The Australian Prevention Partnership Centre
Systems and solutions for better health

The value of primary prevention to reduce alcohol consumption

An Evidence Check rapid review

May 2022

A rapid review of evidence
The value of primary prevention to reduce alcohol consumption

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Disclaimer: This evidence review is not necessarily a comprehensive review of all literature relating to the topic area. It was current at the time of production (but not necessarily at the time of publication) and is based on sources believed to be reliable.

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Executive summary

Alcohol use is a significant health problem in Australia and globally. This Evidence Check rapid review focuses on summarising the health burden and economic costs of alcohol use in Australia, and reviews the evidence about the health, social, economic and other benefits of primary prevention strategies targeting alcohol use.

The Australian Government's recently published National Preventive Health Strategy 2021-2030 recognises the harm caused by alcohol use and sets two targets to reduce this harm:

> At least a 10% reduction in harmful alcohol consumption by Australians (≥14 years) by 2025 and at least a 15% reduction by 2030;
>
> Less than 10% of young people (14-17-year-olds) are consuming alcohol by 2030.

The health burden and economic costs of alcohol

This report found that alcohol use contributes significantly to Australia's health burden (burden of disease) as well as contributing billions of dollars each year in Australia in terms of healthcare and non-healthcare economic costs.

Based on the findings of the Australian Burden of Disease Study 2018 (ABDS 2018), overall health burden attributable to alcohol as measured by disability-adjusted life years (DALYs) was 222,108 DALYs in 2018, or 4.46%. The majority of this was fatal burden as measured by years of life lost (YLLs) at 132,845 YLLs, compared with non-fatal burden as measured by years of healthy life lost due to disability (YLDs) at 89,263. According to ABDS 2018 estimates, there were 6,512 deaths (4.09% of all deaths) attributable to alcohol in 2018, and this has steadily been increasing over time from 5,034 in 2003. The main causes of this health burden linked to alcohol were various cancers, injuries and alcohol use disorder. The cancers causally linked to alcohol use included liver cancer, nasopharyngeal cancer, other oral cavity and pharynx cancers, lip and oral cavity cancer, laryngeal cancer, oesophageal cancer, bowel cancer and breast cancer. Alcohol use was also associated with other health burdens, such as road traffic injuries for cyclists, drivers, passengers and pedestrians.

The studies identified by this report accounted for a diverse range of non-healthcare costs to government, such as impact on taxation revenue, road accidents, police, criminal courts, prisons, child protection services and out-of-home community services. For example, one study by the New South Wales (NSW) Auditor General found that alcohol misuse cost the NSW Government $1.3 billion and $645 million in healthcare costs (indexed to 2016-17 dollars) over one year. This study found an additional $2.1 billion in productivity costs to other sectors due to alcohol misuse (indexed to 2016-17 dollars) for one year.

A recent, comprehensive analysis by the National Drug Research Institute of the costs attributable to alcohol use for the whole of Australia estimated:

- net costs of $2.6 billion related to premature mortality
- $0.7 billion for hospital mortality
- $2.1 billion for other healthcare costs
- $4 billion in workplace productivity costs
- $3.1 billion related to crime
- $2.4 billion due to road traffic crashes
- $1.1 billion of alcohol purchases by people who have an alcohol dependency
- $2.2 billion in other tangible costs.

The study's authors also calculated $48.65 billion of intangible costs, which is the monetisation of health loss through alcohol-related premature mortality and morbidity.

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* All $ figures in this report are in AUD$ unless otherwise stated

The health, social and economic benefits of primary prevention strategies targeting alcohol use

Evidence suggests that multiple strategies and multi-component interventions, targeting multiple parts of the system and the various drivers of alcohol consumption at the primary level of prevention, tend to produce the greatest health benefits. Some of these interventions have also been found to be cost-effective (i.e. they have economic benefits as well as health and other benefits).

Health, social and other benefits were particularly identified from built environment interventions in local places and geography, such as restricting alcohol availability and access through a range of mechanisms like reducing the number of licensed outlets in a defined geographic area and restricting trading hours of licensed venues. These co-benefits included reductions in violence and motor vehicle crashes. While many health and social benefits were identified by studies, few studies reported on or measured any mental health benefits and no studies related to the built environment reported on economic benefits. Some research found there likely was an association between availability and accessibility to alcohol in the local built environment and increased use of alcohol.

A large body of research about health benefits was identified relating to health promotion programs and strategies, including individual-level interventions such as eHealth (electronic, computer or internet-based interventions) and mHealth (mobile phone-based interventions, such as text-messaging and smartphone apps). This also included settings-based interventions which involved programs or strategies targeting or embedded within specific settings, such as schools, universities, workplaces and sports clubs. There was some evidence that eHealth and mHealth interventions could produce health benefits such as reducing short-term alcohol use and other alcohol-related outcomes, including behavioural intentions and attitudes. However, much of this evidence was mixed in terms of reported effectiveness. Most reviews of health promotion interventions only included alcohol-related outcomes, with very few including non-health benefits or mental health benefits. There was very limited research identified about the cost-effectiveness of these interventions.

School-based interventions such as integrating alcohol education and health promotion into curriculum and skill development had some, albeit limited, evidence of improving alcohol-related outcomes. Combined interventions, such as combining school-based and family or community-based interventions to prevent and address alcohol use, seemed to be effective in some contexts. Interventions targeting sports clubs seemed particularly effective. Some studies of interventions targeting multiple risk factors also reported health benefits other than alcohol-related outcomes. Very little economic evidence was identified relating to school-based interventions.

Studies of mass media campaigns generally found health benefits such as changes in knowledge, attitudes and beliefs about alcohol consumption (more 'proximal' measures or outcomes), but few studies looked at whether this flowed through to changes in actual consumption or alcohol-related harms (i.e. more 'distal' outcomes). Two recent systematic reviews found no studies of social media interventions for alcohol use.

We identified some interventions targeting specific priority populations, mostly Aboriginal and Torres Strait Islander communities. This evidence suggests more structural interventions, such as built environment or policy changes in a particular geographic place or location, can have a positive effect on alcohol use and produce other benefits. There were also some examples of health promotion programs co-designed in partnership with Aboriginal populations which found these can be effective at changing alcohol-related behaviours.

Recommendations for future research and policy

Based on the findings of this report, there are three key recommendations for future research and policy for preventing alcohol use and misuse in Australia.

1. **Effective preventive action requires a comprehensive approach based on implementing a range of interventions targeting alcohol supply and use.**

Alcohol use in Australia is associated with a substantial amount of health burden and economic cost, including productivity impacts. There are a range of evidence-informed interventions available to improve population health in terms of addressing and reducing alcohol consumption. The most effective and cost-effective interventions - advertising restrictions and financial levers (i.e. taxes) – were excluded from this report due to the already existing robustness of evidence in those areas. This report identifies other promising interventions that are effective and possibly cost-effective, including:

a. Multi-component interventions and strategies that target the various drivers of alcohol supply and consumption;

b. Built environment changes and geographically-based restrictions, particularly relating to changes in the accessibility and availability of alcohol (noting that these often also produce health, social and other non-health co-benefits);

c. Health promotion programs that can be sustained and scaled up in different settings, noting the opportunities presented by eHealth and mHealth interventions in terms of reach, engagement and co-design with end users.

2. Robust evaluation frameworks need to be combined with implementation of programs to enhance the evidence and help demonstrate the health, social and other benefits of preventive strategies addressing alcohol use.

This report identified many studies and publications on interventions and strategies targeting children and young people, but findings suggest there is mixed or limited evidence for the effectiveness and benefits of these approaches, particularly school-based approaches, which is surprising given their widespread use. Often these trials and programs were evaluated in a short timeframe (e.g. <6-12 months), when benefits may only appear in the medium to longer term. Such programs might have other types of benefits that are not necessarily captured in the evaluation.

More robust and comprehensive evaluations are particularly required for complex interventions that generate multiple benefits. Demonstrating the value of prevention is about being able to measure impact and change in behaviours, particularly over longer periods of time at both the individual and population level. Randomised controlled trials – the 'gold standard' of evidence generation and hypothesis testing – are not always feasible or appropriate, particularly for real-world policy changes and interventions that affect the whole population.

Research and evaluation need to be embedded within program delivery and the results more widely shared, including in the peer-reviewed literature, so that this evidence can be easily identified and included in updated systematic reviews and other types of evidence generation and appraisal to inform policy change. Examples can be found in this review in regard to built environment interventions and specific settings-based interventions (e.g. in sports clubs), where this report identified many high-quality evaluations that measured multiple outcomes or benefits, particularly over longer periods of time.

There is also some evidence about the health benefits of eHealth and mHealth approaches, but far less as to the benefits of mass media and social marketing campaigns. This may be because there is less evaluation data published about such strategies, which represents an opportunity for future research. Given information and education campaigns are popular and common primary prevention strategies for specific health behaviours like alcohol use, incorporating robust evaluation can help improve program and strategy implementation while also generating evidence of effectiveness and benefits. There is also a clear need for more evidence on interventions targeting priority populations, such as Aboriginal and Torres Strait Islander communities, culturally and linguistically diverse communities, and the LGBTIQ+ community.

3. More economic evidence is required to help demonstrate the overall economic value of prevention.

There is a limited body of economic evidence for many primary prevention interventions targeting alcohol use. Given the significant health and economic costs of alcohol use in Australia and the evidence of effective interventions targeting alcohol use, there is an opportunity to generate high quality economic evidence to aid decision makers. Such evidence would help to inform the case for investment in the prevention of alcohol-related harm, as has been seen in other areas of public health such as tobacco control and obesity prevention. Such research could be possible through prevention agencies, public health units and research groups partnering with health economists early in the implementation and evaluation stage of new alcohol programs and interventions, to ensure appropriate data is collected for economic analyses of relevance to policy makers.

Background

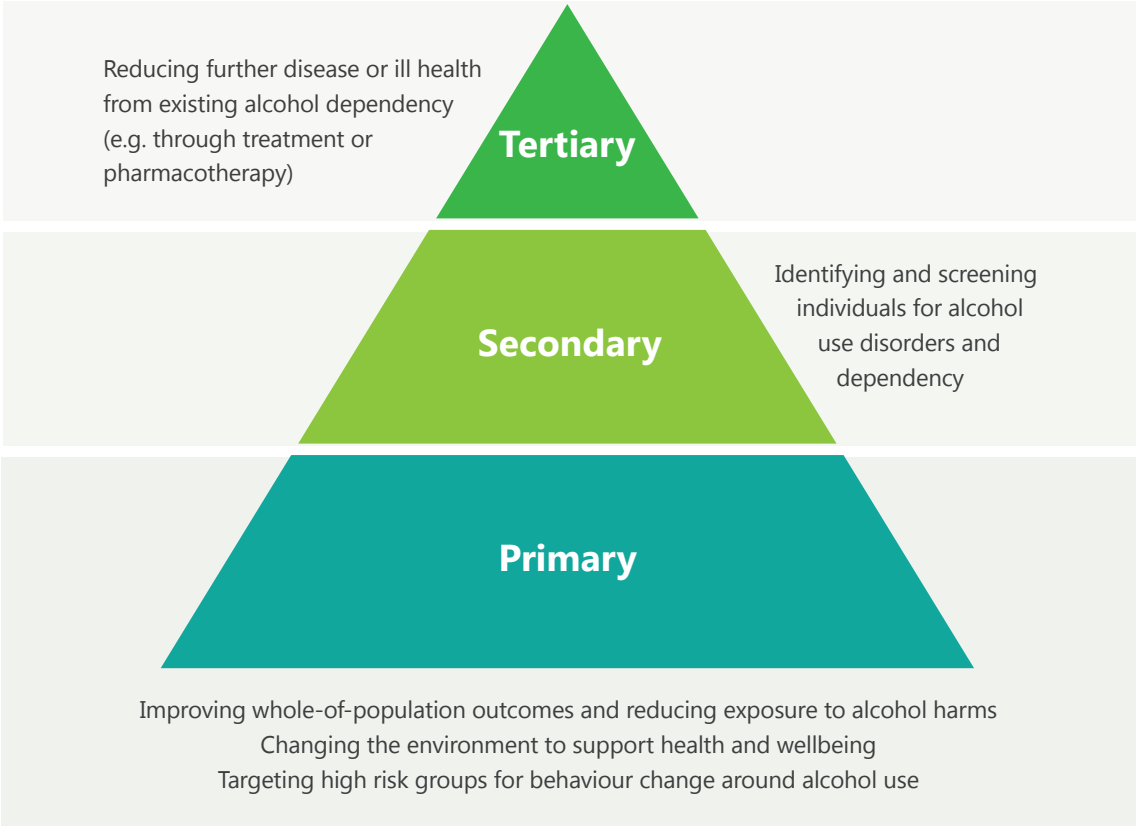
Alcohol is a harmful, toxic and addictive substance that causes many health issues and conditions. Alcohol is a Level 1 carcinogen for humans according to the International Agency for Research on Cancer.[2] The WHO (World Health Organization[3]) estimates that approximately three million deaths per year and 5.1% of the global burden of disease are caused by the harmful use of alcohol. The WHO also notes this burden is inequitable, with more disadvantaged and vulnerable populations experiencing higher rates of alcohol-related deaths and hospitalisations. The WHO has also summarised the very strong evidence base between harmful alcohol use and poorer mental health outcomes.[4]

The Australian Government's recently published National Preventive Health Strategy 2021-2030 recognises the harm caused by alcohol use and sets two targets to reduce this harm[1]:

> At least a 10% reduction in harmful alcohol consumption by Australians (≥14 years) by 2025 and at least a 15% reduction by 2030
>
> Less than 10% of young people (14-17-year-olds) are consuming alcohol by 2030

To address the harms associated with alcohol use requires implementing and sustaining effective preventive strategies. Prevention is about reducing exposure to risk or harm for individuals and populations, and promoting the health and wellbeing of people.[5] Preventive strategies and actions aim to reduce the likelihood of disease, injury and early death. Preventive strategies can be targeted towards individuals and groups or can be 'universal' interventions targeting the whole population and environment. These strategies can also range from primary and primordial interventions to secondary and tertiary prevention levels. This report focuses on primary prevention interventions (including primordial prevention) targeting alcohol use and harms (Figure 1).

Figure 1: Types of prevention



In terms of primary prevention, the more effective and beneficial strategies include alcohol taxation, pricing and fiscal interventions. Taxation strategies such as excise taxes on alcohol are highly effective at reducing alcohol consumption.[6,7] Minimum unit pricing (MUP), in which a 'floor price' for alcohol is set, is highly effective and cost-effective at reducing alcohol-related morbidity and mortality.[8,9] The WHO recommends increases to alcoholic beverage taxation, enforcement of bans and restrictions on alcohol advertising across multiple types of media, and restrictions on the availability of alcohol as highly cost-effective interventions.[10] Other effective primary prevention strategies include alcohol warning labels[11] and restricting exposure to alcohol advertising.[12]

We note the strong body of evidence for these interventions and as such have not focused on examining this evidence. This report instead focuses on other primary prevention strategies to address alcohol use and harms, including:

- **health promotion programs**

  These include eHealth or mHealth interventions (internet or online, text-messaging, smartphone apps), settings-based health promotion strategies (e.g. in schools, workplaces, universities), as well as other health promotion and education strategies (e.g. social norms or peer-based interventions).

