventions could ensure enhanced effectiveness if interventions:

- are multicomponent (e.g., policy + education + screening + brief interventions)
- address all spectrums of AOD use and associated risks
- considers the broader fitness for work framework (1) rather than detection of AOD only
- are embedded within a larger health promotion program
- tailored to specific workplace culture and social context of industry/occupation groups
- focus on at-risk workers (examining their risk factors and drivers of use)
- are designed in collaboration with AOD experts and researchers
- have optimal features such as face-to-face delivery, in frequent and brief sessions.

The success of an intervention also depends on how well it is implemented. Further research is required to identify effective implementation strategies that can overcome barriers to implementing an evidence-based intervention to achieve maximum impact on health outcomes and behaviour change.

Emerging issues

The long-term effects of new and emerging psychoactive substances are largely unknown and need to be investigated as consumption of these drugs could compromise workplace health and safety. Organisations should also take into account of the changing landscape of social perceptions and legal frameworks in relation to AOD use when designing and implementing AOD interventions.

Future research

At present there is a lack of good quality studies on workplace AOD interventions. More robust research designs are required to determine the efficacy and impact of workplace AOD interventions. The focus should be on:

- drug-specific interventions (other than drug testing)
- interventions that improve performance and productivity
- the applicability of interventions across different cultures and workplace settings
- longitudinal designs to measure sustained behaviour change.

Appendix A: Data sources and notes

National Drug Strategy Household Survey (NDSHS)

The NDSHS is a triennial cross-sectional nationally representative survey of the general Australian population's attitudes, opinions and behaviour regarding tobacco, alcohol and illicit drug use. The NDSHS uses multi-stage stratified sampling techniques, and is weighted within geographic strata by household size, age, and sex to be representative of the total Australian population. Data from four waves (2010, 2013, 2016 and 2019) of the NDSHS were used.

Sample size

The following national and employed sample sizes were used per NDSHS dataset for Australians aged 14+ years:

- 2019: N=22,015, n=11,645 employed
- 2016: N=22,521, n=11,795 employed
- 2013: N=22,360, n=12,221 employed
- 2010: N=25,057, n=13,590 employed.

Response rates ranged from 49% to 51% across the four surveys.

Weighting

Full sampling and weighting procedure details are available elsewhere (AIHW 2017) See Technical information https://www.aihw.gov.au/getmedia/559a7cd3-4c73-4f7d-98d6-d155554c7b03/aihw-phe-270-Technical_information.pdf.aspx for more information on the sample, the methodology, response rate and limitations of the survey results.

Report notes

There are a number of notes to consider when reading and interpreting findings from this report:

1. Data reported here may differ to that reported elsewhere (e.g. journal publications) due to:
    a. Different statistical program used to generate the data (STATA for papers, SPSS for the Reports).
    b. Different age ranges used.
2. Pharmaceutical drugs captured by the NDSHS include: pain killers/opiates, tranquilisers/sleeping pills, methadone unless specified elsewhere.
3. The 2019 NDSHS collected data from 14+ year olds whilst previous version also included 12 and 13 year olds. Where 2010-2016 data is reported, data was limited to 14+ years.
4. Polydrug use captured by the NDSHS did not include injecting as respondent may only use one drug (e.g., heroin) but would be counted as a poly drug user if their method of use was injecting. However, by excluding them, it misses those who may inject a drug not previously captured elsewhere. For this reason, the sum of the polydrug use categories may be lower than the any illicit drug use estimate.

Appendix B: Supplementary information

Workplace AOD testing

Method

The 27-item Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (77) was used to guide reporting. The protocol was registered with PROSPERO, the international prospective register of systematic reviews (Registration number: CRD42020202329).

Search strategy

Eight databases were searched: Medline (Ovid), PsychINFO (Ovid), Emcare (Ovid), CINAHL (Ebsco), Scopus (Elsevier), Cochrane (Wiley), ProQuest and Web of Science (Clarivate Analytics). The search was limited to articles or literature reviews published between 1 January 2013 and 19 August 2020). Development of the search strategy was guided by a specialist academic librarian and included search terms used in a previous review (10).

Inclusion criteria

The PICO (Population, Intervention, Comparison, Outcome) approach was used to establish the eligibility criteria. Population inclusion criteria were occupational settings that employed adult workers aged 18 years or over. Study designs included peer-reviewed published systematic reviews, randomised and quasi-randomised controlled trials, controlled before-and-after trials, case time series, n=1 studies, cross-sectional studies, surveys, and secondary data analyses. Papers reporting outcomes of studies, or systematic reviews of studies, were included if they involved a point of comparison relating to workplace AOD testing implementation. Primary or secondary outcomes were employee AOD use, occupational accidents or injuries related to AOD use, absenteeism or presenteeism related to AOD use.

Data screening and extraction

Search results were imported into Covidence online data management software (Veritas Health Innovation) for screening and extraction. Two reviewers independently screened each title and abstract to remove duplicates, papers published before 2013 or not in English, and papers that did not meet the inclusion criteria. Discrepancies were resolved through consensus. Subsequently, full-text screening of papers that were potentially relevant were assessed against the eligibility criteria. Included papers were coded using a standardised form.

Quality assessment

Papers reporting on trials were assessed using the Effective Public Health Practice Project (EPHPP) tool (20) which contains eight domains: selection bias, study design, confounders, blinding, data collection methods, withdrawals and dropouts, intervention integrity, and analysis. As per EPHPP tool instructions, each domain was assigned a rating of strong, moderate or weak plus an overall methodological adequacy rating for each paper (20).

Findings

Search results

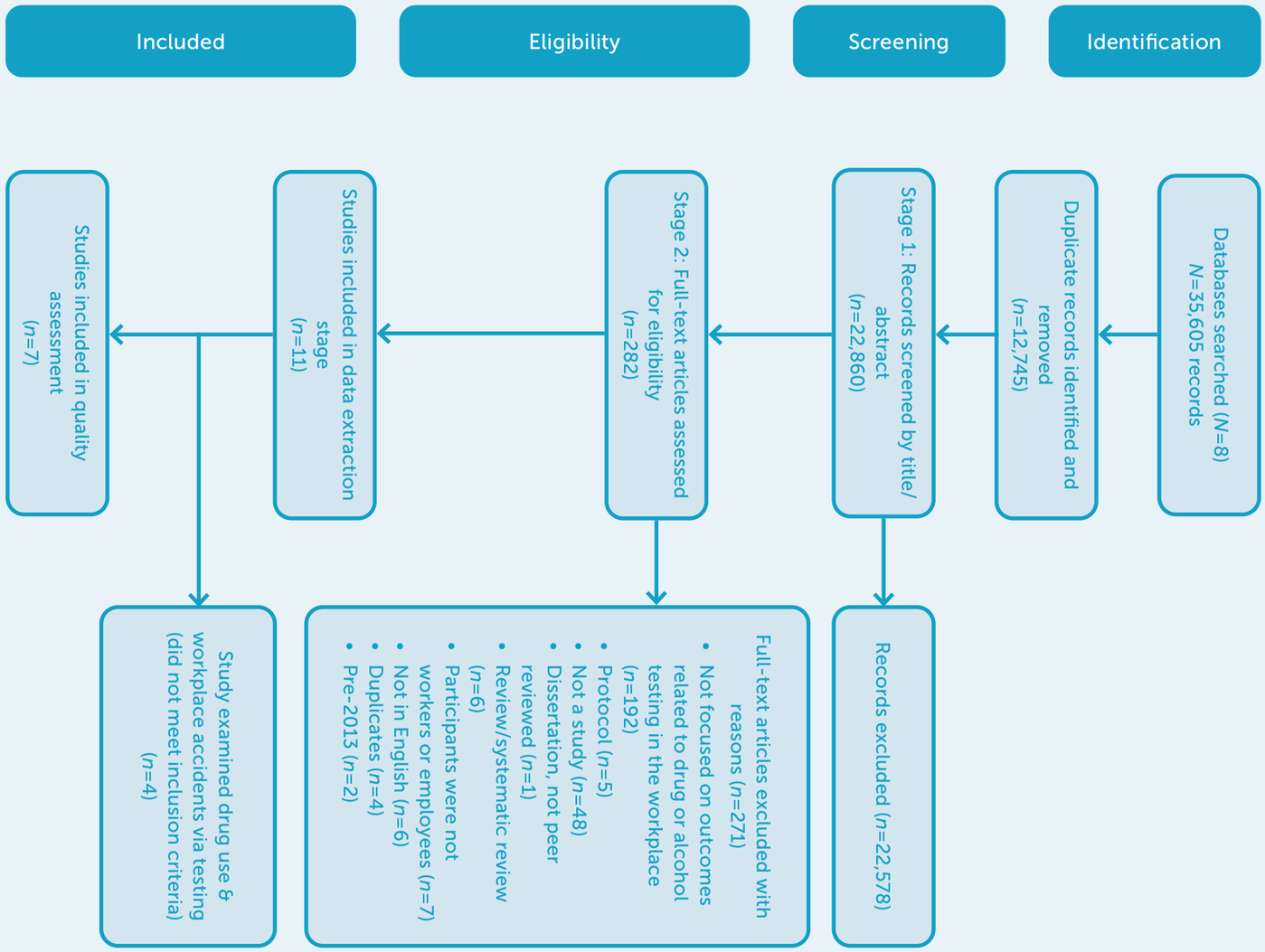
The database searches yielded a total of 35,605 articles. Of these, 12,745 duplicates and 22,578 irrelevant articles were removed based on title and abstract screening, with 98% agreement on independent ratings. Full-text screening of the remaining 282 articles excluded a further 275. A final sample of seven studies was included for the review. Supplementary Figure 1 depicts the PRISMA flow diagram of the search strategy.