- **mass media campaigns and social marketing**

  This includes public education and information strategies and campaigns on various mediums including television, radio, print and social media ('mass media campaigns') as well as marketing strategies and interventions that focus on social change and behaviour change ('social marketing').

- **built environment changes**

  These include changes to the availability and accessibility of alcohol through spatial/geographic and/or temporal restrictions, and other policy levers (such as planning laws)

- **behavioural economics and 'nudge' interventions**

  This includes interventions that use behavioural science to direct people towards healthier choices (or away from less healthy choices and decisions), usually through unconscious processes.

- **healthy lifestyle interventions that target multiple health behaviours**

- **multi-component interventions that include different combinations of these strategies.**

Some strategies target specific groups, such as children and adolescents, young adults or university students, or pregnant women. Other strategies and interventions aim to address alcohol use and harms in priority populations, such as Aboriginal and Torres Strait Islander populations and culturally and linguistically diverse (CALD) populations.

EVIDENCE CHECK

Purpose of review

A recently completed Evidence Check The Value of Prevention: A Rapid Review, was published by The Australian Prevention Partnership Centre in 2021[+]. It included a full literature review and evidence brief which outlined the burden of death and disability attributed to overweight and obesity, unhealthy diet, physical inactivity, tobacco use and smoking. The report quantified the burden on government, businesses and communities including deaths per year in Australia and potentially in NSW, attributable percentage of overall disease burden, annual productivity loss and attributable health expenditure.

A supplementary Evidence Check (the present report) was requested by the Cancer Institute NSW and the Centre for Alcohol and Other Drugs in the NSW Ministry of Health. This Evidence Check focused on the burden associated with alcohol consumption and the economic benefit and health benefit associated with primary prevention strategies focused on reducing alcohol consumption.

Methods

Style of review

An Evidence Check review is a rapid review of existing evidence tailored to the individual needs of an agency through a knowledge brokering session.[13-15] Evidence Check reviews therefore answer specific policy or program questions and are presented as a report with accompanying evidence brief. Reviewers may be asked to identify gaps in the evidence but do not undertake new research to fill these gaps. This style of review is not a comprehensive summary of all the available evidence on a topic, though systematic search processes and methodology are employed.

Review questions

The review questions underpinning this Evidence Check were:

1) What is the health burden and economic costs of alcohol consumption?
2) What are the health, social and economic benefits of primary prevention strategies which address alcohol consumption; and which strategies are most cost-effective?

Search strategies

Search algorithms were designed with the input of a librarian and can be provided upon request to The Prevention Centre or first author (PC). The search algorithms covered a broad range of terms on alcohol use and consumption, the interventions of interest and relevant Medical Subject Headings (MESH) terms relating to public health evaluations.

It was agreed with the commissioning team that health burden for review question 1 would be obtained from burden of disease studies that the research team was already familiar with. Therefore, the search algorithm for review question 1 focused on economic studies only.

Inclusion and exclusion criteria

Inclusion and exclusion criteria were developed with input from the commissioning team and further developed by the research team based on the type of studies identified during the screening process. The inclusion and exclusion criteria can be found in Appendix 3.

Screening and data extraction

A pragmatic approach was taken to the screening process based on the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) systematic review guidelines, modified to the time and resource constraints of this rapid review. The searches were translated and carried out by the librarian across the relevant databases. Search results were collated in EndNote and deduplication carried out there. De-duplicated results were then exported to EPPI Reviewer screening management software. Single reviewer screening based on title and abstract (T&A) was carried out by two members of the research team Paul Crosland and Elly Howse after random allocation to screening groups by EPPI Reviewer. Full-text articles were obtained and single reviewer screening was then again carried out after random allocation in EPPI Reviewer. Data extraction was carried out by several members of the research team (PC, EH, MH, SMA, MRA, SWAD) using a template pre-arranged with the commissioning team.

[+] Howse, E, Crosland, P, Rychetnik, L, Wilson, A. The value of prevention: An Evidence Check rapid review brokered by the Sax Institute for the Centre for Population Health, NSW Ministry of Health. Sydney, Australia: The Australian Prevention Partnership Centre, 2021

Types of benefits

The following benefits are outcomes that have previously been identified from the relevant literature about alcohol use. These benefits were identified as part of the data extraction process where they were measured and reported on in the included studies:

Health benefits

- Reduction in cancer risk and cancer-related outcomes
- Reduction in chronic disease or disease risk, including liver disease and cardiovascular disease
- Reduction in alcohol consumption (including problematic alcohol use and binge drinking)
- Abstaining from alcohol consumption
- Improvement in other health behaviours
- Reduction in injuries
- Benefits to the health system - e.g. reduction in hospitalisations or emergency department presentations
- Reduction in cases or prevalence of Foetal Alcohol Spectrum Disorder (FASD)
- Reduction in overweight, obesity, body mass, body mass index (BMI), or improvement to BMI
- Improvement/increase to health knowledge and attitudes (e.g. immediate benefits for mass media campaigns and health promotion)

Mental wellbeing benefits

- Improved mental or psychological wellbeing
- Reduction in mental health problems
- Reduction in mental disorders
- Reduction in stress
- Reduction in substance misuse
- Improvement in self-esteem
- Reduction in suicide and/or self-harm

Social and other benefits

- Improvements in health and social equity
- Improvement in safety and amenity
- Reduction in traffic accidents
- Reduction in crime or violence
- Reduction in drink driving
- Improvement in social participation
- Improvement to school attendance
- Increased employment
- Reduction in domestic or family violence/ intimate partner violence

Economic benefits and cost-effectiveness

- Reduction in health care expenditure and costs associated with alcohol consumption
- Reduction in productivity losses, presenteeism, absenteeism, welfare payments etc
- Incremental cost effectiveness ratios (ICER)
- Cost per quality-adjusted life year (QALY) gained or disability-adjusted life year (DALY) averted
- Reduction in years of production or income lost due to premature mortality or morbidity
- Improvement to gross domestic product (GDP).

Benefits for priority populations

- Aboriginal, Torres Strait Islander populations
- Lesbian, gay, bisexual, transgender, intersex, queer and questioning (LGBTIQ+) populations
- Culturally and linguistically diverse (CALD) populations.

Evidence synthesis

Health burden for review question 1 was extracted from pre-identified burden of disease studies. The few studies on economic burden for review question 1 were extracted to the results table based on a data extraction template. For review question 2, interventions were categorised into the groups identified in the Background and synthesised together.

Quality assessment

We took a pragmatic approach for the purpose of synthesising the large body of various types of studies, interventions and categories for this rapid review style of work. Most of the included studies were literature reviews of one form or another so the authors' assessment of the underlying evidence were extracted to the results table. For single comparative studies and economic evaluations, the research team summarised the limitations of the study in the results table.

Findings

Review question 1: Health burden and economic costs of alcohol use

Summary of studies

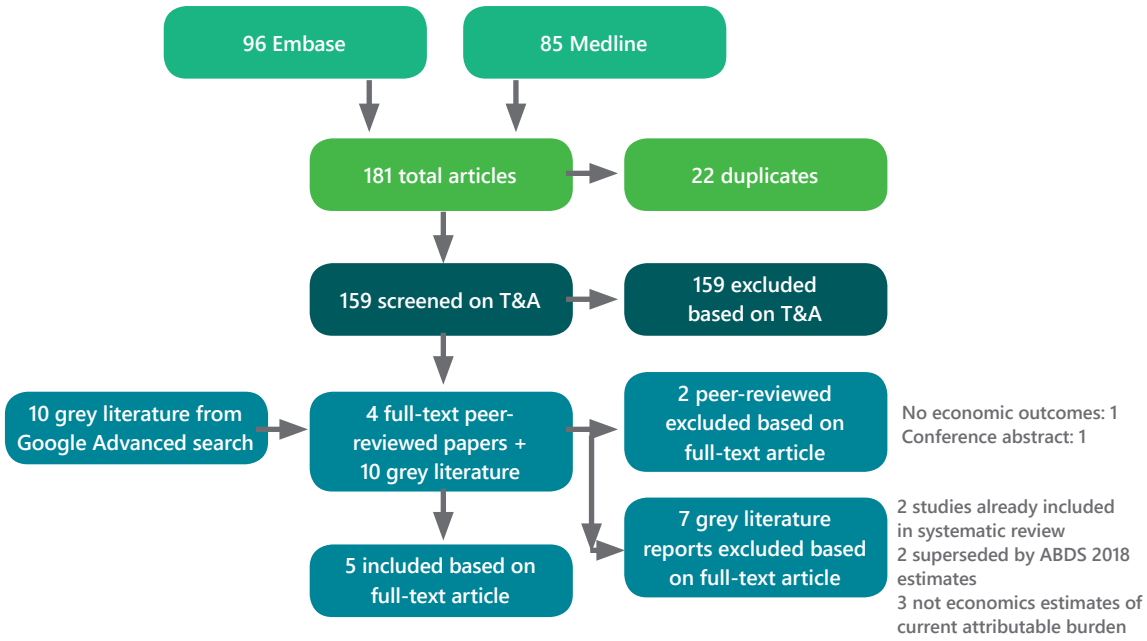
Three studies on the health burden of alcohol use in Australia were used for this part of the review outside of the systematic search of peer-reviewed literature as described in the methods above.

For review question 1, 159 unique articles were identified across the two databases that had the potential to meet the inclusion criteria estimating the economic burden of alcohol use in Australia. Four papers were reviewed in full-text form with 155 excluded based on title and abstract screening. Two were subsequently excluded, leaving two articles meeting the inclusion criteria from the scientific, peer-reviewed literature (Figure 2). An additional three studies were included from the grey literature search on economic burden. A fourth grey literature study published after the searches were conducted was added to this report due to its relevance.[16] Where studies mentioned estimates of both health and economic burden, they were included in the economic studies sections and evidence tables below.

Table 1: Summary of studies included in review question 1

Topic	Systematic review	Other synthesis/review of literature	Single study
Health burden	–	–	3
Economic burden	1	2	3

Figure 2: PRISMA screening flow diagram for review question 1



An additional study was published after the searches and added to this report due to its relevance.[16]

Health burden

The National Health Survey 2017-18 conducted by the Australian Bureau of Statistics found that 16.1% of adults consumed more than two standard drinks per day on average, which exceeded the lifetime risk guideline in place at the time. The good news is that this was a slight decline from 17.4% in 2014-15 and 19.5% in 2011-12. Risky drinking was substantially more prevalent in males compared with females. More than one in five men and one in eleven women exceeded this lifetime risk guideline in 2017-18. Some 42% of adults consumed more than four standard drinks on one occasion in the past year, which exceeded the single occasion risk guideline in place at the time, with men more likely to exceed this risk guideline (54.2%) compared with women (30.5%). A higher proportion of males aged 45-74 years exceeded alcohol consumption guidelines compared with younger and older males based on lifetime risk (Figure 3). In females, the proportion exceeding guidelines of lifetime alcohol consumption peaked in the 35 -44 years age group (Figure 3). A lower proportion of people residing in metropolitan areas exceeded alcohol consumption guidelines in place at the time of the survey (Figure 5) along with a lower proportion of people at relatively greater socio-economic disadvantage (Figure 4).[17]

New guidelines by the National Health and Medical Research Council were released in 2020[18] with the following recommendations:

Adults
To reduce the risk of harm from alcohol-related disease or injury, healthy men and women should drink no more than 10 standard drinks a week and no more than four standard drinks on any one day. The less you drink, the lower your risk of harm from alcohol.

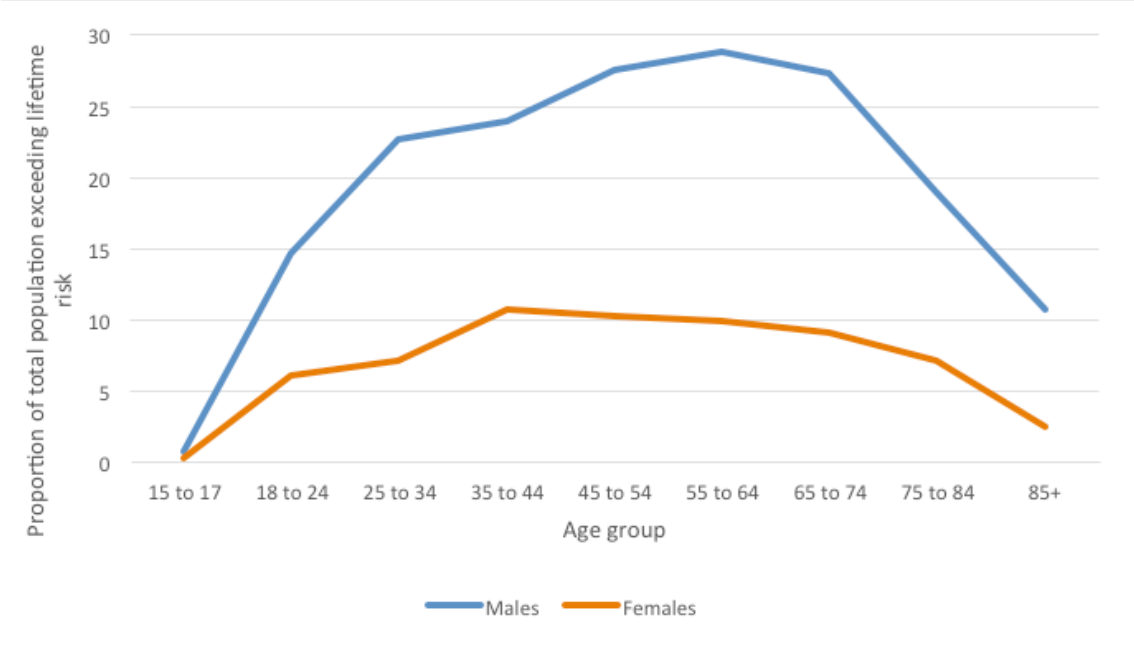
Children and people under 18 years of age
To reduce the risk of injury and other harms to health, children and people under 18 years of age should not drink alcohol.

Advice for pregnancy
To prevent harm from alcohol to their unborn child, women who are pregnant or planning a pregnancy should not drink alcohol.

Advice for breastfeeding
For women who are breastfeeding, not drinking alcohol is safest for their baby.

As described in the methods section, the search of peer-reviewed literature for review question 1 related to studies on the economic burden of alcohol consumption. The Global Burden of Disease Study and Australian Burden of Disease Study were already known to provide the most comprehensive estimates of attributable burden. The findings on the risk factor of alcohol consumption from these comparative risk assessments has been summarised and reported in this section. The latest iteration of the Global Burden of Disease Study by the Institute for Health Metrics and Evaluation at the University of Washington was for 2019 (referred to as GBD 2019 for the remainder of the report) and estimates were extracted from both the GBD Results Tool and GBD Compare. The Australian Burden of Disease Study is conducted by the Australian Institute of Health and Welfare, who provided detailed data of the 2018 estimates (ABDS 2018) as a customised data provision to the research team for use in this report. A third study is included here which adopts a unique approach to comparative risk assessment based on the synthesis of several Australian longitudinal cohorts to estimate the fraction of cancers attributable to alcohol use.

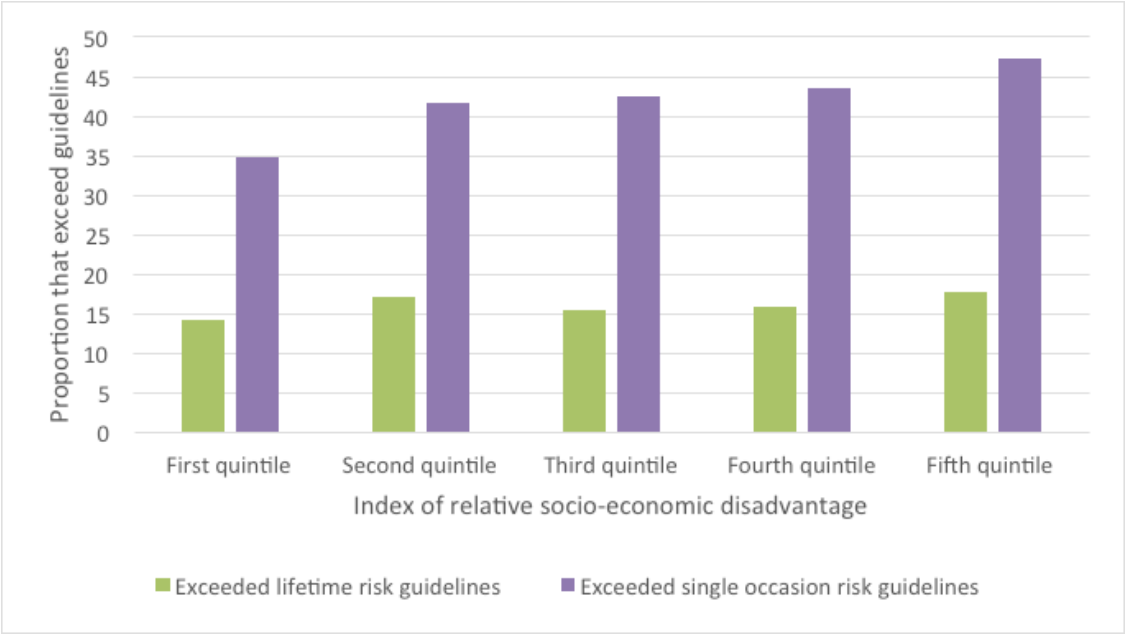
Figure 3: Proportion of people exceeding lifetime risk of alcohol consumption in the last week, 2017-18



Lifetime risk is based on the NHMRC 2009 guideline 1 for the consumption of alcohol which recommended no more than two standard drinks on any day.

Source: Australian Bureau of Statistics, National Health Survey 2017-18. Figure by authors of present report.

Figure 4: Proportion exceeding alcohol consumption guidelines by socio-economic category, 2017-18



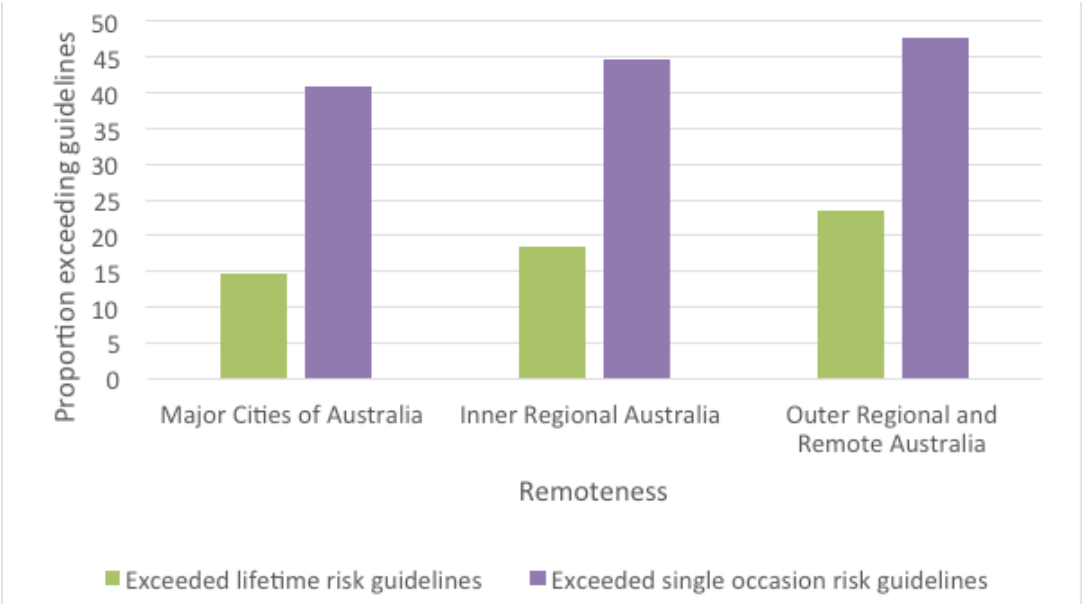
A lower Index of Disadvantage quintile (e.g. the first quintile) indicates relatively greater disadvantage and a lack of advantage in general. A higher Index of Disadvantage (e.g. the fifth quintile) indicates a relative lack of disadvantage and greater advantage in general.

Lifetime risk is based on the NHMRC 2009 guideline 1 for the consumption of alcohol which recommended no more than two standard drinks on any day.

Single occasion risk is based on the NHMRC 2009 guideline 2 for the consumption of alcohol which recommended no more than four standard drinks on a single occasion.

Source: Australian Bureau of Statistics, National Health Survey 2017-18. Figure by authors of present report.

Figure 5: Proportion exceeding alcohol consumption guidelines by degree of remoteness, 2017-18



Lifetime risk is based on the NHMRC 2009 guideline 1 for the consumption of alcohol which recommended no more than two standard drinks on any day.

Single occasion risk is based on the NHMRC 2009 guideline 2 for the consumption of alcohol which recommended no more than four standard drinks on a single occasion.

Source: Australian Bureau of Statistics, National Health Survey 2017-18. Figure by authors of present report.

Australian Burden of Disease Study 2018

Overall health burden attributable to alcohol as measured by disability-adjusted life years (DALYs) was 222,108 DALYs in 2018, or 4.46%. The majority of this is fatal burden as measured by years of life lost (YLLs) at 132,845 YLLs, compared with non-fatal burden as measured by years of healthy life lost due to disability (YLDs) at 89,263. Figure 6 shows that there is a substantial difference in health burden between the sexes, with males experiencing well over double the DALYs experienced by females. This figure also shows that attributable health burden due to alcohol has been increasing steadily over time from 188,151 DALYs in 2003 and this is consistent across both sexes. However, as a proportion of overall health burden, alcohol as a risk factor has remained virtually the same over time (Table 2).[19]

Table 2: Attributable health burden of alcohol as a proportion of DALYs and deaths, 2018

		Proportion of total DALYs attributable to alcohol	Proportion of total deaths attributable to alcohol
2003	Female	2.62	3.07
	Male	6.16	4.52
	Persons	4.51	3.81
2011	Female	2.69	2.99
	Male	6.28	4.67
	Persons	4.60	3.85
2015	Female	2.64	3.10
	Male	6.21	5.00
	Persons	4.52	4.07
2018	Female	2.62	3.17
	Male	6.10	4.93
	Persons	4.46	4.09

DALYs: disability-adjusted life years; YLLs: years of life lost; YLDs: years of healthy life lost due to disability

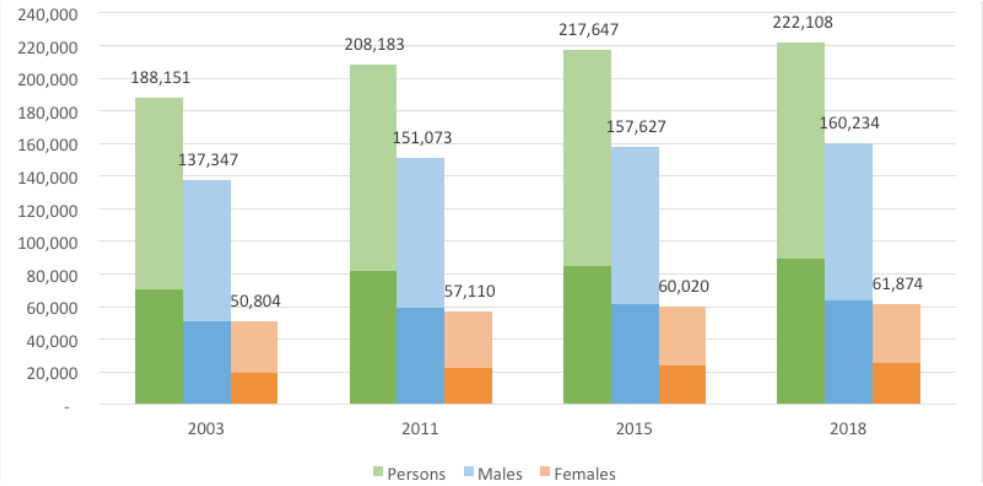
Source: table by authors of present report; original data from Australian Institute of Health and Welfare, Australian Burden of Disease Study 2018

According to the ABDS 2018 estimates, there were 6,512 deaths (4.09% of all deaths) attributable to alcohol in 2018, and this has been steadily increasing over time from 5,034 in 2003 (Figure 7). As a proportion, the deaths attributable to alcohol have risen only slightly over time (Table 2). Figure 7 again shows that the attributable death burden is much higher in males than it is in females.[19]

There are 29 diseases and injuries linked causally to alcohol use in ABDS 2018 (Figure 8). This list is ranked according to proportion of disease burden in terms of DALYs associated with alcohol for all persons (males and females combined). For example, alcohol is associated with 100% of alcohol use disorders in both males and females, 48% of liver cancer burden in males and 21% of liver cancer burden in females. The rest of the top 10 diseases that alcohol is associated with are: nasopharyngeal cancer, other oral cavity and pharynx cancers, lip and oral cavity cancer, road traffic injuries (motorcyclists), other land transport injuries, road traffic injuries (pedal cyclists), road traffic injuries (motor vehicle occupants), and road traffic injuries (pedestrians). Alcohol is somewhat unique, compared with other behavioural or lifestyle-related risk factors, due to the degree that intentional and unintentional injuries and violence contribute to the attributable health burden experienced by the Australian population by gender.[19]

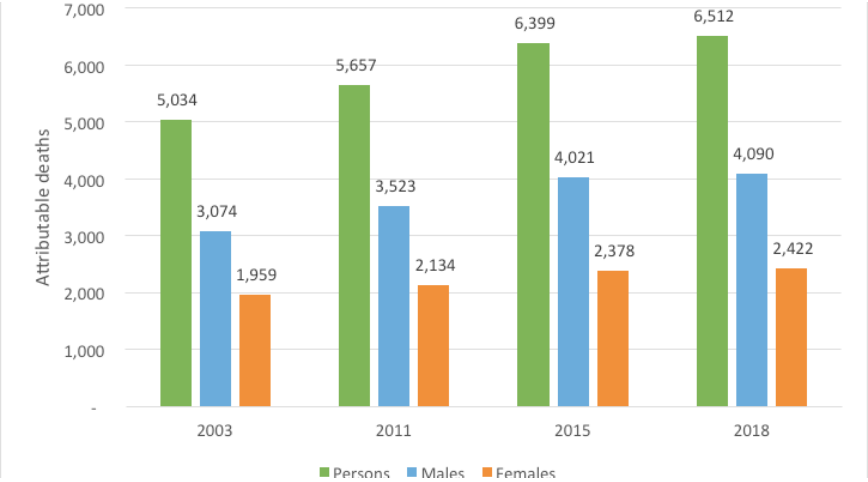
Alcohol use was the fifth highest modifiable risk factor causing preventable health burden in terms of attributable DALYs in 2018 (Figure 9). This has been consistent through time since 2011 (Figure 10).[19]

Figure 6: Overall health burden attributable to alcohol (DALYs) by gender, 2018



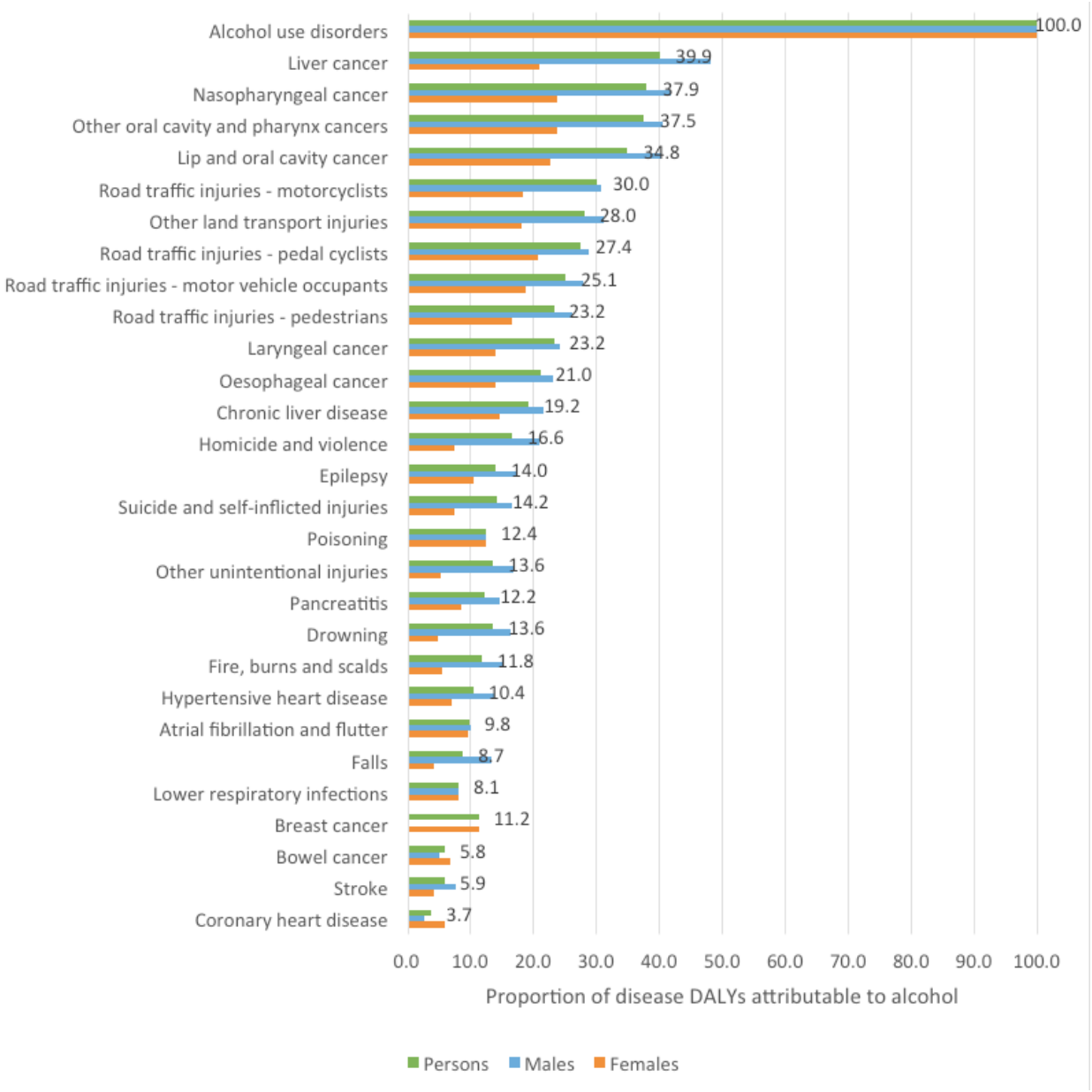
Dark shading is years lived with disability (YLDs; non-fatal burden); light shading is years of life lost (YLLs; fatal burden); DALYs = YLLs + YLDs
DALYs: disability-adjusted life years; YLLs: years of life lost; YLDs: years of healthy life lost due to disability
Source: figure by authors of present report; original data from Australian Institute of Health and Welfare, Australian Burden of Disease Study 2018