Study characteristics

Seven papers met the inclusion criteria, all of which were quasi-experimental studies (12, 14-19). None of the studies employed randomised controlled trials (RCTs). Key information regarding the studies is set out in Supplementary Table 1. Three studies were conducted in the US (16, 17, 19), three in Europe (Spain: (14),Portugal: (15), Italy:(18); and one in Australia (12). Four studies were cross-sectional in design (12, 16, 18, 19). The other three studies comprised a non-randomised single case study (14), retrospective cohort study (17) and a retrospective case-control study (15). Three studies provided information on their funding sources, with two reporting that their studies were funded (16, 17), and one study reported that their study was not funded (14).

The studies' research aims were to either, examine the association between drug testing and drug use (12, 16, 18), or investigate drug testing and its impact on workplace accidents/injuries (15, 17, 19). One study utilised testing as a detection or monitoring tool before/during the implementation of education and secondary prevention training (14). Only one study examined absenteeism in relation to drug testing (12).

A summary of the study quality assessment is provided in Supplementary Table 2. Measures used to assess drug/alcohol use were mainly self-report surveys/interviews (12, 14, 16, 19) followed by test results (14, 15, 18). Types of drug tests undertaken (when reported) were urine, saliva, and breath tests. Two studies involved a combination of random, pre-employment, post-accident, periodic or reasonable suspicion (14, 17). One study was solely based on random test results (15) while testing undertaken in another study was mandated by law as part of an annual health screening (18). For the studies that were based on self-report surveys, testing frequency or type was unknown (12, 16, 19). Accident/injury rates were measured using workers' compensation claims (17) or accident records (15) or injury reports (19). Absenteeism and information regarding workplace drug policy were based on self-report data (12, 16).



Supplementary Figure 1. PRISMA flow diagram for the literature search

Supplementary Table 1. Summary of studies examining the effectiveness of testing in reducing AOD use, accidents/injuries, and or absenteeism

Study & country	Industry	Participants (no & description)	Aims	Study design	Type of testing	Measures	Results/Outcomes	Comments	Funding source reported
Gomez-Recasens 2018 Spain (14)	Service industry (government department for "promotion of construction and contracts")	N=1,103, mainly male, blue-collar workers across 12 service centres. 82.6% participation rate.	To reduce drug and alcohol use via awareness training and secondary intervention	Non-randomised single group study	Breath, saliva and urine testing. Used random, reasonable suspicion, post-accident, periodic (planned detection).	Semi-structured interview to determine Standard drink units (SDU) and drug use during work and leisure time; drug test results	At baseline, 19% (n=210) risky alcohol & drugs, 14.7% (n=162) risky alcohol, 6.8% (n=75) risky drugs. A significant decline in drug use was found in year 2 compared to Year 1 only. The significant decreases in risky use were not consistently observed across all centres. Greatest decrease was at Reus (a pilot centre) with the greatest combined rate of risky AOD consumption at baseline compared with the other centres.	Limitations: No control group and prior education about the whole program and required testing meant staff were not "randomly" tested without some expectation. Results presented with no effect sizes. Breath, saliva, and urine test results for each data collection period not reported; interview results (e.g., weekly SDUs for each data collection period) not reported. Intervention integrity not reported. Characteristics of program completers vs non-completers not reported. Facilitating factor: Staff were educated about the tests and no participant refused. Testing was used solely as a measure of detection.	Yes - not funded

Study & country	Industry	Participants (no & description)	Aims	Study design	Type of testing	Measures	Results/Outcomes	Comments	Funding source reported
Marques 2014 Portugal (15)	Railway transportation	3,801 workers that worked there for the entire 5.5-year period. Demographics other than occupations were not reported.	To compare accident rates of drug tested and untested employees to ascertain whether drug testing reduces risk of workplace accidents. To estimate an optimal frequency of testing to post-accidents.	Retrospective case-control study (longitudinal)	Breathalysers for alcohol; Urine or oral fluid tests for illicit drugs. 31,123 AOD tests over 5.5 years. Random testing.	Obtained 29,916 records of accidents, tests, or the absence of one or the other	Workers randomly tested for alcohol/drugs were significantly less likely to have accidents compared to untested workers (19.4% vs 47.0%) across all occupational risk groups. This was particularly for white-collar workers.	Random testing may have a preventive impact in reducing workplace accidents. Results may not be generalisable given only one organisation was involved.	No

Study & country	Industry	Participants (no & description)	Aims	Study design	Type of testing	Measures	Results/Outcomes	Comments	Funding source reported
Miller 2015 USA (16)	Not specified	20,457 participants aged between 15-25, from which 12,308 (60.2%) were aged 18-25 and employed full/part time. Sample taken from a national population-based survey.	To examine the association between drug use and workplace substance use prevention programs and policies that may include testing.	Cross-sectional, observational (secondary analyses)	Unknown	National population survey questions on: drug use (self-report) and workplace programs that included a question on whether drug testing is conducted in their workplace.	Drug-testing was associated with lower odds of non-prescription drug misuse, particularly sedatives/tranquilisers and stimulants after controlling for demographics such as age group, sex, race, education and community size. Association was not significant after controlling for demographics and past-month smoking and marijuana use. Drug testing was significantly associated with lower rates of marijuana use in workers, after controlling for demographics and past- month risky drinking.	No direct measure between actual testing and deterrence of drug use. Based on self-report data. Type of workplace testing not specified.	Yes - funded

Study & country	Industry	Participants (no & description)	Aims	Study design	Type of testing	Measures	Results/Outcomes	Comments	Funding source reported
Pidd 2016 Australia (12)	Various	13,590 workers aged 14+ from a national population-based survey. 56.2% males; Mean age = 40.6 years	To examine the relationship between alcohol/ drug use and workplace drug policies that may include testing	Cross-sectional (secondary analyses)	Unknown	National population survey questions on: alcohol policies including testing; frequency of alcohol and drug consumption in the last 12 months; absence from work due to AOD use in the last 3 months (self-report)	6.6% reported alcohol/ drug testing policies; 9.8% reported comprehensive AOD policies which included testing. No significant association between AOD policy type and absenteeism. No significant association between AOD testing policies and AOD use. Comprehensive AOD policies that included testing was significantly associated with reduced drug use (28% lower odds).	Limited generalisability of results. No direct measure between actual testing and deterrence of alcohol/drug use or absenteeism. Based on self-report data.	No
Schofield 2013 USA (17)	Construction industry	Companies N=1,360. 185,808,952 hours of employee-time-at-risk (approx. 92,882 FTE employees and 9,986 workers' compensation claims (over 6 years) with average claim rate of 10.54/100FTE. Companies ranged from 1 to 100 employees.	To examine the association between drug testing programs and workplace injury rates and severity	Retrospective cohort study	Companies represented three categories of drug-testing programs - no testing program (n=1,084), pre-employment/ post-accident (n=67), and all four types (pre-employment / post-accident /random / reasonable suspicion) (n=207). Type of testing not reported.	Compared compensation claims and payroll data between companies participating in drug testing programs	(1) Compared with no testing, in all categories of claims (overall injuries, lost-time injuries, medical only injuries), lower injury rates were associated with the pre-employment/post-accident testing programs (some significantly lower, some not). (2) Analysis by trade: significantly lower rates of injury associated with AOD testing in 5/21 categories: (i) interior carpentry, (ii) heating/ ventilation/air-con & plumbing, (iii) floor-installation & flatwork, (iv) painting, (v) concrete & masonry. (3) Analysis by mechanism of injury: significantly lower rates of injury with some types of drug testing programs in 8/20 categories. Pre-employment/post-accident programs associated with lower risk of strains, general slips, trips, falls, struck by/ flying objects, cumulative/ repetitive trauma. All types of drug testing associated with lower risk for strains, powered and hand tools, falls from ladders and scaffolding. (4) Pre-employment/ post-accident testing associated with lower injury rates within all total claim dollar categories.	Generalisability of results may be limited - all data from one workers' compensation insurer in one state of the USA. Construction companies involved were small, so results may not reflect the wider construction industry. The dataset had pre-employment and post-accident testing combined, or pre-employment, post-accident, random and reasonable suspicion combined, and could not differentiate between the different types of testing. Potential under-reporting of injuries may have occurred due to drug-testing programs.	Yes - funded