Figure 7: Deaths attributable to alcohol by gender, 2018



Source: figure by authors of present report; original data from Australian Institute of Health and Welfare, Australian Burden of Disease Study 2018

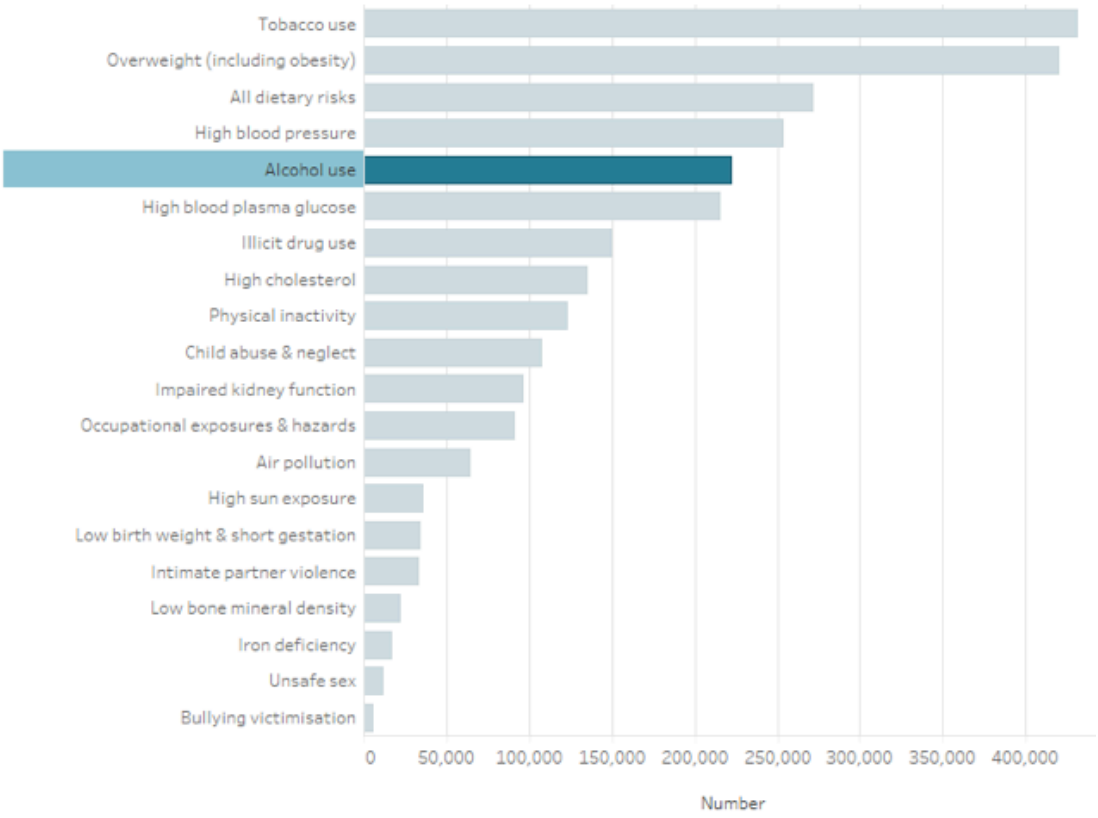
Figure 8: Overall health burden for diseases (DALYs) attributable to alcohol as a proportion by gender, 2018



Source: figure by authors of present report; original data from Australian Institute of Health and Welfare, Australian Burden of Disease Study 2018

Data labels are for total persons

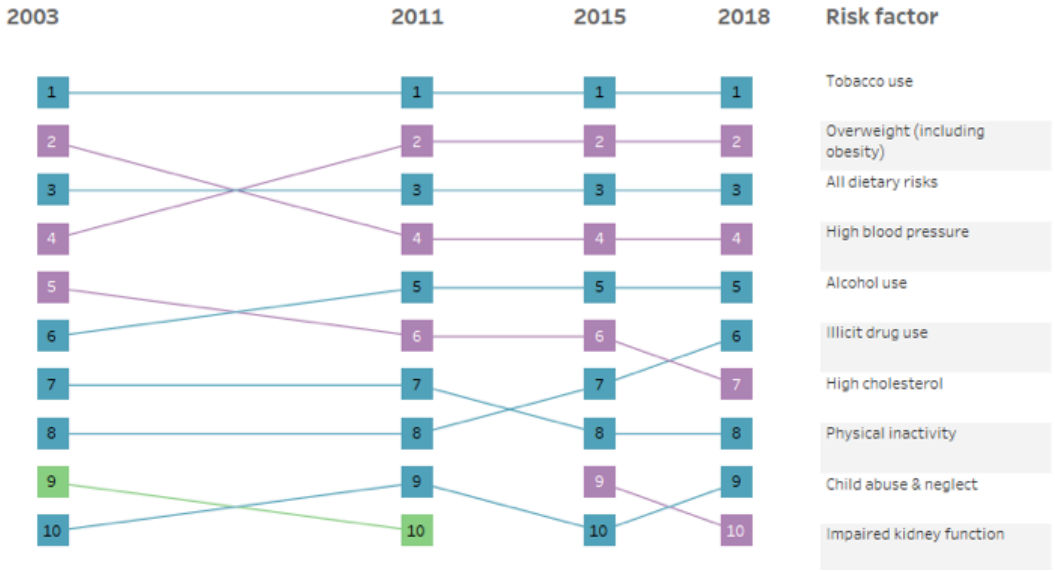
Figure 9: Leading risk factors contributing to disease burden in Australia, 2018



Health burden based on attributable disability-adjusted life years

Source: AIHW Australian Burden of Disease Database. http://www.aihw.gov.au

Figure 10: Ranking by number of leading risk factors contribution to disease burden in Australia, attributable DALYs



Source: AIHW Australian Burden of Disease Database. http://www.aihw.gov.au

Global Burden of Disease Study

The estimates of Australian health burden attributable to alcohol in the Global Burden of Disease Study 2019 (GBD 2019) are higher than in the ABDS 2018 (Table 3, Table 4). This study found that 239,618 DALYs were attributable to alcohol in males and 80,309 DALYs were attributable to alcohol in females, for a total of 319,927 DALYs for both males and females combined. This was 5.1% of overall health burden. Alcohol was attributed to 8,576 deaths (5.02%) in 2019, 6,598 (7.42%) in males and 1,978 (2.41%) in females. Although the estimates are higher, they are similar to ABDS 2018, with a similar spread between fatal and non-fatal burden and the same magnitude of difference between the burden experienced by the different sexes.[20]

Table 3: Health burden attributable to alcohol by gender, GBD 2019

	1999				2019			
	Deaths	YLDs	YLLs	DALYs	Deaths	YLDs	YLLs	DALYs
Male	4,899	48,679	147,359	196,038	6,598	68,119	171,500	239,618
Female	1,193	21,215	37,744	58,959	1,978	30,271	50,038	80,309
Persons	6,092	69,894	185,103	254,997	8,576	98,390	221,537	319,927

DALYs: disability-adjusted life years; YLLs: years of life lost; YLDs: years of healthy life lost due to disability

Source: table by authors of present report; original data from Institute for Health Metrics and Evaluation, GBD Results Tool http://ghdx.healthdata.org/gbd-results-tool

Table 4: Health burden attributable to alcohol as a proportion by gender, GBD 2019

	1999				2019			
	Deaths	YLDs	YLLs	DALYs	Deaths	YLDs	YLLs	DALYs
Male	7.38%	4.44%	9.86%	7.58%	7.42%	4.36%	10.36%	7.47%
Female	1.98%	1.61%	3.63%	2.51%	2.41%	1.63%	4.10%	2.62%
Persons	4.80%	2.90%	7.30%	5.17%	5.02%	2.88%	7.70%	5.10%

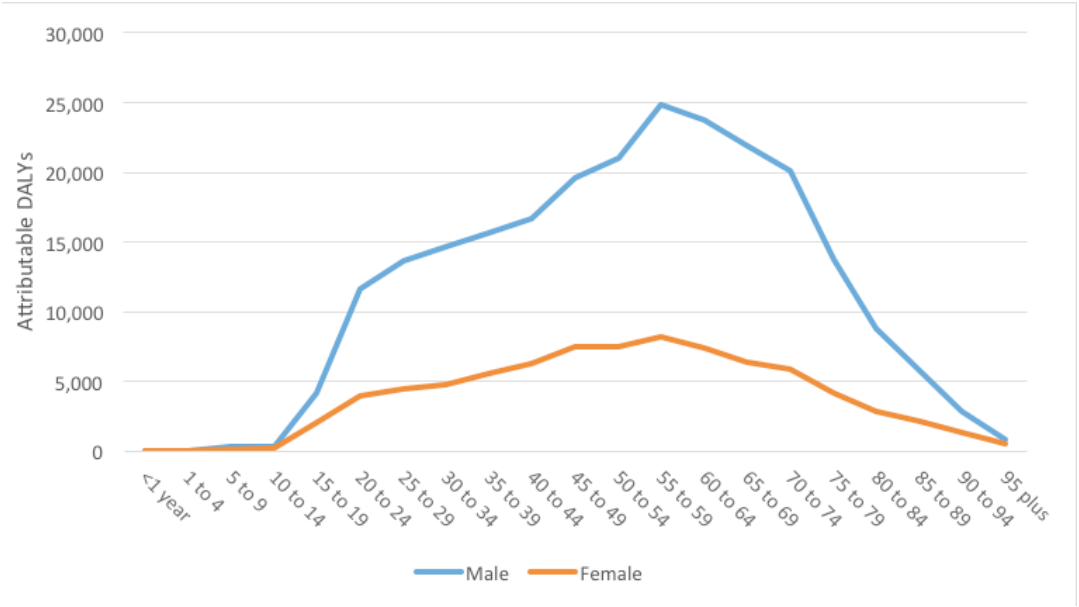
DALYs: disability-adjusted life years; YLLs: years of life lost; YLDs: years of healthy life lost due to disability

Source: table by authors of present report; original data from Institute for Health Metrics and Evaluation, GBD Results Tool http://ghdx.healthdata.org/gbd-results-tool

There are various reasons why the burden of disease studies arrived at slightly different estimates including methodological approach, input data and calculations methods. An example of a difference in methodological approach is the choice of linked diseases for inclusion. ABDS 2018 had 29 linked diseases whereas GBD 2019 had 33 diseases linked to alcohol, due to differing expert advice the analytical teams received in the interpretation of the strength of causality and evolving scientific knowledge. Input data can differ due to choice of sources and the change in those sources, such as risk factor exposure statistics over time. Calculation methods and modelling approaches can also differ due to different disease progression pathways, software, and quantitative coding.

The attributable DALYs and attributable deaths by age group are displayed in Figure 11 and Figure 12 respectively. Attributable DALYs rise steeply in the teenage years and then steadily from the 20s until they peak in the late 50s. Attributable deaths reflects a similar age distribution in health burden and the differences between genders is again pronounced.

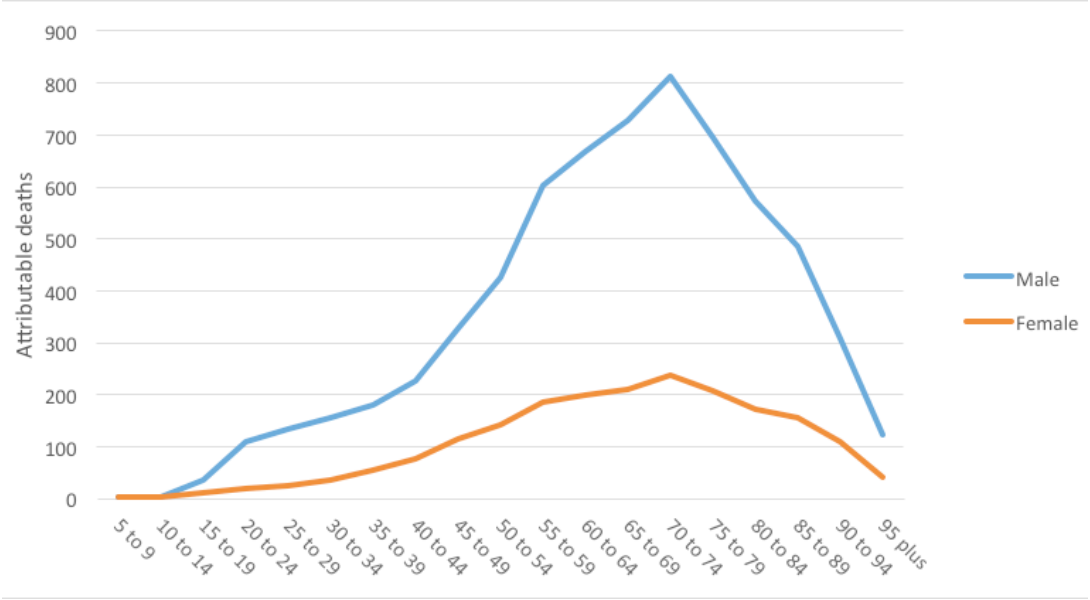
Figure 11: Attributable health burden by age group by age group and gender, DALYs, GBD 2019



DALYs: disability-adjusted life years

Source: figure by authors of present report; original data from Institute for Health Metrics and Evaluation, GBD Results Tool http://ghdx.healthdata.org/gbd-results-tool

Figure 12: Attributable deaths by age group and gender, 2019, GBD 2019



DALYs: disability-adjusted life years

Source: figure by authors of present report; original data from Institute for Health Metrics and Evaluation, GBD Results Tool http://ghdx.healthdata.org/gbd-results-tool

Australian cancer-PAF cohort consortium

Arriaga et al estimated the incidence of cancer and cancer-related deaths attributable to several lifestyle-related risk factors and their combinations by pooling seven Australian cohort studies with 365,173 participants. Other burden of disease studies estimate population attributable fractions (PAF) for combined effects of risk factors by assuming independence between carcinogenic exposures. This study allowed ascertainment of multiple outcomes related to an exposure and thus permitted analyses to account for potential competing risks, such as death, because it used data from cohort studies. This analysis found that consuming more than two alcohol drinks per day was linked to 6% (95% CI 5% to 8%) of cancers over the past 10 years. For men this was 9% (6% to 12%) and women 2% (0% to 4%).[21]

This study also projected that in Australia over the next decade, 15,000 cancers will be attributable to consumption of more than two alcohol drinks per day.[21]