Study & country	Industry	Participants (no & description)	Aims	Study design	Type of testing	Measures	Results/Outcomes	Comments	Funding source reported
Vignali 2013 Italy (18)	Transportation	10,598 (95% male): 1,745 in 2008; 4,283 in 2009; 2,537 in 2010; 2,033 in 2011	To examine the impact of mandated workplace drug testing on worker drug use	Cross-sectional	Urine (first level) via annual health screening. Urine and hair (second level), following referral from physician.	Laboratory records of drug tests	Reduction in positive urine samples in the initial testing: 2.8% in 2008; 2.03% in 2009; 1.62% in 2010; 1.43% in 2011. No. of samples sent in at the second level was small.	Results do not conclusively show whether drug testing is a deterrence for drug use. Other factors may be at play.	No
Waehrer 2016 USA (19)	Various non-agricultural	1,405 companies with matching data on anti-drug programs and workplace injuries from 1988/89	To assess the different workplace safety programs including drug testing and their effects on workplace injuries	Cross-sectional	Not specified	Survey questions on drug testing and workplace injuries	41% used drug testing. Drug testing was associated with 15% reduction in the risk of no loss in work injuries. Drug testing was significantly associated with 35-38% decrease in no loss work injuries in transportation/ comms/utilities industry. No association found between drug testing policies and injuries that resulted in work loss.	No direct measure between actual testing and workplace injuries. No comparative control group. Data from 1980s.	No

Supplementary Table 2. Quality assessment of studies

Study	Control for selection bias	Study design	Control for confounders	Blinding	Data collection method	Withdrawals / dropouts	Unit of analysis	Intervention integrity	Global rating
Gomez-Recasens 2018 (14)	Moderate	Moderate	Weak	Weak	Moderate	Weak	Individual	Different questions regarding use were asked across work centres. High attrition rate and limited generalisability of results. Second level testing was unreliable. Potential contamination of intervention due to gradual implementation across centres.	Weak
Marques 2014 (15)	Moderate	Moderate	Moderate	N/A	Moderate	N/A	Individual	No detail regarding type of testing undertaken. Low number of cases with high frequency of testing. Randomised testing by computer.	Moderate
Miller 2015 (16)	Moderate	Weak	Strong	N/A	Weak	N/A	Individual	No detail regarding type/frequency of testing at workplace. Based on self-report questions on misuse and testing. No direct measure of testing.	Weak
Pidd 2016 (12)	Moderate	Weak	Moderate	Weak	Weak	N/A	Individual	Included self-report questions on policies that included testing, AOD use and absenteeism. Testing type or frequency not known. No direct measure of testing.	Weak
Schofield 2013 (17)	Weak	Moderate	Weak	N/A	Moderate	N/A	Aggregated compensation data	Varied testing programs across different workplaces. Frequency of testing and proportion of workers tested not reported.	Weak

Study	Control for selection bias	Study design	Control for confounders	Blinding	Data collection method	Withdrawals / dropouts	Unit of analysis	Intervention integrity	Global rating
Vignalli 2013 (18)	Moderate	Weak	Weak	Weak	Moderate	N/A	Individual	Testing undertaken as part of annual health screening. Employees were aware of testing ahead of time. Underestimation of actual drug use. Representativeness of sample and control for confounders not reported.	Weak
Waehrer 2016 (19)	Moderate	Weak	Moderate	N/A	Weak	N/A	Organisation	No direct measure of testing. No control group. Based on self-report data. Testing type/frequency not known. Underreporting may have occurred. Based on old data from the late 80s where policies and testing practices were different.	Weak

Other workplace interventions

Methods

The 27-item Preferred Reporting Items for Systematic Reviews and Meta-Analyses (77) was used to guide the reporting of the systematic review. The protocol was registered with PROSPERO, the international prospective register of systematic reviews (Registration number: CRD42021248441).

Search strategy

Eight databases were searched: Medline (Ovid), PsychINFO (Ovid), Emcare (Ovid), CINAHL (Ebsco), Scopus (Elsevier), Cochrane (Wiley), ProQuest and Web of Science (Clarivate Analytics). The search was limited to reviews published from inception to April 19, 2021. Development of the search strategy was guided by a specialist academic librarian. Reference lists of included papers were also searched.

Inclusion criteria

The inclusion criteria were based on study population, type of design, type of intervention, and outcome under study. The population inclusion criteria were occupational settings that employed adult workers aged 18 years or over. Included review papers were peer-reviewed published systematic reviews, narrative reviews, scoping reviews, reviews and meta-analyses of the following study designs: randomised controlled and cluster randomised controlled trials, quasi-randomised and cluster quasi-randomised controlled trials, controlled before-and-after and cluster controlled before-and-after trials, case time series studies, n=1 studies, cross-sectional studies, survey studies and secondary data analyses. There were no language restrictions.

The review papers that were included were of interventions with primary or secondary outcomes including: employee AOD use, occupational accidents or injuries related to AOD use, absenteeism or presenteeism related to AOD use, knowledge of, and attitudes towards, workplace AOD interventions.

Data screening and extraction

The search results were imported into Covidence (Veritas Health Innovation) for screening and extraction. First, two reviewers independently screened each title and abstract to remove duplicates, papers not in English, and papers that did not meet the eligibility criteria. Discrepancies were resolved through consensus. Then, full-text screening of the remaining papers was undertaken against the full eligibility criteria. At this stage, justification was provided for the removal of any papers, with discussion and consensus achieved. The final selection of papers was coded using a standardised form.

Quality appraisal

Two reviewers independently assessed each selected paper and any differences in ratings were resolved through consensus. Each of the final selection of papers that reported results of systematic reviews were assessed using the tool "A Measurement Tool to Assess Systematic Reviews, version 2" (AMSTAR 2) (23). Sixteen items across several domains were appraised separately. These included registration of protocols, appropriateness of the literature searches, appropriateness of meta-analytical methods (if used), justification for studies' exclusion, risk of bias assessments and interpretation of included studies, and potential impact of publication bias. Each item was scored 'yes' if it had been addressed in the review, 'partial yes' if partially addressed the item, and 'no' if the item was omitted. Systematic reviews of high quality were those that received all or mostly 'yes' and 'partial yes' scores. See Supplementary Table 4.

Each of the final selection of papers that reported results of narrative or descriptive reviews were assessed using the Scale for Assessment of Narrative Review Articles (SANRA) (24). Six items were assessed separately: justification of the article's importance for the readership, statement of concrete aims or formulation of questions, description of the literature search, referencing, scientific reasoning and appropriate presentation of data. Each narrative review was allocated two points per item if the item was addressed, one point if partially addressed, and no points if omitted. Reviews that were considered higher quality scored higher points. See Supplementary Table 5.

Findings

Search results

The search across eight databases resulted in the identification of 12,461 papers. A total of 3,257 duplicates were identified and removed, and the remaining 9,204 papers were screened. The first stage of screening inspected titles and abstracts for relevance to workplace drug or alcohol testing. Screening at this stage removed 9,110 irrelevant papers, and the two reviewers achieved 98.8% agreement on independent ratings prior to consensus discussions. Consensus was achieved without requiring a third researcher.

The second stage of screening examined 94 full-length articles against the eligibility criteria. A further 81 papers were removed, deemed ineligible. A final sample of 13 reviews was included. Handsearching of the reference lists of the included reviews did not yield any additional reviews. Supplementary Figure 2 presents the PRISMA flow diagram depicting the results of the search strategy.

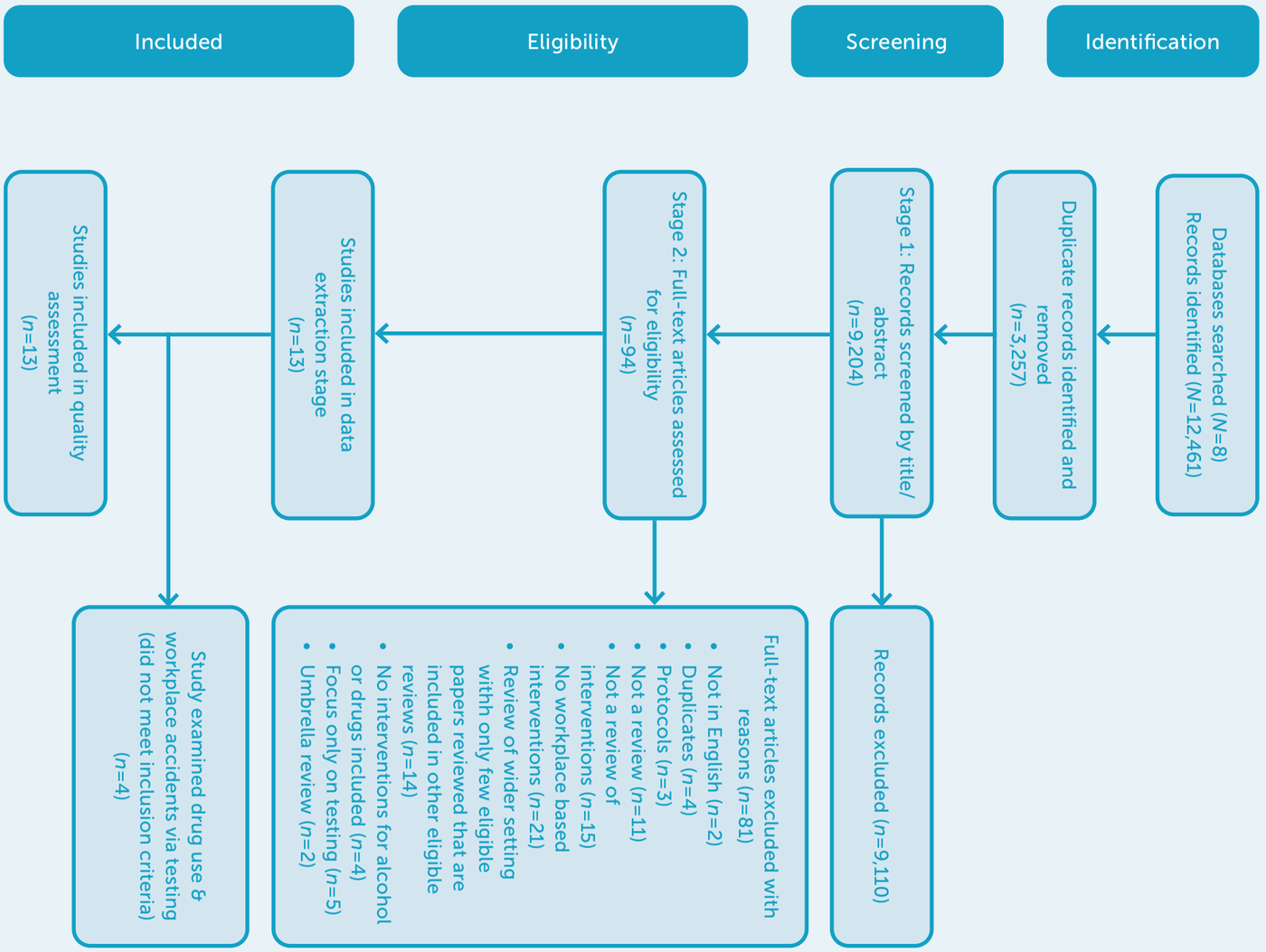
Review characteristics

Thirteen papers met the inclusion criteria:10 systematic reviews (25-28, 30-34, 37) and three narrative/descriptive reviews (29, 35, 36). Key information regarding the reviews is set out in Supplementary Table 3. Where reported, reviews included between three and 27 studies, involving between 24 and >600,000 study participants.

Ten reviews focused on workplace interventions aimed at alcohol (25-29, 31-33, 35, 37). One review examined employer-led interventions targeting opioids and related illicit drugs (30) and two other reviews (34, 36) focused on general substance use although studies were mainly on alcohol-related interventions. While all the reviews examined studies with reduction of alcohol/drug use as one of their outcome measures, five reviews (25, 27, 29, 36, 37) did not assess primary studies that examined the impact of interventions on workplace accidents/injury rates, or absenteeism of presenteeism.

Where specified, multiple industries were examined by primary studies in most of the reviews and two reviews exclusively examined studies on specific occupations only i.e., seafarers (37) and active-duty military personnel (26). Types of workplace interventions examined were employee education, employee assistance programs (EAPs), supervisor training, written policy, health promotion interventions, brief interventions, screening, web-based interventions, psychosocial interventions, peer support/assistance, counselling/rehabilitation, and combined interventions. Six reviews (26, 28-31, 33) examined studies that included workplace AOD testing alongside other interventions, as single or combined interventions.

A summary of review conclusions and identified evidence gaps is provided in Supplementary Table 6.



Supplementary Figure 2. PRISMA flow diagram of the study selection

Supplementary Table 3. Key characteristics of included reviews

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Akanbi 2020 (30)	Opioids & related illicit drugs	To examine the effectiveness of employer-led interventions to reduce drug use (mostly opioid) in the workplace	Systematic	11 databases. From inception to May 8, 2019. No date/ language restrictions. Search terms provided but incorrect search strategy provided. Inclusion/exclusion criteria listed. Used PRISMA guidelines and registered protocol with PROSPERO.	27	Downs & Black questionnaire	Industries: Construction, Insurance, Transportation, Tourism, Hospitality, Manufacturing, Wholesale & Retail, Utilities, Agriculture, Forestry & Fishing, Real Estate	Employee education, drug testing, EAPs, supervisor training, written policy, restructuring of health benefit plans, combined interventions	Sample size: 52- 409k; USA (23), Australia (1), Canada (1), Portugal (1), Spain (1).
Alfred 2021 (35)	Alcohol	To determine the impact and influence of alcohol workplace policy (AWP) on workplaces and employees	Narrative synthesis following Popay et al. (2006)	Self-developed search strategy - 5 academic e-databases, Google scholar, professional and HRM websites, grey literature. Search terms provided. Hand searched reference lists. Inclusion/ exclusion criteria listed. English language only from Jan 1996 - Jan 2020. Used PRISMA guidelines. Protocol not registered.	14 (PR=8; grey=6)	Authority, Accuracy, Coverage, Objectivity, Date Significance (AACODS) checklist for grey literature; Joanna Briggs Institute (JBI) appraisal tools for qualitative, cross-sectional, quasi-experimental studies; Mixed Methods Appraisal Tool (MMAT)	Industries: Manufacturing, Construction, Transport, Utilities, Hospitality, F&B, Gas/Fuel, Agriculture	Alcohol workplace policy/ programmes	Sample size: 22 - 115m; 14+yrs; USA (5), AUS (4), Taiwan (1), Sweden (1), ENG (1), EUR (2).

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Ames 2011 (29)	Alcohol	To examine primary prevention strategies that target all employee alcohol use	Narrative	No search strategy (studies were selected by authors)	Not specified	None	Industry and other types of workplaces not specified	Health promotion, social health promotion, brief intervention, web-based feedback intervention	Sample size: not consistently stated. Countries include USA and Australia but not consistently stated
Baygi 2020 (37)	Alcohol	To evaluate health promotion interventions of seafarers	Systematic	5 databases. From inception to end-Jan 2019. No date/ language restrictions. Search terms provided. Inclusion/exclusion criteria listed. Hand searched reference lists. Used PRISMA guidelines and registered protocol with PROSPERO.	3 out of 10 interventions included focus on reduction of alcohol	Cochrane for RCTs, Joanna Briggs Institute (JBI) appraisal tools for quasi experimental studies	Maritime industry	Health promotion interventions including education and advice about preventive strategies for better health. Three studies targeted alcohol consumption.	Sample size:141- 392. Relevant studies that targeted alcohol consumption as one of the outcomes included USA (1), Danish (1), Finland (1). Participants were seafarers, sailors, and marine workers.

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Burnhams 2013 (34)	Mostly alcohol	To determine the effectiveness of substance (predominantly alcohol) and HIV prevention programmes	Systematic	7 databases. From Jan 1995 to Oct 2009. Search terms provided. Also searched for unpublished data and selected websites WHO, SAMHSA, ILO. English language only. Inclusion/ exclusion criteria listed.	14 (10 RCTs, 3 non-randomised experimental studies, 1 ecological time series analysis	Babor's et al. (2003) Objective Decision Model	Industries: Services, Manufacturing, Transportation	Health promotion interventions, psychosocial skills training, AOD information	Sample size: 48-8,567; 18+ years. USA(12), AUS (1), Iran (1)
Cook 2002 (36)	Mostly alcohol	To review preventive interventions on substance abuse	Narrative	No search strategy (studies were selected by authors)	Not specified	None	Manufacturing and other types of workplaces not specified	Education, EAP, peer assistance, work group training, health promotion, stress management, counselling, testing	Sample sizes not consistently stated.

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Kolar 2015 (33)	Alcohol	To evaluate workplace alcohol interventions in reducing alcohol consumption and related harms	Systematic	6 databases. From Jan 1990 to Jun 2014. English language and peer reviewed articles only. Search terms provided. Inclusion/ exclusion criteria listed. Hand searched reference lists. Used PRISMA guidelines.	18	Not reported	Construction, other type of workplaces not specified	Brief interventions, web based interventions, psychosocial interventions, random AOD testing	Sample size: 26-2,000; USA (11), AUS (2), Sweden (2), UK (1), Ireland (1), Multiple countries in one study (Belgium, Canada, India, Sri Lanka, Malaysia, South Africa, Namibia)
Lee 2014 (28)	Alcohol	To examine alcohol interventions for workers in male-dominated industries	Systematic	6 databases. From Jan 1990 to Jun 2012. English language only. Search terms provided. Inclusion/ exclusion criteria listed. Hand searched reference lists and grey literature. Used PRISMA guidelines.	8	Assessed using six criteria i.e., subject selection, assessment, confounders, statistical analysis, conflict of interest, bias.	Industries: agriculture, construction, mining, manufacturing, transport, and utilities	Screening, brief interventions, peer care or peer support interventions, well-being interventions, testing, combined interventions	Sample size:194-664.5k; USA(6), AUS(1), Sweden (1)

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Roman 1996 (32)	Alcohol	To examine individual and organisational outcomes of workplace-based alcohol interventions	Unspecified (part of a larger review conducted elsewhere)	not stated in this paper (in a previous paper not identified)	24 (19 employee-centred, 5 supervisor training)		Manufacturing, transport, military, other types of workplaces not specified	EAP and employee rehabilitation (for problem drinkers), education. Some controlled studies included, some survey studies	Range, mostly problem drinkers
Schulte 2014 (27)	Alcohol	To examine the effectiveness of workplace alcohol screening and brief intervention	Systematic	Six databases – Jan 2002 to June 2013	9 (RCTs)	Cochrane risk of bias tool	Transportation, food, and retail, manufacturing sectors.	Screening, brief interventions	All large companies (over 1,000 employees); USA (5), Europe (3), Japan (1)
Watterson 2021 (26)	Alcohol	To analyse and synthesise the evidence related to workplace-based interventions for reducing alcohol use in active-duty military personnel.	Systematic	Four databases – inception to January 2020	7 (4 RCTs, 2 non-randomised controlled, 1 before and after)	Effective Public Health Practice Project	Active-duty military personnel	Web-based, telephone, face-to-face individual and group	Range 24-1,371 personnel