Economic costs

Only two studies were identified on the economic burden of alcohol use in Australia in the scientific literature. The first was a systematic review published in 2019 of five lifestyle-related risk factors, including alcohol, and the economic cost they are linked to.[22] Six studies on alcohol as a risk factor were included in this review. Four of these studies were published as grey literature with the other two in peer-reviewed journals. Only one study would have met the timeframe inclusion criterion of the present review of being published in the last 10 years and this was restricted to links between alcohol use and absenteeism. One study by the NSW Auditor General found that alcohol misuse cost the NSW government $1.3 billion and $645 million in health care costs (indexed to 2016-17 dollars). This study found an additional $2.1 billion in productivity costs to other sectors due to alcohol misuse (indexed to 2016-17 dollars). Three of the remaining studies produced estimates for the entire Australian population, one for working Australians only, and one on people affected by the alcohol use of others. Attributable healthcare costs range from $1.89 billion to $2.58 billion for one year and $2.69 billion over the lifetime of the 2008 population. The studies identified by this review accounted for a diverse range of non-healthcare costs to government, such as taxation effects, road accidents, police, criminal courts, prisons, child protection services and out-of-home community services. The annual cost of traffic accidents and the criminal justice system were the largest in this category, with one study estimating costs of $2.89 billion due to traffic accidents and $1.24 billion of criminal justice system costs attributable to alcohol. Another study estimated that in one year $3.35 billion of criminal justice system costs and $4.14 billion of traffic accidents costs were attributable to alcohol. Negative productivity impacts due to alcohol range from $1.12 billion when considering absenteeism in working adults only up to $6.839 billion in one year when considering wider societal costs. In summary, harmful alcohol use was associated with substantial economic costs and non-health costs are a substantial portion of this.[22]

The second peer-reviewed study included in the present review estimated the revenue generated through the consumption of alcohol collected by both industry and the Government in the form of taxes. The study authors found that revenue generated from alcohol consumption by 12- 25-year-olds in 2010 (2014 dollars) was $2.8 billion to industry in the form of sales and $2 billion to government in the form of taxes. Young people generated $1,805 per drinker per annum in revenue compared with $1,663 for the general population. These are considered to be conservative estimates because prices were taken from the website of a large warehouse-style retail chain and drinkers were assumed to consume only one type of alcoholic beverage. The authors concluded "it would be in the public interest to divert some of this revenue towards health initiatives to reduce drinking by young people, especially given the high societal costs of alcohol consumption". [23]

Three studies were included based on the search of grey literature in Google Advanced. One literature review of health and economic burden in older adults in Australia did not identify any studies on the economic burden specifically in the older population.[24] A factsheet produced by Cancer Council WA summarised various studies on the health and economic burden of alcohol use in both Western Australia (WA) and Australia. The authors found that alcohol use costs the WA community $3.1 billion per year in policing costs, hospitalisations, road crashes and ambulance transportations. Part of this cost is due to the one in six presentations to emergency departments in WA relating to alcohol (in 2018) and 16,387 hospitalisations in WA due to alcohol (in 2012-13). Non-economic burden of alcohol estimates included: 10 deaths, 160 family violence assaults and 315 hospitalisations each week in WA; 3,496 cancers in Australian adults in 2013; more than 10,000 children are in the child protection system because of a carer's drinking and alcohol was a factor in 20% of fatal road crashes in WA, resulting in 33 deaths.[25]

The third study looked at the cost of illness and the social and economic cost of alcohol use in the Northern Territory (NT). "Historically, per capita costs and harms of alcohol consumption in the NT have been the highest in the nation." The authors of this study estimated that the total social cost of alcohol in 2015-16 in the NT was $1.387 billion, consisting of tangible costs of $701.3 million and intangible costs of $685.5 million.[26]

A fourth study was published after the searches were conducted and subsequently included in this report due to its relevance. This study by the National Drug Research Institute estimated the costs of alcohol use in Australia in 2017-18 and was the most comprehensive national analysis of the economic burden of alcohol in over 10 years. One of the key methodological approaches of this analysis was the adoption of three main scenarios due to the emerging evidence on causal relationships, particularly relating to purported protective effects: unmitigated protective effects (low bound); reduced protective effects (central estimates); and no protective effects (high bound). Based on the central estimate of 5,219 deaths and 127,000 hospital separations attributable to alcohol, the net tangible cost was $2.6 billion due to deaths and $700 million due to hospitalisations.

The authors calculated a further $2.1 billion in healthcare costs as well as:

- Productivity costs of $4 billion, mostly due to absenteeism.
- The cost of road traffic crashes was $2.4 billion.
- The cost of alcohol purchases by people with alcohol dependency was $1.1 billion.
- The cost of alcohol-attributable child abuse was $0.7 billion after excluding costs, like health services, that may already be accounted for elsewhere.
- The cost of alcohol-attributable domestic violence was estimated to be $0.9 billion, noting sections that potentially overlapped with other categories such as premature mortality and the criminal justice system were excluded from this category.
- The cost to child protection services and child death reviews attributable to alcohol was $0.5 billion.

The overall tangible cost due to alcohol use was $18.2 billion. The authors estimated another $48.65 billion in intangible costs, which is the monetisation of health loss in terms of premature mortality or disability-adjusted life years. There were three other types of costs estimated in this study but excluded from the overall estimates due to uncertainties in underlying data or risk of double counting: harms experienced by others (for example, women and children living with people with an alcohol dependency); fetal alcohol spectrum disorder (FASD); and presenteeism. The central estimates for these cost categories were: $21.8 billion, $16 billion and $4.92 billion respectively. Together these items add up to a substantial $42.72 billion for the central estimate not otherwise reported in the main overall results. The authors conclude that the extent to which alcohol-attributable harms extend beyond the individual alcohol consumer provides a clear rationale for interventions and policies to minimise these harms.[16]

*Presenteeism is the lost productivity resulting from an employee being at work but at a reduced capacity due to illness or injury.

Review question 2: Benefits of primary prevention addressing alcohol consumption

Summary of findings

The search of five databases of peer-reviewed literature identified 11,891 unique articles after deduplication. Screening based on title and abstract excluded 11,192 of these papers. Remaining papers were prioritised based on the criteria described in the methods section, excluding 448 non-prioritised articles, leaving 275 articles for full-text review. A total of 105 of these were excluded based on full-text review due to the type of study (11), type of intervention (46), topic (7), country (3) or other reasons (38). This left 170 articles for inclusion in this report (Figure 13).

Figure 13: PRISMA screening flow diagram for review question 2

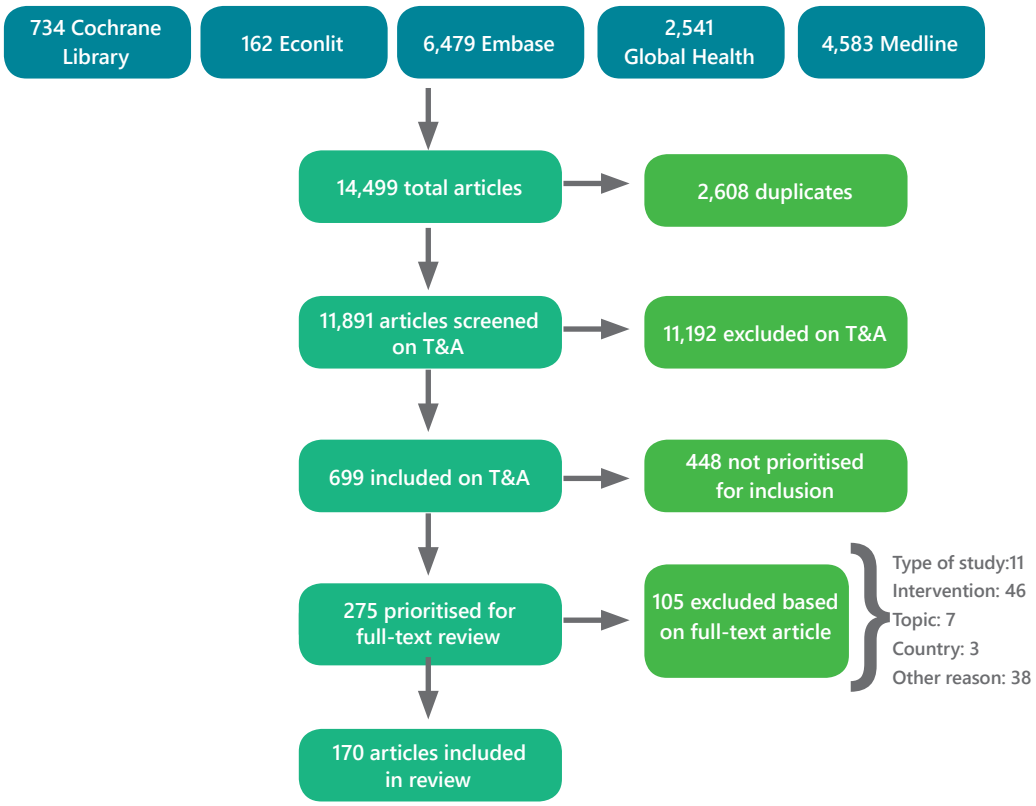


Table 5: Summary of studies included for review question 2

Prevention strategy	Umbrella review & meta-analysis	Umbrella review	Systematic review and meta-analysis	Systematic review	Non-systematic review	Single comparative study	Modelling study	Systematic review (economic)	Cost-effectiveness analysis	Total
Built environment (association)				5		1				6
Built environment (intervention)			1	5	2	29	6			43
Health promotion (settings based)		1	4	11	1	8		1	1	27
Health promotion (eHealth & mHealth)			8	16		3			1	29
Health promotion (other)				3				1		4
Health promotion (social norms or peer based)		1	2							3
Healthy lifestyle				1	1					2
Mass media campaigns and social marketing		1	1	4		4				10
Multiple strategies and multi-component interventions		8	3	15	3	8	2	1	3	43
Other				1		2				3
Total	1	11	19	61	7	55	8	3	5	170

Multiple strategies and multi-component interventions

This section summarises the evidence available from studies investigating multiple strategies and multi-component interventions. Most of these studies are broad systematic reviews of various alcohol control policies or umbrella reviews (systematic reviews of systematic reviews). We have also included multi-component interventions where several different strategies are implemented at once in a particular location or population.

Alcohol control policies

The available evidence on alcohol control policies concludes they are effective and cost-effective, particularly policies that target access, availability and affordability or pricing of alcohol. These policies and strategies tend to be more effective compared to education and information-based strategies. The evidence also suggests that addressing alcohol use and harms requires multiple policies and actions at both population and individual level.

There were five studies that took a broad approach to capturing the available evidence on all the main alcohol control policies and interventions.

A comprehensive evidence review commissioned by Public Health England examined the burden of alcohol use in England and a range of alcohol control policies that could be used to reduce this burden. The review and companion article published in The Lancet contained a substantial amount of high-level evidence (i.e. systematic reviews) and individual studies, although the evidence from the individual studies is understandably tailored to the English context. The intervention categories from this review, relevant to this report, include: trading hours, education programs, the drinking environment (night-time economy), and multi-component interventions (which consist of local community-based prevention coordination, increased enforcement and serving practices). The headline findings for these interventions are that "an adequate reduction in temporal availability, particularly late night on-trade sale availability, is effective and cost-effective" when targeted at the most densely populated areas. Enforced legislative measures are also effective. The authors found that the group of interventions including mass media campaigns, social norms, social marketing, education programs at schools and universities, and labelling, increased awareness but were not sufficient to produce long-lasting changes in behaviour. The authors noted the lack of effectiveness of education and information campaigns may be due to the widespread and unrestricted marketing of alcohol. Regarding the night-time economy, "at best, interventions enacted in and around the drinking environment (the night-time economy) lead to small reductions in acute alcohol-related harm". The authors also concluded that local multi-component community programs were effective, cost-effective and amenable to local implementation, however, this was predominantly based on evidence from Sweden. This study included several other popular interventions excluded from the present review.[27,28]

The Organisation for Economic Co-operation and Development (OECD) prepared a report that contained a broad, overarching review of the evidence of harm caused by alcohol in all OECD countries. The authors of this report also conducted cost-effectiveness modelling of a variety of alcohol control policies, however, this was restricted to Canada, the Czech Republic and Germany and only regulation of opening hours and school-based programs met the inclusion criteria for the present review. The headline conclusion of the report was that the "evidence of the magnitude of the risks associated with harmful alcohol use and of the effectiveness of many policy options to address those harms, has never been so abundant and detailed as it is today". They found regulatory policies were cost-effective and substantially less expensive to implement compared with those that are delivered in the healthcare setting, drink-driving restrictions and workplace policies. The combined impacts of multiple policies will be larger than those of individual policies. A multi-pronged approach may create a critical mass effect that would make a change in the social norms on alcohol drinking behaviours more likely. In regard to the policies of most relevance to the present review, opening hours restrictions were likely to free approximately 25,000 working males and 2,000 working females of alcohol-related diseases each year in Canada. Opening hours restrictions, with enforcement, was estimated to cost Canada approximately $10 million per year and result in approximately $25 million in healthcare cost savings per year. The incremental cost effectiveness ratio (ICER) for opening hours regulation was approximately US$7,500 per DALY for Canada. For school-based programs the effect size was very small or not significant. Where results were presented by gender, there was a tendency for greater impacts for

males due to the greater burden experienced by them and a higher likelihood to be in paid employment with accumulating productivity gains.[29]

The most recent of the umbrella reviews by Siegfried et al.[30] sought to thoroughly assess the systematic review level evidence on alcohol control policies generally. This umbrella review included 42 systematic reviews on alcohol control policies and was unique by not applying any language restrictions nor country restrictions and using the ROBIS tool for data extraction and quality assessment. The use of this tool means this study casts a more critical eye over the included systematic reviews and conclusions of the evidence based on this. The authors found that the following interventions are "possibly beneficial": community mobilisation, multi-component interventions in the drinking environment; restricting alcohol advertising; restricting on and off premise outlet density; police patrols and ignition locks to reduce drink driving; and increasing price and taxation including minimum unit pricing. The authors noted the field, in general, lacks controlled studies, with few investigators utilising newer methods of policy evaluation including implementation science and pragmatic randomised trials. These newer methods may be better suited because alcohol control interventions tend to be complex, multi-faceted, and often multi-sectoral. The umbrella review authors determined that evidence on Indigenous community-led legal interventions to control alcohol was uncertain due to the high risk of bias of the single systematic review included.[30]

Another umbrella review by Mewton et al sought to synthesise evidence from existing reviews on the evidence for universal alcohol and illicit drug prevention strategies across different intervention settings. Fifty-two reviews were included. The authors concluded "there is sufficient evidence to support universal preventive interventions for alcohol in family and school settings. More evidence is needed to support preventive interventions in college, workplace, healthcare and community settings". The review also had a focus on Aboriginal and Torres Strait Islander peoples, older populations and internet-based preventions. although limited evidence was identified for the Australian context.. Supply reduction strategies that work to prevent substance use amongst Aboriginal and Torres Strait Islander peoples include taxation, restrictions on trading hours and alcohol outlets, dry community declarations, Opal fuel substitution and culturally sensitive law enforcement. However, this conclusion was based on one included review with limited data. This study found a lack of evidence on population-wide interventions targeting alcohol use amongst older people and identified only one review with two relevant studies which did not find significant effects of internet-based interventions targeting alcohol use. School-based interventions facilitated online may be effective based on two other reviews.[31]

The objective of the final umbrella review by Martineau et al was to identify systematic reviews on the effectiveness of population-level alcohol interventions and consumption or alcohol-related health or social outcomes. Fifty-two reviews were included covering 10 policy areas. The headline conclusions of this study found there is good evidence for policies and interventions to limit alcohol sale availability, to reduce drink-driving, to increase alcohol price or taxation. There is mixed evidence for family and community-level interventions, school-based interventions, and interventions in the alcohol server setting and the mass media. There is weak evidence for workplace interventions and for interventions targeting illicit alcohol sales. There is evidence of the ineffectiveness of interventions in higher education settings".[32]

There were also another three studies that looked at the impact of multiple alcohol control strategies and policies.