Reference	Substance type	Aim	Type of review	Search strategy	No and type of primary studies included (relevant/ total)	Quality Assessment tool used	Type of workplace	Type of workplace intervention	No. & description of participants
Webb 2009 (31)	Alcohol	To determine which interventions most effectively reduce work-place-related alcohol problems.	Systematic	Seven database – Jan 1995 – Sept 2007	10 (4 RCTs, 3 randomised non-controlled, 1 time series, 2 non-randomised) All low quality.	Quality Assessment for Quantitative Studies (developed from Cochrane tool)	Manufacturing, printing, mail delivery, civic services, health care	Mail outs, counselling, personal feedback, Peer Care, education, EAP	Range 48 - >1,000
Yuvaraj 2019 (25)	Alcohol	To review the effectiveness of workplace interventions in reducing alcohol consumption among employees	Systematic	At least 6 databases from inception to May 2018. Registered protocol with PROSPERO.	7 (parallel arm individual and cluster RCTs) No blinding of participants or outcome assessment.	Cochrane risk of bias tool	Not specified	Brief interventions, health promotion, mental simulation exercise, self-help group sessions, web-based intervention	Sample size: 26 to 290; Total n=1,291. 18+ years. Countries: Australia, UK, Japan, Norway, Germany

Supplementary Table 4. Quality assessments of included systematic reviews using AMSTAR 2

Reference	AMSTAR 2 (16 items)															
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
Akanbi 2020 (30)	Yes	Partial Yes	No	Partial Yes	Yes	Yes	Yes	Yes	Yes	No	No meta	No meta	Yes	Yes	No meta	Yes
Baygi 2020 (37)	Yes	Yes	Yes	Partial Yes	Yes	Yes	No	Partial Yes	Yes	No	No meta	No meta	Yes	Yes	No meta	Yes
Burnhams 2013 (34)	Yes	Partial Yes	Yes	Partial Yes	Yes	Yes	No	Yes	No	No	No meta	No meta	No	Yes	No meta	Yes
Kolar 2015 (33)	Yes	No	Yes	Partial Yes	Yes	Yes	No	Partial Yes	No	No	No meta	No meta	No	No	No meta	Yes
Lee 2014 (28)	Yes	No	No	Partial Yes	No	Yes	No	Yes	Partial Yes	No	No meta	No meta	No	Yes	No meta	Yes
Roman 1996 (32)	Not specified	Not specified	Not specified	Not specified	Not specified	Not specified	No	Yes	Partial Yes	No	No meta	No meta	No	Yes	No meta	No
Schulte 2014 (27)	Yes	Partial Yes	Yes	Partial Yes	Not stated	Not stated	No	Partial Yes	Yes	No	No meta	No meta	No	Yes	No meta	Yes
Watterson 2021 (26)	Yes	Yes	Yes	Partial Yes	Yes	Yes	No	Yes	Yes	No	No meta	No meta	Yes	Yes	No meta	Yes
Webb 2009 (31)	Yes	No	Yes	Partial Yes	No	No	No	Partial Yes	Yes	No	No meta	No meta	Yes	Yes	No meta	Yes
Yuvaraj 2019 (25)	Yes	Yes	Yes	Partial Yes	Yes	Yes	No	Partial Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes

Notes.

1. PICO components listed
2. Protocol reported / deviations justified
3. Study design justified
4. Comprehensive literature search strategy
5. Study selection performed in duplicate
6. Data extraction performed in duplicate
7. List of excluded studies provided & justified
8. Characteristics of studies provided in detail
9. Risk of bias assessed
10. Sources of funding for studies listed
11. Appropriate methods to combine findings of studies / heterogeneity tested
12. Accounted for risk of bias if meta-analysis was performed
13. Discussion of risk of bias in individual studies
14. Discussion of heterogeneity observed in the results
15. Publication bias investigated and impact discussed (quantitative synthesis)
16. Reviewers' conflicts of interest stated

Supplementary Table 5. Quality assessment of non-systematic reviews using SANRA

Review reference	SANRA (6 items)						
	Article importance justified	Concrete aims or research questions	Search strategy described	Referencing	Scientific reasoning	Appropriate presentation of data	Total
Alfred 2021 (35)	2	2	2	2	2	2	12
Ames 2011 (29)	1	1	0	2	1	1	6
Cook 2002 (36)	2	2	0	2	2	1	9

Supplementary Table 6. Summary of review conclusions and identified evidence gaps

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Akanbi 2020 (30)	**Education:** resulted in significant reduction in illicit drugs (opioids) use in 2 out of 6 studies. **Drug testing:** associated with significant reduction in drug use (marijuana or illicit drugs) in 2 out of 5 studies. **EAP:** 1 out of 2 studies reported a significant association with reduced drug use (marijuana). **Drug-free policies:** 2 out of 4 studies reported a significant reduction in drug use (marijuana or prescription medications). **Combined interventions:** One study reported that it may be effective (testing, education, written policy with or without EAP), one had mixed results (testing with education – only had significant reduction in use after one year, no other time periods), and two had no significant effects (education / EAP with written policy; testing with written policy).	**Drug testing:** significantly associated with reduction accidents in 2 out of 7 studies. Three studies had mixed results, depending on type of drug and type of accident. Two studies had no significant results. **EAP:** One study showed a significant reduction in accidents, one study reported mixed results, with a significant reduction with "no loss of work injuries" but no significant for "work loss" injuries. One study reported no significance with absenteeism. One study reported no association with drug-free policy and injuries. **Combined interventions:** 3 out of 4 studies reported a decline in injuries/ accidents. 1 study reported no association with absenteeism.	Unconfirmed. Need more rigorous studies in different industries, population groups, cultures and countries to see if it is applicable.	Unable to conclude long-term beneficial outcomes and any optimal features for drug interventions to be effective due to methodological inadequacies. It is suggested that combining some interventions may have a significant benefit in reducing risks of accidents/injuries.	Not addressed in this review.	Low quality of evidence. Number of studies on drug-related interventions are limited. Employer-led interventions indicate some benefits. More robust research designs needed in wider settings.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Alfred 2021 (35)	**Alcohol workplace policy (AWP):** Majority of evidence (12 of 14 studies) indicated alcohol policies/programmes deterred alcohol use during work hours. Studies focused mainly on self-reported awareness/knowledge of existing policies.	A study reported reduced absenteeism via a workplace alcohol program. Unclear how much influence policy played in outcomes as intervention was a combined program. A longitudinal 7-year study reported significant reduction of occupational injuries in selected industries. Unclear how much influence policy played in outcomes, intervention was a combined program.	Unconfirmed. Mixed results in different studies and settings. Younger, male workers (18-25) and heavy drinkers less likely to work for companies with AWPs or have awareness/ understanding of AWPs. Need more studies in different cultures and countries to see if it is as effective.	AWPs that involve employees, have monitoring and evaluation processes are more effective. Policies may be more effective if it is part of a more comprehensive program that includes other interventions that support long term behaviour change. A study found that workers adhered to policy more closely if they felt their managers or supervisors would enforce it.	Mixed results across different studies. One study reported better attitudes towards alcohol at corporate events. One study reported limited influence of alcohol policy on subcontract workers own behaviour and attitudes to alcohol.	Mainly cross-sectional studies rated as moderate to good quality. Workplace alcohol policy is an underutilised opportunity for health promotion. More research needed on the absence of alcohol polices in some workplaces. More comprehensive approaches needed that combine policy + alcohol harm reduction education, brief interventions and counselling.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Ames 2011 (29)	All studies reviewed that targeted individuals changing risk factors, showed some degree of success. **Combined interventions:** Education combined with brief intervention showed most potential. **Health promotion:** Programs integrating alcohol intervention into worksite health promotion have been met with marginal success, with usage not always reduced (i.e., reduced in women only not men, or improved intentions to reduce in heavy drinkers, but not behaviour). Brief interventions (including online) are mixed. Web-based, sms-based interventions embedded in general health promotion and stress management interventions showed some promise to reduce use. Other: A program designed to change workplace culture towards risk factors was associated with reduced workplace AOD use, but not overall use.	Not addressed in this review.	Brief intervention: Some studies show promise to reduce use among women in particular.	Education combined with brief interventions may be beneficial. Face-to-face, mail and internet brief interventions have shown some promise to reduce use.	A general stress-management program showed significant improvement on participants' attitudes/ perceptions towards alcohol abuse regardless of the substance abuse prevention program. A study on healthcare workers found binge drinkers were 2.6 times more likely to report a desire to reduce alcohol consumption after undergoing a substance abuse prevention program. A psycho-social health promotion program called Team Resilience, which embeds substance use reduction messages within a context of fostering social support and consideration, personal confidence, accountability, coping, and stress management, was associated with increased awareness of AOD risks among hospitality workers (aged 16-34 years).	Interventions indicate some effectiveness. More rigorous and integrated research is needed. Proposed a guiding research framework to develop workplace alcohol interventions.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Baygi 2020 (37)	Educational interventions - no significant change in reduction of alcohol use for two studies. One study reported reduction, but relevant statistical information not reported.	Not addressed in this review.	Unconfirmed. Studies looked at workers in the maritime industries only.	Not able to conclude.	Not addressed in this review.	Low quality of evidence. More rigorous designs needed.
Burnhams 2013 (34)	**Health promotion:** mixed results. Some studies reported significant reduction in alcohol use, one study had no significant differences between control and experimental groups. One study reported reduction in beer binges following an intervention delivered over the internet.	**Health promotion:** One study reported reduced sickness absence associated with a Team Awareness programme. **Peer-based:** One study reported a significant association between a peer referral system and injury rates.	Unconfirmed. Most studies were based in developed countries. One study was rated well for cross-cultural applicability.	Lack of intervention integrity monitoring and generally outcomes were based on self-reported use. General health promotion programmes that embed substance use prevention might be less stigmatising and more effective.	One study on petrochemical workers reported better awareness and attitudes towards drug abuse using a psychosocial skills training program.	Insufficient conclusive evidence due to methodological inadequacies studies. Implementation integrity not specified. Guidelines are needed for reporting implementation integrity. Lack of research in developing countries. More studies needed on feasibility of interventions.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Cook 2002 (36)	**EAP:** 1 study reported reduced use among alcoholic employees. Health promotion (stress management course) was associated with reduction in drinking. **Education:** 1 study reported a brief healthy alcohol consumption education program was associated with reduced alcohol use. Brief intervention: 3 studies showed no decrease in use but increased intentions to reduce and attitudes towards alcohol. **Counselling:** Individual counselling of at-risk employees found to decrease alcohol use.	Not addressed in this review.	Not able to conclude.	Not able to conclude.	One health promotion/ substance abuse program showed a significant increase in the desire to reduce alcohol consumption in a sample of manufacturing workers. No effects found for health beliefs or self-efficacy to reduce drinking in an alcohol prevention program in a health promotion framework in a sample of workers in a printing company. A general stress-management program showed significant improvement on property insurance workers' attitudes/ perceptions towards alcohol abuse regardless of the substance abuse prevention program. A brief "healthy alcohol consumption" education program was associated with more socially responsible attitudes towards alcohol and reduced use.	Current evidence is limited. More rigorous research needed on comprehensive interventions that focus on policy/norms plus specific AOD interventions integrated within wider health promotional programs.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Kolar 2015 (33)	**Brief interventions:** Mixed results, generally non-significant. Three studies reported significant reduction in use; **Web based interventions:** Two studies found significant reduction in alcohol use; **Psychosocial interventions:** Two studies reported reduced alcohol rates; **Random AOD testing:** no significant reduction in use.	Brief intervention: One study reported significant reduction in presenteeism but not absenteeism; **Psychosocial interventions:** One study reported reduced injury rates and reduced sickness absenteeism; **Random AOD testing:** Two studies reported significant reduction in injury rates	Not addressed in this review.	Unable to conclude long term effects and applicability of findings due to methodological limitations.	Educational **brief interventions:** One study reported increased knowledge of risks associated with alcohol use; **Psychosocial interventions:** One study reported increased knowledge of alcohol.	Low quality of evidence. More robust longitudinal designs required. Qualitative research designs are also needed. A needs analysis should be undertaken prior to tailor an intervention that best suits the specific workplace.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Lee 2014 (28)	Screening: 1 study reported reduced alcohol use; **Brief interventions:** 1 study reported reduction in alcohol use for women only but not men; **Well-being interventions:** 1 study reported no significant difference in drinking rates; 1 study reported reduced rates for at-risk drinkers and males; **Combined interventions:** No significant changes in alcohol rates with random drug testing + education; no significant differences for enhanced EAP which included health promotion + substance abuse prevention/intervention program; reduction in alcohol use for a comprehensive multilevel program that included supervisor training, education workshop, discussion of alcohol policies and guidelines, and a peer support program.	**Peer-based intervention:** 2 studies reported a reduction in injury rates; **Combined interventions:** (AOD policy + EAP) indicated a reduction in injury rates for certain industries	Unconfirmed. Studies limited to workers from male-dominated industries only in developed countries. A combination of alcohol screening, secondary prevention and low intensity intervention activities may be effective for risky male drinkers.	Unable to conclude which interventions work best or are generalisable to other work settings. A multifaceted program involving a combination of interventions may be useful.	Not addressed in this review	Limited number of well controlled, high quality studies. Based on limited evidence, it was suggested that a multi-level approach is adopted whereby policies addressing risky alcohol use in the workplace is implemented alongside screening interventions that directly address attitudes toward drinking, as well as a provision for counselling, such as employee assistance programs.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Roman 1996 (32)	EAP-based interventions show some efficacy; Education for supervisors shows some efficacy. Both types are complimentary.	EAP-based interventions show some efficacy; **Education for supervisors:** shows some efficacy. Both intervention types are complimentary	Not able to conclude as programs and interventions all differed significantly.	Not able to conclude.	**Educational program** showed modest improvement in related attitudes and knowledge but no long-term impacts. Training sessions on alcohol showed improvements in related knowledge and attitudes in supervisors and employees, regardless of being brief or lengthy in duration. **Supervisory training + employee education program** was associated with improved knowledge of alcohol problems.	More rigorous research designs needed. Standardised measures needed to allow for comparisons between intervention studies. Application of interventions in wider settings required.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Schulte 2014 (27)	**Alcohol screening and brief interventions** delivered in different ways (e.g., web based, face-to-face) associated with some reduction of alcohol use in 8/9 studies reviewed.	Not addressed in this review.	Not able to conclude generalisability. Studies mainly conducted in the US and on larger organisations.	Not able to conclude.	Study using face-to-face educational interventions were more effective in increasing knowledge about and attitudes towards drinking compared to e-mail interventions.	Low quality of evidence. More rigorous research needed to determine the acceptability, feasibility and implementation strategies of **alcohol screening and brief interventions** in the workplace.
Watterson 2021 (26)	Brief intervention: Six out of seven studies reviewed found reduction in use (interventions included web, telephone, individual and group face to face). **Combined interventions:** Some evidence for combining random breath testing with brief intervention.	Brief intervention: One study found brief intervention and testing associated with reduction in alcohol-related injury	Unconfirmed. Studies limited military personnel only.	Not able to conclude due to wide variety of studies. Outcomes not sustained in the longer term.	Two studies examined attitudes towards drinking. Only reported results of one study – attitudes improved following alcohol risk education program, but not maintained at 20 months	Low quality of evidence. More longitudinal designs are needed. More methodologically rigorous studies are required.

Review	Q1a: Which workplace-based drug and alcohol interventions reduce drug and alcohol use? (Deterrence)	Q1b: Which workplace-based drug and alcohol interventions reduce drug and alcohol-related occupational accidents, injury rates, absenteeism and presenteeism?	Q2: Is the workplace drug and alcohol intervention evidence base applicable to all workplace population groups and in different countries?	Q3: What are the optimal characteristics (type, length, frequency, content) of workplace drug and alcohol interventions and do they show long-term beneficial outcomes?	Q4: Do the interventions influence employee and manager knowledge and attitudes towards alcohol or drugs?	Review conclusions
Webb 2009 (31)	Education / brief intervention: Nine out of 10 studies reported reduction in use in certain settings and for certain population groups.	**Peer-based:** An intervention with Peer Care found significant reduction in injury rates. Brief intervention: A brief counselling intervention found no impact on absenteeism.	Not able to conclude due to heterogeneity of settings. Some interventions showed effectiveness for women and binge drinkers.	Brief interventions, interventions contained within health/lifestyle promotion programs, psychosocial skills training and peer-led programs may have some potential.	**Mailed personalised feedback on drinking** showed an increase in levels of perceived risks of alcohol use and consequences.	Low quality of evidence. More rigorous research needed. Variability in studies made comparisons difficult. Need to have standardised methodology to evaluate alcohol interventions.
Yuvaraj 2019 (25)	There was a positive effect of different workplace interventions (mostly brief interventions, face-to-face and some with web-based components) on reduction of alcohol consumption with pooled MD of −2.25 [95% CI: −4.20 to −0.30]. The effect was only seen where subjects had a baseline alcohol consumption of over 15 standard drinks per week.	Not addressed in this review.	Studies were conducted in developed countries, and "stable workplaces". Some interventions may be effective if targeted at "heavy" drinkers.	The intervention was done via group face-to-face sessions in most of the trials, duration of intervention less than 6 months. 4/7 interventions had high frequency of contact (twice or more a month).	Not specifically examined but does mention that for some studies there was an increase in awareness amongst employees regarding harmful effects of alcohol.	Low quality of evidence on effectiveness of alcohol interventions. Need more epidemiological studies, and studies in lower-income countries and other cultural settings.

Glossary

burden of disease and injury: A term referring to the quantified impact of a disease or injury on an individual or population, using the disability-adjusted life year (DALY) measure.

daily smoker: Reported smoking tobacco at least once a day (includes manufactured (packet) cigarettes, roll-your-own cigarettes, cigars or pipes). Excludes chewing tobacco, electronic cigarettes (and similar) and smoking of non-tobacco products.

electronic cigarette (e-cigarette): Devices designed to produce a vapour that the user inhales. Usually contain a battery, a liquid cartridge and a vaporisation system and are used in a manner that simulates smoking.

emerging psychoactive substances: Drugs that often mimic the effects of more established illegal drugs. These are sometimes referred to as research chemicals, analogues, or bath salts. Some of the more well-known substances include Mephedrone, NBOMe, Methylone, Flakka, MDPV, 2C-I, BZP, Carfentanyl and Krokodil.

ever use: Used at least once in lifetime.

illicit drugs: Illegal drugs, drugs and volatile substances used illicitly, and pharmaceuticals used for non-medical purposes. The survey included questions on the following illicit drugs:

- pain-killers/pain-relievers and opioids[10]
- tranquillisers/sleeping pills[10]
- steroids[10]
- meth/amphetamines[10]
- cannabis
- heroin
- methadone or buprenorphine[10]
- cocaine
- hallucinogens
- ecstasy
- ketamine
- GHB
- synthetic cannabinoids
- emerging psychoactive substances
- inhalants
- (any) injected drug.