Chisholm et al use the WHO/United Nations (UN) OneHealth modelling tool to conduct cost-effectiveness analysis of a range of interventions. However, the majority of interventions analysed in this study were excluded from the present review. Only one intervention met the inclusion criteria: enactment and enforcement of restrictions on the physical availability of retailed alcohol via reduced hours of sale. The authors found that the average cost-effectiveness ratio across the nine upper-middle and high-income countries was I$181[$] per healthy life year gained (i.e. was cost effective).[33]

[$] International dollars is a hypothetical unit of currency that has the same purchasing power that the US dollar had at a given point in time.

Fitzgerald et al conducted an umbrella review of the gender differences in the impact of population-level alcohol policy interventions. The umbrella review included systematic reviews on most of the areas captured by the present review:

- drinking environment/alcohol server settings - six reviews
- sales availability (including opening hours and outlet density) - eight reviews
- mass media and social marketing - seven reviews
- schools - seven reviews
- higher education - five reviews
- family and community - four reviews
- workplace - four reviews.

Five studies in one of the included reviews suggested increasing outlet density was associated with an increase in consumption or harms including suicides, night-time crashes and assaults in males but less so in females. However, another review found the associations were more mixed. In summary, although 63 systematic reviews covering 10 policy areas were included, the authors found that gender is "poorly reported in systematic reviews of population-level interventions to reduce alcohol-related harm, hindering assessment of the intended and unintended effects of such policies on women and men".[34]

A systematic review on the impact of alcohol policies on suicidal behaviour found 19 studies that met the inclusion criteria. The majority of these studies found associations between the impact of restrictions on alcohol availability and increased cost of alcohol with reduced suicides across Western and Eastern Europe, as well as the US. The studies that examined the effect of increased alcohol availability and decreased cost did not yield as consistent a message. The anti-suicide effects associated with restricting alcohol use were predominant in males. [35]

Cancer prevention strategies

While some lifestyle-related strategies aim to address cancer risk and enhance prevention, only two studies were included in this section. One systematic review did not find any cost-effective lifestyle-related interventions for alcohol and cancer prevention. The other study suggested that public health policies implemented in Australia in the latter half of the 20th century helped to reduce cancer-related mortality from alcohol use.

Two studies focused on multiples strategies related to the prevention of cancer and both are relatively recent.

Bellanger et al conducted a systematic review of cost-effectiveness analyses of lifestyle-related interventions for the primary prevention of breast cancer. They did not find any studies for alcohol that met the inclusion criteria. They did find six studies indicating that diet-related and physical activity-related interventions for the primary prevention of breast cancer were cost effective.[36]

The second study of multiple interventions relating to cancer was a modelling study on the effectiveness of several policies and regulations in Australia. Results supported the proposition that key public health policies implemented from 1960-1980s that control alcohol consumption were effective in reducing cancer mortality in the long term (e.g. random breath testing program). However, some policies such as liquor licence liberalisation in the 1960s was significantly associated with increases in the level of population drinking and thereafter of male cancer mortality.[37]

Alcohol control policies and violence prevention

Three reviews considered the impact of multiple strategies on preventing violence. There is some albeit limited evidence that alcohol policies could prevent intimate partner violence, however, more research is needed.

A systematic review examined the evidence on the effect of alcohol policies in preventing intimate partner violence (IPV). The authors concluded that higher density of alcohol outlets appears to be associated with greater rates of IPV. For example, one included study reported an increase of 10 alcohol outlets per 10,000 persons was associated with 34% increase in male-to-female partner violence. However, there was limited evidence suggesting that alcohol pricing policies and restrictions on hours and days of sale were associated with IPV outcomes. Knowledge about the impact of alcohol-related policies on IPV and violence in general is limited by several significant research gaps.[38]

Another systematic review on IPV was conducted by Wilson et al. This systematic review identified 11 studies that included outcomes measures for IPV related to alcohol control interventions. There was weak evidence of an association with IPV due to community-level policies or interventions such as hours of sale and alcohol outlet density. The authors concluded that although there is evidence for an association between problematic alcohol use with IPV, the potential for alcohol interventions to reduce IPV has not been adequately tested.[39]

The objective of an umbrella review by Lippy et al was to identify high-level systematic review level evidence or government reports on sexual violence outcomes associated with alcohol control policies, not all of which were interventions of interest for the present review. The authors found that early evidence suggested there was an association between alcohol pricing, alcohol outlet density, bar-room management, sexist content in alcohol marketing, and policies banning alcohol on campus and in substance-free dorms. Outcomes on violence in general and alcohol consumption were also summarised and reported.[40]

Multiple strategies targeting children and adolescents

A large amount of high-level evidence was identified on multiple strategies reducing alcohol consumption in children and adolescents, including one umbrella review and many systematic reviews. School-based strategies tend to be the most common, however, there are also individual, family and community-based programs. In summary, the systematic reviews considering multiple types of interventions targeting alcohol use in adolescents in schools and other settings present inconsistent conclusions about the effectiveness or lack of effectiveness of these interventions. In general, more recent and thorough systematic reviews tend to make less positive conclusions about the evidence-base. The strongest evidence, relatively speaking, appears to support universal interventions delivered in school-based settings and the umbrella review lists the specific types of interventions as: personalised feedback, moderation strategies, expectancy challenge, identification of risk situations and goal setting. Family-based, internet-based and policy initiatives are generally less supported by existing evidence as are information and education campaigns.

The section on schools under Multiple strategies differs from the section on schools under Settings-based health promotion because the reviews described here tend to encompass a broader set of interventions beyond health promotion, although they may include health promotion approaches.

The umbrella review identified 46 systematic reviews on interventions for smoking, alcohol use, drug use and combined substance misuse. Eight of these were for alcohol use. The systematic reviews on alcohol use found that school-based alcohol prevention interventions have been associated with reduced frequency of drinking, while family-based interventions have a small but persistent effect on alcohol misuse among adolescents. The school-based prevention interventions included personalised feedback, moderation strategies, expectancy challenge, identification of risk situations and goal setting, which were associated with reduced frequency of drinking. The authors of the umbrella review found that evidence from internet-based interventions, policy initiatives and incentives appeared to be mixed and needed further research. They concluded that their review highlighted "school-based delivery platforms are the most highly evaluated platforms for targeting adolescents for substance abuse" but there was a lack of data to determine the differential effects of interventions by gender, socioeconomic status and population density. [41]

The most recently published systematic review was a Cochrane review that sought to identify the evidence on family-based prevention programs for alcohol use in young people. Although the research team included 47 studies and conducted meta-analysis, they concluded there were no clear benefits of family-based programs for alcohol use among young people. Quality of the evidence was assessed using Grading of Recommendations Assessment, Development and Evaluation (GRADE) and quality of studies ranged from very low to low. [42]

A systematic review published in 2018 also contained a meta-analysis and an analysis of individual, family and school-level interventions targeting multiple risk behaviours in young people. There were 67 studies included from high-income countries and 53 out of 70 studies included alcohol in their multiple-risk behaviour intervention. Overall, evidence from meta-analyses showed that on average, universal school-based interventions probably have a positive effect in relation to alcohol use. Family-level interventions had little to no evidence of effect, except for one targeted family-level intervention. GRADE was used to assess quality and the research team found the quality of studies for alcohol interventions was moderate. [43]

Tremblay et al.[44] reviewed the effectiveness of primary prevention programs for children and youth targeting substance use. Among studies with large sample sizes, studies on the LST (life skills training) program demonstrated reductions in the use of substances, including both alcohol and drugs. Other programs such as DARE, Project Choice, and the Adolescent Alcohol Prevention Trial resulted in reduced alcohol use and improved knowledge. One program also found mental health benefits such as a reduction in anxiety and improved relaxation skills.

A systematic review of combined student and parent-based programs to prevent alcohol and other drug use among adolescents identified 22 relevant studies. Six programs demonstrated significant intervention effects in terms of delaying or reducing adolescent alcohol use in at least one trial. These programs included a student and parent component. Activities included online, hard-copy information leaflets and booklets, pamphlets, game packets, postcards, telephone-delivered and in-person delivery of lessons, consultations and activities, peer-leadership and media campaigns. Although positive outcomes were observed in both the earlier and later phases of the original trial of Project Northland, iatrogenic effects were found when students were in grades 9 to 10. That is, the intervention group showed significantly greater growth over time than the control students in their tendency to use alcohol, past month alcohol use and binge drinking.[45]

One systematic review on the impact of school policies on various non-communicable disease risk factors identified one study on alcohol policy out of 27 included studies. Low policy enforcement in schools on alcohol use has a significant association with desired outcomes of reduced alcohol intake although abstinence messaging and harm minimisation messaging was less effective. [46]

The WHO conducted a systematic review and meta-analysis on preventing youth violence which included some alcohol interventions. They found that across different studies, earlier closing times for pubs and increased alcohol pricing reduced alcohol consumption and alcohol-related harm or alcohol-related violence. The research team also included a systematic review of school-based education programs on responsible alcohol use and found them to have no effects in reducing alcohol-related harm. [47]

Hale et al conducted another systematic review of interventions for reducing multiple risk behaviours in adolescence. Although 55 studies describing 44 interventions were included, most studies that sought to reduce alcohol use also aimed to reduce other substance use and risky behaviours so it is difficult to disentangle intervention effectiveness on the reduction of alcohol consumption specifically, particularly considering the objective of this study related to multiple risk behaviours. One study focusing specifically on alcohol prevention in adolescents with a four-year follow-up found a reduced growth for recent alcohol use compared to the comparator cohort, lifetime alcohol use, and lifetime drunkenness. An important limitation of this systematic review was that it only included studies in which the intervention was effective for two or more risk behaviours. [48]

Another systematic review looked at the effects of the school environment on student health. This review aimed to assess outcomes of school-based tobacco and alcohol interventions and effects of the school environment. One study mentioned the impact of allowing drinking at school on special occasions. Other studies describing alcohol use referenced effect of neglected environment versus an attractive physical environment. The authors found "there was consistent evidence that schools with higher attainment and attendance than would be expected from student intake had lower rates of substance use. Findings on the influence of smoking/alcohol policies were mixed. Three studies examined the health effects variously associated with school campus area and observability, year structure, school size and pupil-to-teacher ratio with mixed findings". [49]

In 2011 a series of three Cochrane systematic reviews was published by the same research team on different settings for reducing alcohol use in adolescents. The first focused on family-based prevention programs for alcohol misuse in young people, the second on school-based programs and the third on multi-component prevention programs. The review on family-based prevention programs found that nine of the 12 included trials showed some evidence of effectiveness compared to a control or other intervention group, with persistence of effects over the medium and longer-term. One study with a small sample size showed positive effects that were not statistically significant, and two studies with larger sample sizes reported no significant effects of the family-based intervention for reducing alcohol misuse.[50] The second review on school-based prevention programs for reducing alcohol use found that six of the 11 trials evaluating alcohol-specific interventions showed some evidence of effectiveness compared to a standard curriculum. In 14 of the 39 trials evaluating generic interventions, the program interventions demonstrated significantly greater reductions in alcohol use either through a main or subgroup effect. Gender, baseline alcohol use, and ethnicity modified the effects of interventions.[51] In regard to the review on multi-component interventions, 12 of the 20 trials showed some evidence of effectiveness compared to a control or other intervention group, with persistence of effects ranging from three months to three years. Of the remaining eight trials, one trial reported significant effects using one-tailed tests and seven trials reported no significant effects of the multi-component interventions for reducing alcohol misuse.[52]

Multi-component strategies and interventions, including local or community-based interventions

Most of the evidence supports the effectiveness of multi-component interventions targeting multiple parts of the alcohol consumption system. For example, a coordinated, cross-government/agency approach to preventing alcohol misuse and harms. Similarly, other studies concluded that reducing the harms from alcohol consumption requires a suite of interventions at the local level, such as combining access restrictions (outlet density and days and times of sale) with localised access to health promotion programs, mass media campaigns and support through the health system.

Anderson et al conducted an umbrella review to identify systematic reviews on city-based action in high-income countries. This study identified five reviews for inclusion looking at evidence-based policies and programs that could be implemented at a city or municipal level to reduce harms associated with alcohol. The authors found that alcohol likely requires a suite of interventions at a local level; for example, combining access restrictions (outlet density and days and times of sale) with localised access to health promotion programs and support through the health system. However, no comprehensive coordinated municipal/city action plans were identified that addressed and evaluated all of these strategies. This is a major gap in the evidence base for alcohol compared to other areas of public health, such as smoking, obesity, physical activity. Effective strategies have included local level taxation, outlet density, restrictions on days and hours of sale, restricting advertising, random breath testing, digital interventions, and primary healthcare screening. There was mixed or limited evidence for bar policies, changing social norms information/education, and alcohol content reformulation. There was evidence of ineffectiveness for designated driver campaigns, workplace-based programs, school-based programs, and public information campaigns.[53]

Porthe et al conducted a recent systematic review on community-based interventions to reduce alcohol consumption in adults. This systematic review identified eight primary studies on community interventions to reduce alcohol consumption and harm among adults. The six studies that were found to be effective included three components: community mobilisation, law enforcement and media campaigns. Effective interventions combined approaches at individual and environmental levels addressing structural determinants of health and some cultural aspects related to consumption. Community mobilisation was seen as an important component to effectiveness and although this differed between studies generally involved multidisciplinary stakeholders and sectors, such as schools, sports centres, health services, police and religious centres. Media campaigns and law enforcement were also considered important. The two studies that found no effect were based on liquor accords, which are voluntary agreements between members of local areas to deal with alcohol misuse and ensure safe environments with a strong police control and compliance with regulations.[54]

Stockings et al conducted a systematic review of whole-of-community interventions to reduce population-level harms arising from alcohol and other drug use. Twenty-four studies from 63 publications were included involving 249,125 participants. Only two trials were from Australia. One Australian study found a 64% reduction in sexual assaults but no change in non-sexual assaults. The other Australian study (the AARC study) found reductions in verbal abuse and average alcohol consumption but no change in alcohol-related crime, alcohol-related assaults, alcohol-related street offences, and injuries. The review overall found that interventions to reduce alcohol and other drug use applied to whole communities have resulted in small reductions in risk alcohol consumption but have had little impact on past month alcohol use, binge drinking and most studies are subject to high risk of bias.[55]

Giesbrecht et al conducted a review on implementing and sustaining effective alcohol-related policies at the local level. The authors found community-based initiatives have been shown to bring positive outcomes, including increased support for restrictions in marketing and price controls, decreased alcohol sales to minors and reduced consumption by youth, reduction in drink driving arrests and fatal crashes, and declines in violent crimes and assault injuries. However, the positive impact of interventions seemed to reduce over time. Examples from countries suggested that local level efforts that focus on alcohol sales and service can be successful at reducing underage access and service to over-intoxicated persons. There is some indication that such efforts can also reduce violence and alcohol-related problems. They found the following elements essential to sustain local policy interventions: community engagement, local capacity, monitoring implementation, and sufficient resources (e.g. funding).[56]