10 Used for non-medical purposes. Non-medical and non-maintenance use is noted in the report. Excludes the use of cannabis for medical purposes that was prescribed by a doctor only.

injected drugs: The injection of drugs that were not medically prescribed to inject.

medicinal cannabis: Cannabis that has been prescribed for use by a doctor.

never smoker: A person who does not smoke now and has smoked fewer than 100 cigarettes or the equivalent tobacco in his or her lifetime.

non-medical use: Use of drugs either alone or with other drugs to induce or enhance a drug experience, for performance enhancement or for cosmetic purposes. In this report, this includes pain-killers/analgesics, tranquilisers/sleeping pills, steroids, methadone or buprenorphine and meth/amphetamines and other opioids such as morphine or pethidine.

non-smoker: Never smoked or an ex-smoker.

over-the-counter (OTC) drugs: Medicine that you can buy without a prescription from a pharmacy or retail outlet.

polydrug use: Unless otherwise specified, the following drugs were assessed for polydrug use: cannabis, ecstasy, amphetamines, cocaine, hallucinogens, inhalants, heroin, ketamine, GHB, synthetic cannabinoids, emerging psychedelic substances, painkillers/opioids, tranquilisers/sleeping pills, steroids, methadone/buprenorphine

roll-your-own tobacco/cigarettes: Cigarettes made from loose tobacco and rolling paper.

smoker: A person who reported currently smoking daily, weekly or less often than weekly.

standard drink: Containing 10 grams of alcohol (equivalent to 12.5 millilitres of alcohol); also referred to as a full serve.

Symbols

N.A.	not available
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data
OR	odds ratio
*	Estimate has a relative standard error of 25% to 50% and should be used with caution
**	Estimate has a relative standard error greater than 50% and is considered too unreliable for general use

References

1. Kaila-Kangas L, Koskinen A, Pensola T, Mäkelä P, Leino-Arjas P. Alcohol-induced morbidity and mortality by occupation: a population-based follow-up study of working Finns. Eur J Public Health. 2016;26(1):116-22.
2. French MT, Maclean JC, Sindelar JL, Fang H. The morning after: alcohol misuse and employment problems. Appl Econ. 2011;43(21):2705-20.
3. Frone MR. Prevalence and distribution of alcohol use and impairment in the workplace: a U.S. national survey. J Stud Alcohol. 2006;67(1):147-56.
4. Bhattacharya A. Financial headache: the cost of workplace hangovers and intoxication to the UK economy. London: Institute of Alcohol Studies; 2019.
5. Pidd K. The Workplace as an AOD-Related Harm Prevention and Intervention Setting. Drug and Alcohol Research Connections2014.
6. Roman PM, Blum TC. The workplace and alcohol problem prevention. Alcohol Research & Health. 2002;26(1):49.
7. Ames GM, Bennett JB. Prevention Interventions of Alcohol Problems in the Workplace. Alcohol Research & Health. 2011;34:175 - 87.
8. Frone MR, Brown AL. Workplace substance-use norms as predictors of employee substance use and impairment: a survey of U.S. workers. J Stud Alcohol Drugs. 2010;71(4):526-34.
9. Coronges K, Stacy AW, Valente TW. Social network influences of alcohol and marijuana cognitive associations. Addict Behav. 2011;36(12):1305-8.
10. Pidd K, Roche AM. How effective is drug testing as a workplace safety strategy? A systematic review of the evidence. Accid Anal Prev. 2014;71:154-65.
11. Pidd K, Roche A, Duraisingam V. Drug use and workplace safety: Issues and good practice responses. In: R. J. Burke, Richardsen AM, editors. ncreasing Occupational Health and Safety in Workplaces: Individual, Work and Organizational Factors: Edward Egar Publishing; 2019. p. 69-92.
12. Pidd K, Kostadinov V, Roche A. Do workplace policies work? An examination of the relationship between alcohol and other drug policies and workers' substance use. International Journal of Drug Policy. 2016;28:48-54.
13. Pidd K, Roche A, Cameron J, Lee N, Jenner L, Duraisingam V. Workplace alcohol harm reduction intervention in Australia: Cluster non-randomised controlled trial. Drug and Alcohol Review. 2018;37(4):502-13.
14. Gomez-Recasens M, Alfaro-Barrio S, Tarro L, Llaurado E, Sola R. A workplace intervention to reduce alcohol and drug consumption: a nonrandomized single-group study. BMC Public Health. 2018;18(1):1281.
15. Marques PH, Jesus V, Olea SA, Vairinhos V, Jacinto C. The effect of alcohol and drug testing at the workplace on individual's occupational accident risk. Safety Science. 2014;68:108-20.
16. Miller T, Novak SP, Galvin DM, Spicer RS, Cluff L, Kasat S. School and work status, drug-free workplace protections, and prescription drug misuse among Americans ages 15-25. J Stud Alcohol Drugs. 2015;76(2):195-203.
17. Schofield KE, Alexander BH, Gerberich SG, Ryan AD. Injury rates, severity, and drug testing programs in small construction companies. Journal of Safety Research. 2013;44:97-104.
18. Vignali C, Stramesi C, Morini L, Pozzi F, Collo G, Groppi A. Workplace drug testing in Italy - critical considerations. Drug Testing & Analysis. 2013;5(4):208-12.
19. Waehrer GM, Miller TR, Hendrie D, Galvin DM. Employee assistance programs, drug testing, and workplace injury. Journal of Safety Research. 2016;57:53-60.
20. Effective Public Health Practice Project. Quality Assessment Tool for Quantitative Studies Dictionary Hamilton, Canada.: Effective Public Health Practice Project; 2009 [Available from: https://merst.ca/wp-content/uploads/2018/02/quality-assessment-tool_2010.pdf (Accessed 7 October 2020).
21. Els C, Jackson TD, Milen MT, Kunyk D, Wyatt G, Sowah D, et al. Random drug and alcohol testing for preventing injury in workers. Cochrane Database of Systematic Reviews. 2020(12).
22. Frone MR. Workplace interventions I: Drug testing job applicants and employees. In: Association AP, editor. Alcohol and illicit drug use in the workforce and workplace2013. p. 143–75.
23. Shea BJ, Reeves BC, Wells G, Thuku M, Hamel C, Moran J, et al. AMSTAR 2: a critical appraisal tool for systematic reviews that include randomised or non-randomised studies of healthcare interventions, or both. BMJ. 2017;358:j4008.
24. Baethge C, Goldbeck-Wood S, Mertens S. SANRA—a scale for the quality assessment of narrative review articles. Research Integrity and Peer Review. 2019;4(1):5.
25. Yuvaraj K, Eliyas SK, Gokul S, Manikandanesan S. Effectiveness of Workplace Intervention for Reducing Alcohol Consumption: a Systematic Review and Meta-Analysis. Alcohol Alcohol. 2019;54(3):264-71.
26. Watterson JR, Gabbe B, Rosenfeld JV, Ball H, Romero L, Dietze P. Workplace intervention programmes for decreasing alcohol use in military personnel: a systematic review. BMJ Mil Health. 2021;167(3):192-200.
27. Schulte B, O'Donnell AJ, Kastner S, Schmidt CS, Schäfer I, Reimer J. Alcohol screening and brief intervention in workplace settings and social services: a comparison of literature. Front Psychiatry. 2014;5:131.
28. Lee N, Roche A, Duraisingam V, Fischer J, Cameron J, Pidd K. A Systematic Review of Alcohol Interventions Among Workers in Male-Dominated Industries. Journal of Men s Health. 2014;11:53-63.
29. Ames GM, Bennett JB. Prevention interventions of alcohol problems in the workplace. Alcohol Research & Health. 2011;34(2):175-87.
30. Akanbi MO, Iroz CB, O'Dwyer LC, Rivera AS, McHugh MC. A systematic review of the effectiveness of employer-led interventions for drug misuse. J Occup Health. 2020;62(1):e12133.

31. Webb G, Shakeshaft A, Sanson-Fisher R, Havard A. A systematic review of work-place interventions for alcohol-related problems. Addiction. 2009;104(3):365-77.

32. Roman PM, Blum TC. Alcohol: a review of the impact of worksite interventions on health and behavioral outcomes. Am J Health Promot. 1996;11(2):136-49.

33. Kolar C, von Treuer K. Alcohol misuse interventions in the workplace: A systematic review of workplace and sports management alcohol interventions. International Journal of Mental Health and Addiction. 2015;13(5):563-83.

34. Burnhams N, Musekiwa A, Parry C, London L. A systematic review of evidence-based workplace prevention programmes that address substance abuse and HIV risk Behaviours. African Journal of Drug and Alcohol Studies. 2013;12:1-22.