Curtis et al conducted a time series analysis to examine the effectiveness of community-based interventions for reducing alcohol-related harm in two metropolitan and two regional sites in Victoria. This study found there were no health or social benefits from voluntary interventions introduced by local liquor accords during the period studied across four sites in Victoria. The authors suggest that more effective interventions are likely to be mandatory, evidence-based regulatory interventions such as reducing access through closing times and increased taxation of alcohol.[57]

Miller et al conducted another time series analysis specific to Australia by investigating whether community interventions targeting licensed venues reduce alcohol-related emergency department (ED) presentations. The community interventions were not associated with reduced alcohol-related attendances in the ED. The kind of interventions included in this study were the police-licensee Night-Watch Radio Program (NWRP), the identification scanners initiative at licensed venues, the Victoria Police Operation Nightlife 2 (combination of ID scanner, NWRP, CCTV), and the alcohol awareness campaign JustThink (endorsed by football stars/celebrities). Although this study did not find evidence of an effect, it should be noted the outcome measure was restricted to ED presentations. [58]

Navarro et al conducted a cost-benefit analysis of increasing community and liquor licensee awareness, policy activity and feedback, with a focus on benefits in terms of alcohol-related violent crime. The intervention was a multi-component intervention across 10 communities in NSW on weekends that were identified as being historically problematic. The authors found no effect on alcohol-related assaults and a small effect on alcohol-related sexual assaults. The additional average total cost of the intervention for the experimental communities for all targeted weekends was estimated as $187,905. The value of the benefit of the intervention in achieving a statistically significant reduction in alcohol-related sexual offences in the experimental, relative to control, communities was estimated as $4,126,123. Despite the small degree of effects of the intervention, the benefit-cost ratio was estimated as 22:1 and the net social benefit was estimated as $3,938,218.59

Quigg et al conducted a pre-post study of a multi-component intervention in the UK called Drink Less Enjoy More. This intervention included three interacting components: community mobilisation and awareness-raising; responsible bar server training; and active law enforcement of existing legislation prohibiting sales of alcohol to, and purchasing of alcohol for, a person who appears to be alcohol intoxicated. One of the limitations of this study was that it reported only intermediate outcomes, rather than actual changes in alcohol consumption or subsequent health impacts. The intervention was associated with a reduction in sales of alcohol to pseudo-intoxicated patrons in on-licensed premises in a UK nightlife setting and an improvement in nightlife patron awareness of associated legislation in the UK. Compared to pre-intervention, the odds of alcohol sale refusals were more than 14 times higher at follow-up.[60]

Shakeshaft et al conducted a cluster randomised controlled trial in NSW for a multi-component community-based intervention. The intervention included a range of options such as community engagement, GP training, feedback to key stakeholders, a media campaign, workplace policies, school-based intervention etc. There was insufficient evidence to conclude that the community-based interventions were effective in the intervention group compared with the control group. [61]

Atkinson et al conducted modelling using system dynamics to investigate the potential effectiveness of a range of state-based or local community interventions. Four scenarios were modelled: 3 am closing time and 1 am lockouts; 3 am closing times; expansion of alcohol treatment services; 3 am closing times, 1am lockouts and expansion of treatment services. The greatest health benefits came from combining interventions (3 am closing times, 1 am lockouts and expansion of alcohol treatment services) which resulted in a 33.3% reduction in acute harms, 36.6% reduction in emergency department presentations and a 37.2% reduction in hospitalisations over a four year period. This study looked at both acute and chronic harms.[62]

Bolier et al conducted a review of intervention studies targeting alcohol and drug prevention in nightlife settings. They included 17 studies in their review, 15 of which were focused on alcohol. The studies examined a range of interventions such as community-based interventions; alcohol server interventions (e.g. responsible service of alcohol); educational interventions; and policy interventions. The study suggests that more effective strategies are those which combine multiple interventions, are embedded within the community, and include enforcement mechanisms. The authors also noted the evidence base for educational interventions in nightlife settings is very limited.[63]

Brennan et al reviewed the evidence on interventions for disorder and severe intoxication in and around licensed premises. Interventions included those targeting licensed premises, such as responsible beverage service training, identification checking and premises risk assessments. Interventions reviewed also included community-level interventions such as police enforcement of licensing laws and/or licensee accords. This review found that some multi-component interventions were likely to be effective. The authors concluded that night-time economy interventions targeting licensed premises and areas can have some positive benefits but there is limited evidence overall that they reduce intoxication and disorder. There are some benefits in terms of reduction in assaults, aggression and alcohol-related injuries.[64]

Jones et al conducted a systematic review of interventions for reducing harm in drinking environments with 39 studies. The review had a variety of intervention components based on server and patron interventions, policing and enforcement approaches, and multi-component programs. The authors indicated that effective delivery of multi-component programs in drinking environments may reduce alcohol-related harm and consequently costs to health services, criminal justice agencies and a range of other public services. However, these findings were limited by the methodological shortcomings of the included studies.[65]

Wright et al.66 looked at the effect of alcohol policy change in the Northern Territory (NT) on intensive care unit (ICU) admissions in Central Australia. In 2018 a floor price or minimum unit price (MUP) for alcohol was introduced at AUD$1.30 per standard drink and the introduction of Police Auxiliary Liquor Inspectors (PALIs). This resulted in a 38% relative reduction in ICU admissions associated with alcohol misuse as well as a marked reduction in trauma admissions. This reduction in alcohol-related harm is suggestive of the effectiveness of the NT's policy reforms. Fiscal interventions such as a MUP were excluded from the present review but this study has been included due to the integration of PALIs in the intervention.

Health promotion programs and strategies

Health promotion programs included any intervention targeting individuals or groups using health promotion and/or education principles, such as improving knowledge, providing health information and feedback, changing attitudes and intentions, and changing health behaviour.

Some 61 studies were identified and categorised as health promotion including computer or internet-based (eHealth) interventions as well as mobile phone, text message and app-based (mHealth) interventions (n=27); settings-based health promotion in schools, families, universities, sports clubs and workplaces (n=27); other health promotion and education programs and strategies (n=7), including social norms or peer based (n=3).

eHealth and mHealth

Health promotion through eHealth and/or mHealth interventions had a mixed body of evidence in terms of effectiveness and benefits. The 27 studies in this category included 23 reviews and/or meta-analyses and four single studies. Some reviews suggested these could be effective interventions for reducing short-term alcohol use and other alcohol-related outcomes, including behavioural intentions and attitudes. Most reviews of interventions only included alcohol-related outcomes, with very few including non-health benefits. Many interventions were short-term (<6 months) with limited follow-up beyond 12 months and relied mostly on user-reported alcohol use. It should be noted that a small number of reviews indicated some eHealth or mHealth interventions could increase alcohol use. There was very limited evidence about cost-effectiveness of these interventions, though some reviews and one cost-effectiveness analysis indicated that eHealth or mHealth interventions could be cost-effective.

Reviews and meta-analyses

The 23 studies identified included an umbrella review, systematic review and/or meta-analysis. Nine of these studies looked at eHealth while 9 studies looked at mHealth) and four looked at both eHealth and mHealth.

An umbrella review and meta-analysis by Gold et al.[67] looked at the effectiveness of digital interventions (both eHealth and mHealth) addressing cardiovascular disease risk behaviours (alcohol, tobacco, diet, physical activity) in the general adult population. Six reviews focused only on alcohol, finding that digital interventions can reduce alcohol consumption, but the effect sizes were small. Effectiveness seemed to decrease over time and there were mixed results regarding the sustainability of interventions (none had a follow-up after 12 months). Furthermore, it was not clear from the reviews whether digital interventions were necessarily any more effective than active controls.

eHealth

eHealth interventions commonly included computer and internet-based programs to address alcohol use.

Some of these reviews were conducted in university (college) student populations. For example, Bhochhibhoya et al.[68] reviewed the evidence on using the internet to prevent binge drinking with the study finding that internet-based brief interventions can reduce risky drinking among young people, and are more effective when delivered periodically compared to one-time interventions. All studies but one reported a significant reduction in the frequency and quantity of alcohol consumption and problems related with heavy drinking. Internet-based interventions appeared to be more effective than traditional print-based interventions although face-to-face interventions were typically more effective. Periodic interventions were also more effective than one-off interventions.

Prosser et al.[69] also conducted a systematic review as well as a meta-analysis of e-interventions to reduce alcohol consumption in university and college students. The majority of these interventions were web-based personalised feedback. The review found e-interventions are effective at reducing the number of alcoholic drinks students consume per week. In addition, web-based personalised feedback was found to be the most effective of the e-interventions, while there was not good evidence of a difference in efficacy of e-interventions between 'at risk' and 'any drinkers'. However, the beneficial effects of e-interventions disappeared after six to 12 months. The authors also noted more recent studies showed smaller effect sizes compared to pre-2012 trials.

Cadigan et al.[70] compared personalised drinking feedback of computerised interventions versus in-person interventions, mostly in college students. At short follow-up (<4 months), there were no differences between in-person and computer-delivered on any alcohol use variable or alcohol-related problems. At long follow-up (>4 months), in-person interventions were more effective than computer delivered at impacting overall drinking quantity and drinks per week. Long-term benefits beyond 12 months were not measured.

Oosterveen et al.[71] found that one-off eHealth interventions with personalised feedback about alcohol intake for young adults can significantly lower the mean number of drinks consumed per week. They also noted the potential benefits of wide reach from these interventions.

Kemp et al.[72] looked at the effectiveness of family-based eHealth interventions targeting cardiovascular disease risk. Three of the included studies measured adolescent alcohol use and/or parental alcohol use. All studies reported a significant reduction in alcohol use from baseline to follow-up.

Champion et al.[73] conducted a systematic review and meta-analysis to assess the effects of school-based eHealth interventions on risky health behaviours, such as alcohol consumption, tobacco smoking, and consumption of snack and sugar-sweetened beverages. No effect was seen for alcohol consumption in the six studies reporting alcohol outcomes. Other earlier reviews by the same research group found that school-based alcohol and drug prevention programs facilitated by computers or the internet resulted in health benefits including small reduction in alcohol use in the short term as well as improved knowledge about alcohol use[74,75] Other benefits included less school truancy and psychological distress.[75] However, longer term benefits were not measured.

Other reviews on multiple risk factors included a systematic review of computer-based educational games about alcohol and other drugs for adolescents. [76] This review included only eight trials and found that educational games on alcohol use associated with at least one of the following benefits: increased knowledge of drug misuse prevention; reduction in harm from alcohol use; and increased assertiveness skills. However, only one study showed benefit in terms of reduced frequency of drinking.

mHealth

Several reviews looked specifically at whether mHealth interventions could have health benefits such as a reduction in alcohol use.

Hutton et al.[77] conducted a systematic review on mHealth interventions to reduce alcohol use in young people. This review found that use of mHealth, particularly text messaging or SMS, was found to be an acceptable, affordable and effective way to deliver messages about reducing alcohol consumption to young people and can have positive benefits in terms of reducing alcohol use.

Rourke et al.[78] reviewed the evidence on electronic interventions (text message, app or social media based) for hazardous young drinkers. Some interventions can result in modest reductions in alcohol consumption, frequency of binge drinking and intention to drink. However, four of the 13 studies found no significant health benefits or impacts. Interventions were more effective when personalised feedback was provided. Interventions were generally short term and with limited or no long-term follow-up.

Song et al.[79] found most mHealth interventions (SMS, app or virtual reality) were effective at improving behavioural outcomes regarding alcohol. Mixed or limited evidence was available for physiological or cognitive outcomes associated with alcohol use.

Bastola et al.[80] reviewed the effectiveness of mobile phone, text messaging interventions for young people. Their review suggests that the texting interventions designed to reduce problem drinking may have no positive effect or actually the opposite effect by. making problem drinking worse.

Other mHealth reviews looked at mobile phone interventions addressing multiple risk factors.

Palmer et al.[81] considered the effectiveness of mobile phone interventions targeting chronic disease prevention (physical activity, diet, smoking and alcohol). This review of eight randomised controlled trials (RCTs) found some health benefits, such as reducing the number of binge drinking days and number of drinks per drinking day. These were through providing feedback and supportive SMS. However, overall results were inconclusive and there were no benefits in terms of continuous abstinence, drinking frequency or cognitive outcomes. One trial using an app intervention found it increased rather than decreased alcohol consumption.

Kazemi et al.[82] reviewed mHealth interventions (web based, text messaging, SMS or apps) preventing alcohol and other substance misuse. The majority of studies used text messaging or SMS as the intervention. They found mixed results for risky alcohol use, though some evidence mHealth interventions could decrease alcohol consumption and increase number of days of abstinence. One study also reported more psychiatric hospital days in the intervention group and another study reported increased drinking due to a party planner app intervention. Intervention length was from two weeks to eight months.

Staiger et al.[83] conducted a systematic review of mobile apps to reduce tobacco, alcohol and illicit drug use. Some 11 studies reported on alcohol use, with five reporting greater reductions in substance use post intervention compared to the control groups. Effect sizes were modest and intervention designs varied in quality.

Tong et al.[84] conducted a systematic review and meta-analysis of personalised mobile technologies, such as fitness apps and trackers. for lifestyle behaviour change. Only three of the 31 studies looked at alcohol use and found there may be a small positive effect but evidence overall was unclear and the interventions were of short duration (<6 months).

Mason et al.[85] looked at the effectiveness of text messaging for adolescent and young adult substance use. Only three of the 14 interventions focused on alcohol. One out of three studies showed significant decrease in alcohol consumption and the other two studies showed no significant difference. One study also found large and significant effects on intention to reduce alcohol consumption.

eHealth and mHealth

Other systematic reviews looked at both eHealth and mHealth interventions targeting alcohol consumption, sometimes with other risk factors.

Afshin et al.[86] found evidence to support effectiveness of internet interventions (both computer and mobile) in reducing alcohol consumption, mainly coming from short term (<6 months) experimental studies, with far less data on long-term effectiveness or sustainability.

Kaner et al.[87] looked at computer or mobile-based interventions to reduce hazardous and harmful alcohol consumption. The review found digital interventions can reduce alcohol consumption. Most people reported drinking less if they received advice about alcohol from a computer or mobile device compared to people who did not get this advice. The RCTs of behaviour substitution, problem solving and credible source were associated with effectiveness to reduce alcohol consumption. Advice from trusted people such as doctors seemed helpful, as did recommendations that people think about specific ways they could overcome problems that might prevent them from drinking less and suggestions about things to do instead of drinking. 5 studies also looked at cost-effectiveness of these interventions, with 4 studies finding the intervention was cost-effective compared to the control.

Phillips et al.[88] reviewed and analysed the evidence of eHealth and mHealth interventions in workplaces targeting mental health, such as email or SMS reminders, online feedback and support groups. Five of these studies reported on alcohol, finding some small effects including improvements in binge drinking and reduced consumption. However, one study found higher alcohol consumption in the intervention group.

Humphreys et al.[89] looked at computer-based and mobile phone-based interventions targeting alcohol consumption, binge eating and gambling. This review included 32 studies targeting alcohol use, of which 21 (66%) were found to be effective at reducing alcohol use. It also found some mobile phone-based interventions were effective at reducing binge drinking or harmful single occasion drinking, while others improved the number of drinks consumed per week.

Two further reviews considered mobile phone messaging for preventive healthcare, and technology-based interventions for tobacco and other drug use in university students, however, none of the included studies targeted alcohol use or consumption.[90,91]

Single studies

Four single studies were included with two RCTs, 1 prospective longitudinal study, and one cost-effectiveness analysis.