35. Alfred L, Limmer M, Cartwright S. An integrative literature review exploring the impact of alcohol workplace policies. International Journal of Workplace Health Management. 2021;14(1):87-110.

36. Cook R, Schlenger W. Prevention of Substance Abuse in the Workplace: Review of Research on the Delivery of Services. Journal of Primary Prevention. 2002;23(1):115-42.

37. Baygi F, Djalalinia S, Qorbani M, Dejman M, Nielsen JB. Lifestyle interventions in the maritime settings: a systematic review. Environmental Health and Preventive Medicine. 2020;25(1):10.

38. Mewton L, Visontay R, Chapman C, Newton N, Slade T, Kay-Lambkin F, et al. Universal prevention of alcohol and drug use: An overview of reviews in an Australian context. Drug Alcohol Rev. 2018;37 Suppl 1:S435-s69.

39. McEntee A, Roche A, Whetton S. Chapter 5: Workplace costs. In: Tait RJ, Allsop, S. (Eds.). , editor. Examining the Social and Economic Costs of Alcohol Use in Australia: 2017/18. Perth, WA: National Drug Research Institute, Curtin University; 2021.

40. McEntee A, Roche A, Whetton S. Chapter 6: Workplace costs. In: Tait RJ, Allsop, S. (Eds.). , editor. Quantifying the Social Costs of Pharmaceutical Opioid Misuse & Illicit Opioid Use to Australia in 2015/16. Perth, WA: National Drug Research Institute, Curtin University; 2020.

41. McEntee A, Roche A, Whetton S. Chapter 6: Workplace costs. In: Tait RJ, Allsop, S. (Eds.). , editor. Quantifying the Social Costs of Cannabis Use to Australia in 2015/16. Perth, WA: National Drug Research Institute, Curtin University; 2020.

42. Kelly M, Doohan E. The Social Determinants of Health. In: Merson MH, Black RE, Mills AJ, editors. Global health: Diseases, programs, systems, and policies. 3rd ed ed. Burlington, MA: Jones & Bartlett Publishers; 2012. p. 75–113.

43. Kelly MP, Barker M. Why is changing health-related behaviour so difficult? Public Health. 2016;136:109-16.

44. Meier PS, Warde A, Holmes J. All drinking is not equal: how a social practice theory lens could enhance public health research on alcohol and other health behaviours. Addiction. 2018;113(2):206-13.

45. Banks E, Yazidjoglou A, Brown S, Nguyen M, Martin M, Beckwith K, et al. Electronic cigarettes and health outcomes: systematic review of global evidence: Australian National University; 2022.

46. National Health and Medical Research Council. 2022 CEO Statement on Electronic Cigarettes. 2022.

47. Greenhalgh E, Scollo M, Winstanley M. Tobacco in Australia: Facts and issues. Melbourne: Cancer Council Victoria; 2020.

48. Larcombe A, Allard S, Pringle P, Mead-Hunter R, Anderson N, Mullins B. Chemical analysis of fresh and aged Australian e-cigarette liquids. Medical Journal of Australia. 2022;216(1):27-32.

49. Owen AJ, Maulida SB, Zomer E, Liew D. Productivity burden of smoking in Australia: A life table modelling study. Tobacco Control. 2019;28:297-304.

50. AIHW. National Drug Strategy Household Survey 2019. Canberra: Australian Institute of Health and Welfare; 2020.

51. Roche A, McEntee A, Kim S. If cannabis use is increasing among workers what are the implications for policy? A secondary analysis of a nationally representative Australian dataset. Drugs: Education, Prevention and Policy. 2022:1-11.

52. MacPhail SL, Bedoya-Pérez MA, Cohen R, Kotsirilos V, McGregor IS, Cairns EA. Medicinal Cannabis Prescribing in Australia: An Analysis of Trends Over the First Five Years. Front Pharmacol. 2022;13:885655.

53. Carnide N, Lee H, Frone MR, Furlan AD, Smith PM. Patterns and correlates of workplace and non-workplace cannabis use among Canadian workers before the legalization of non-medical cannabis. Drug Alcohol Depend. 2021;218:108386.

54. Hasin DS, Shmulewitz D, Sarvet AL. Time trends in US cannabis use and cannabis use disorders overall and by sociodemographic subgroups: a narrative review and new findings. Am J Drug Alcohol Abuse. 2019;45(6):623-43.

55. Schlag AK, O'Sullivan SE, Zafar RR, Nutt DJ. Current controversies in medical cannabis: Recent developments in human clinical applications and potential therapeutics. Neuropharmacology. 2021;191:108586.

56. Stella B, Baratta F, Della Pepa C, Arpicco S, Gastaldi D, Dosio F. Cannabinoid Formulations and Delivery Systems: Current and Future Options to Treat Pain. Drugs. 2021;81(13):1513-57.

57. AIHW. COVID-19 Impact on Mental Health [Online]. Canberra, ACT: Australian Institute of Health and Welfare 2021.

58. AIHW. National Drug Strategy Household Survey: Online data tables 2020 [Available from: https://www.aihw.gov.au/about-our-data/our-data-collections/national-drug-strategy-household-survey.

59. Salomone A, Palamar JJ, Vincenti M. Should NPS be included in workplace drug testing? Drug Testing and Analysis. 2020;12(2):191-4.

60. Chihuri S, Li G. Use of prescription opioids and motor vehicle crashes: A meta analysis. Accident Analysis & Prevention. 2017;109:123-31.

61. Li G, Chihuri S. Prescription opioids, alcohol and fatal motor vehicle crashes: a population-based case-control study. Injury Epidemiology. 2019;6(1):11.

62. Schifano F, Catalani V, Sharif S, Napoletano F, Corkery JM, Arillotta D, et al. Benefits and Harms of 'Smart Drugs' (Nootropics) in Healthy Individuals. Drugs. 2022;82(6):633-47.

63. Nelson M, Jensen C, Lenton S. Study drug use among university students in Western Australia: Results of a web survey and their policy and practice implications. Drug and Alcohol Review. 2021;40(4):530-9.

64. Zaami S, Rinaldi R, Bersani G, Del Rio A, Ciallella C, Marinelli E. Nootropics use in the workplace: psychiatric and ethical aftermath towards the new frontier of bioengineering. Eur Rev Med Pharmacol Sci. 2020;24(4):2129-39.

65. Larance B, Degenhardt L, Copeland J, Dillon P. Injecting risk behaviour and related harm among men who use performance- and image-enhancing drugs. Drug Alcohol Rev. 2008;27(6):679-86.

66. Larance B, Degenhardt L, Dillon P, Copeland J. Use of performance and image enhancing drugs among men: a review. Sydney: National Drug and Alcohol Research Centre; 2005.

67. Pope HG, Jr., Wood RI, Rogol A, Nyberg F, Bowers L, Bhasin S. Adverse health consequences of performance-enhancing drugs: an Endocrine Society scientific statement. Endocr Rev. 2014;35(3):341-75.

68. Hope VD, Harris R, McVeigh J, Cullen KJ, Smith J, Parry JV, et al. Risk of HIV and Hepatitis B and C Over Time Among Men Who Inject Image and Performance Enhancing Drugs in England and Wales: Results From Cross-Sectional Prevalence Surveys, 1992-2013. J Acquir Immune Defic Syndr. 2016;71(3):331-7.

69. Piatkowski TM, Dunn M, White KM, Hides LM, Obst PL. Exploring the harms arising from polysubstance use among performance and image enhancing drug users among young Australian men. Performance Enhancement & Health. 2021;9(3):100197.

70. Memedovic S, Iversen J, Geddes L, Maher L. Australian Needle Syringe Program Survey national data report 2011-2015: Prevalence of HIV, HCV and injecting and sexual behaviour among NSP attendees. Sydney: Kirby Institute, University of New South Wales; 2017.

71. Fomiatti R, Moore D, Latham JR, Fraser S, Lenton E, Seear K, et al. Understanding performance and image-enhancing drug injecting to improve health and minimise hepatitis C transmission: Findings and recommendations from a national qualitative project. Melbourne: The Australian Research Centre in Sex, Health and Society, La Trobe University; 2019.

72. Dinis-Oliveira RJ, Magalhães T. Abuse of Licit and Illicit Psychoactive Substances in the Workplace: Medical, Toxicological, and Forensic Aspects. J Clin Med. 2020;9(3).

73. Perkins D, Sarris J, Rossell S, Bonomo Y, Forbes D, Davey C, et al. Medicinal psychedelics for mental health and addiction: Advancing research of an emerging paradigm. Australian & New Zealand Journal of Psychiatry. 2021;55(12):1127-33.

74. Anderson T, Petranker R, Christopher A, Rosenbaum D, Weissman C, Dinh-Williams L-A, et al. Psychedelic microdosing benefits and challenges: an empirical codebook. Harm Reduction Journal. 2019;16(1):43.

75. Andrews T, Wright K. The frontiers of new psychedelic therapies: A survey of sociological themes and issues. Sociology Compass. 2022;16(2):e12959.

76. Roche AM, Pidd K, Berry JG, Harrison JE. Workers' drinking patterns: the impact on absenteeism in the Australian work-place. Addiction. 2008;103(5):738-48.

77. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. Annals of Internal Medicine. 2009;151(4):264-9.