One study by Ni Mhurchu et al.[92] was a cluster RCT of a co-designed mHealth healthy lifestyle program for Maori and Pasifika peoples in New Zealand. The program provided health-related behaviour guidelines and information for physical activity, alcohol use, smoking, and fruit and vegetable intake. They found no significant effect in behaviour change for alcohol consumption.

Another RCT study from the US by Wilton et al.[93] compared telephone interventions with in-person intervention for reducing alcohol exposure in pregnancy. Participants showed small but significant reductions in alcohol use There was no significant difference in success of the intervention between the two conditions (telephone versus in-person). These findings suggest telephone-based brief interventions may be equally successful and cost-effective in reducing the risk of an alcohol-exposed pregnancy and thus Foetal Alcohol Spectrum Disorder (FASD). Other benefits from the intervention included increased use of effective contraception.

de Visser et al.[94] conducted a prospective longitudinal study in the UK of 857 adults from online participation in 'Dry January' (alcohol abstinence challenge month). They found participation was associated with changes toward healthier drinking and those who successfully completed the challenge were more likely to consume fewer drinks per typical drinking day and lower frequency of drunkenness at follow-up.

The only cost-effectiveness analysis study identified for eHealth or mHealth looked at a web-based computer alcohol prevention program for adolescents.[95] The intervention involved feedback messages that were tailored and adapted to individuals based on their responses. This study found the intervention group decreased their binge drinking occasions and had a smaller increase in glasses of alcohol consumed compared to the control. A unique aspect of this study was the inclusion of the societal perspective by attempting to include intersectoral costs and benefits, such as in the educational and criminal justice sector. The intervention had an incremental-cost effectiveness ratio (ICER) of €40 per reduction of one glass of alcohol per week and €79 per one binge drinking occasion per 30 days for a healthcare perspective. This was €62 and €144 respectively for the societal perspective. Intervention was cost-effective for older adolescents and those at a lower educational level for both outcomes. The authors concluded that computer-tailored feedback could be a cost-effective way to target alcohol use and binge drinking among adolescents. However, this analysis is based on intermediate health outcomes and would need to be extended to longer term health measures such as quality-adjusted life years (QALYs) or disability-adjusted life years (DALYs) before such definitive conclusions about cost effectiveness can be made.

Settings-based health promotion

Settings-based health promotion interventions were identified as those which involved programs or strategies targeting or embedded within specific settings, such as schools, universities, workplaces and sports clubs. Ten of the 27 studies were school-based interventions such as integrating alcohol education into curriculum and skills development. These interventions generally found some or limited evidence of improving alcohol-related outcomes. Effect sizes if positive were generally small. Interventions in sports club settings were mostly effective at reducing risky drinking behaviours, and often had multiple co-benefits, such as a reduction in drink driving behaviours, or maintenance of club membership and funding. Combined interventions, such as school-based with family or community-based interventions to prevent and address alcohol use, tended to be effective. Interventions targeting multiple risk factors reported on benefits other than alcohol-related outcomes (such as outcomes and benefits relating to mental wellbeing, sexual health, illicit drug use or tobacco use). However, alcohol-focused interventions generally only reported on alcohol-related outcomes in the short term. There was limited evidence regarding the effectiveness or benefits of workplace health programs on alcohol-related outcomes with very little economic evidence identified.

Schools

This category included nine systematic reviews, one umbrella review and one cost-effectiveness analysis.

The umbrella review by Shackleton et al.[96] looked at school-based interventions targeting adolescent health. These interventions included school-based education, policy change, parental involvement, and work with local communities. Ten out of 22 reviews included interventions on alcohol use. Most reviews reported no or inconsistent evidence of the effectiveness of the interventions in regard to alcohol use, although there is some evidence for other outcomes such as sexual health, violence and tobacco.

Langford et al.[97] conducted a Cochrane systematic review and meta-analysis based on the WHO's Health Promoting Schools Framework. There were two alcohol-only studies and a few multiple risk behaviour interventions (including alcohol use) out of 67 interventions for health promotion. On average, there was no evidence for alcohol use. Alcohol-only and multiple risk studies (including alcohol) had conflicting results of either positive or no effect on alcohol intake.

The systematic reviews of school-based interventions looked at a range of strategies, including curriculum changes and integration, alcohol education, skills-based training, and programs targeting social skills, problem solving and self-control.

Dietrich et al.[98] reviewed the evidence of alcohol education programmes in middle and high school settings. Positive behavioural outcomes were observed in both the short and medium term. Nine studies reported positive behaviour change effects. Five of the 16 programs were in pilot stages and long-term behavioural data were not available. Successful effects were observed in the two-year alcohol education program SHAHRP, with 30% less alcohol consumption at eight-month and 20-month follow-up. Most alcohol education programs were developed on the basis of theory and achieved short and medium-term behavioural effects. Brief interventions were considered more cost-effective but no formal analysis was explicitly described.

Flynn et al.[99] reviewed the effect of drug prevention curricula in middle schools in the US. This review evaluated drug misuse prevention programs (for marijuana, tobacco, and alcohol use) from 13 studies. No significant changes were found for alcohol use.

Lee et al.[100] found moderate to significant positive effects in terms of lower alcohol use from some school-based alcohol education interventions. Examples of effective interventions included: Climate Schools (computerised lessons); ALERT (social influence model with student and parent activities); All Stars (multiple risk behaviour program with a mix of interactive lessons, peer support, one-on-one with facilitators, debates, games and general discussion); and LST (life skills training). However, although many programs were evaluated, very few had sufficient evidence to be able to endorse their widespread implementation in schools. It should also be noted that one intervention (TCYL - life skills training) found increased drinking in the intervention group.

Strøm et al.[101] looked at the effectiveness of school-based preventive interventions for adolescents' alcohol use. These interventions included alcohol education and life skills training, including coping strategies and problem-solving skills. The overall effect of school-based preventive alcohol interventions was small but significant and positive for quantity of alcohol use but not frequency of alcohol use. One study reported adverse effects with a prevention program, associated with increased alcohol use. Brief program duration (less than four months) was generally as effective as those with a longer duration. The authors also suggested that school-based alcohol interventions are cost effective because they may avert costs associated with harmful drinking but no formal assessment on cost-effectiveness was conducted as part of the review and meta-analysis.

Melendez-Torres et al.[102] conducted a systematic review and meta-analysis of the effectiveness of integrating academic and health education programs in schools. They found interventions integrating academic and health education had a significant effect in reducing alcohol use among students aged 11-14 years. However, there was heterogeneity across the effect sizes.

Onrust et al.[103] reviewed the evidence on which school-based substance prevention programs work best for different age groups. About half (154/288) programs reviewed were about alcohol use. They found that components of universal programs in schools (self-control training, problem-solving, decision-making skills, cognitive behavioural therapy, behavioural management by parent or teacher) were associated with larger reductions in alcohol use. Some types of programs were more effective for different age groups between early adolescence and late adolescence.

Moore et al.[104] looked at the socio-economic differences in effects of school-based health behaviour interventions. Twelve out of 20 studies focused on alcohol only and 11 studies focused on both alcohol and tobacco-related outcomes. All studies with positive effects included environmental change components, alone or combined with education. Two education-only intervention studies for tobacco and alcohol showed no significant main effects on alcohol. Another intervention on education, environment and family/community involvement showed significant effect on drunkenness. One combined student–parent intervention showed substantial and statistically significant effects on heavy weekly drinking, weekly drinking and frequency of drinking. Larger effects on reductions in alcohol consumption were identified in more deprived schools when interventions combined education, environment and family/community involvement.

Hennessy et al.[105] reviewed 17 studies of brief interventions in school settings to prevent alcohol use amongst adolescents. They found that school-based brief Alcohol Interventions (BAIs) were associated with significant improvements among adolescents, whereby adolescents in the BAI groups reduced their alcohol consumption relative to the control groups. Individually delivered interventions also seemed more effective than group delivered interventions.

Only one cost-effectiveness analysis study was identified and included on a combined classroom curriculum and parental intervention targeting alcohol misuse in schools.[106] The authors conclude that a classroom-based alcohol education curricula implemented in 105 schools in Northern Ireland and Scotland was relatively low cost and reduced heavy episodic drinking. The mean reduction in public sector costs was £17.19 per pupil. No medium or long-term cost-effectiveness data were provided because the intermediate outcome of reduction in heavy episodic drinking was not extended to a reduction in disease or QALYs.

Universities

One meta-analysis was included looking specifically at the effectiveness of BAIs for college or university students. Hennessy et al.[107] found brief interventions can reduce problematic alcohol consumption in the short-term (0-3months). four interventions reduced problematic alcohol use but only one (Brief Alcohol Screening Intervention for College Students (BASICS)) reduced heavy frequency, heavy quantity and quantity during peak (binge drinking) episode. Few trials employed long-term follow-up designs. Thus, although the current study found that some BAIs may be effective in the short-term for college students, it is unclear how most BAIs perform beyond three months. Long-term effects are unclear.

Workplaces

Four reviews were identified in this category with two systematic reviews, one integrative literature review, and one systematic review (economic).

Osilla et al.[108] conducted a systematic review of worksite wellness programs. Two out of three studies reported reductions in alcohol drinking on weekends, frequency of intoxication, and fewer days of alcohol consumption per week. Effective interventions included web-based motivational interviewing, with more mixed effects for individual counselling.

Wolfenden et al.[109] in their Cochrane systematic review of workplace-based policies or practices targeting tobacco, alcohol, diet, physical activity and obesity found no trial targeted risky alcohol consumption. Quality of evidence was low to very low, suggesting no clear evidence regarding the impact of implementation strategies on workplace health-promoting practices and policies in terms of improving employee health behaviours.

Alfred et al.[110] conducted an integrative literature review looking at the impact of alcohol workplace policies, finding that overall, alcohol workplace policy has been associated with reduced odds of hazardous alcohol consumption. However, one study found that an alcohol policy did not deter workers from drinking as they found ways to bring alcohol into the workplace.

Baid et al.[111] conducted a systematic review of the economic literature on the return on investment of workplace wellness programs for chronic disease prevention. Only two of the25 studies were considered high quality and did not find there was a positive return on investment for workplace wellness programs. Only five studies looked at alcohol although it was unclear as to the outcomes of those studies.

Sports clubs

Nine studies looked at the benefits of healthy settings approaches and interventions within sports clubs. One study was a systematic review, three were RCTs (one cluster RCT), and the remaining studies were cross-sectional. Six studies were evaluations of different components of the Good Sports Program in sports clubs across Australia, while the other two studies were association studies looking at the relationship between health promotion practices around alcohol in sports clubs and subsequent alcohol use and risky drinking behaviours.

Australian research demonstrated the benefits that could be gained from health promotion interventions in sports club settings. One intervention included in the evidence for this review was the Good Sports Program, a community health sports program funded by state and federal governments to limit the harm caused by alcohol and other drugs. The evidence in this review suggested the program has health benefits in terms of reduction in risky and hazardous alcohol use, while also offering a range of social and economic benefits for sports clubs and their local community.

The systematic review by Kingsland et al.[112] aimed to identify interventions in sports settings that decreased alcohol consumption and related harms. Relevant outcomes measured alcohol consumption, alcohol-related injury and violence. The review required studies to have a comparison group and included grey literature. Only three studies met the inclusion criteria. One study of an Olympic training facility in the US found significant change in alcohol use, however, the intervention was mostly focused on individual-based behaviour change. One study of a community sports club in Australia found a significant intervention effect for both risky alcohol consumption and overall risk of alcohol-related harm. The other study of a community sports club in Ireland found no significant intervention effect, however, this study was only implemented for four months compared with 2.5 years for the Australian intervention.

The cluster RCT by Wolfenden et al.[113] looked at whether the Good Sports Program had an impact on sports club membership and revenue, finding no evidence to suggest that efforts to reduce alcohol-related harm in community sporting clubs will compromise club revenue and membership. This suggests that these types of programs have social and economic benefits for sports clubs.

Rowland et al.[114] found that higher levels of Good Sports Program accreditation in cricket and football clubs were strongly associated with lower levels of long and short-term risky alcohol consumption. A related study also found that higher accreditation levels had a protective effect on short-term and long-term risky consumption in the previous 12 months. The length of time a club had been in the Good Sports Program was associated with reduced rates of weekly drinking that exceeded Australian short-term risky drinking guidelines. However, the authors noted consumption rates for all clubs were still higher than the general community.[115]

Another study by Rowland et al.[116] indicated that clubs participating in the program had a reduced risk of 8% of drink driving. One RCT of the Good Sports Program found that responsible alcohol management practices in community sports clubs can reduce overall alcohol club consumption, which in turn can increase club member participation.[117]

An RCT looking at the sustainability of the program also found that alcohol management practices were sustained over time in both intervention (clubs participating in web-based intervention) and comparison groups.[118] Risky alcohol consumption was reduced for club members in the intervention group (web-based) relative to control.

The two association studies looked at the links between alcohol management practices in sports clubs and alcohol consumption.

Kingsland et al.[119] found sports clubs that served alcohol to intoxicated people [OR: 2.23 (95% CI: 1.26-3.93)], conducted 'happy hour' promotions [OR: 2.84 (95% CI: 1.84-4.38)] or provided alcohol-only awards and prizes [OR: 1.80 (95% CI: 1.16-2.80)] were at significantly greater odds of consuming alcohol at risky levels than members of clubs that did not have such alcohol management practices. The authors noted there is an opportunity for the implementation of alcohol harm reduction strategies targeting specific alcohol management practices at community football clubs (e.g. prohibit happy hour promotions, alcohol only awards and prizes, identification of intoxicated patrons and refusal to serve them, accreditation with recognised authority).

Rowland et al.[120] also looked at alcohol management practices in sports clubs, finding that three of 11 club alcohol management practices were associated with a significant probability of risky drinking at the club including serving intoxicated individuals, having at least one alcohol promotion, and having the bar open for more than four hours. These three practices were associated with a similar probability of being an overall hazardous drinker. However, none of the alcohol management practices were found to be directly associated with overall hazardous consumption.

Multiple settings

Two systematic reviews were identified that combined programs in multiple settings, such as schools and family or community-based interventions.

The review by Cairns et al.[121] found evidence of small positive effects for combined interventions in schools and families, delivered over short and longer-term duration and low and higher levels of direct contact with students and families. Family-based elements that correlated with positive effects were targeting information and skills development, family communications, and stricter parental attitudes to alcohol misuse. School-based components which involved life skills and social-norms approaches were associated with reductions in risky behaviours. Some evidence indicated that peer-led programs, external delivery agents and linkages of school-based components to community-level change may strengthen combined school and family intervention programs.

Hurley et al.[122] also looked at school-based education programs that targeted families and parents of adolescents. Ten out 17 school-based education programs demonstrated positive effects in at least one parent reported outcome measure. Each of the identified programs focused on influencing specific parenting factors associated with preventing or reducing alcohol use among adolescents including parents' restrictive attitudes, parent-child communication, alcohol-specific rule setting and parental monitoring. However, given the mixed evidence base, study quality concerns and limited use of parent-specific outcome measures, further evaluations are needed to extend the evidence base.

Other health promotion programs

Other health promotion programs and strategies included social norms or peer-based interventions, or combined health promotion interventions. Social norms or peer-based interventions had mixed results and effect sizes were small. Combined health promotion programs targeting pregnant women, while lacking in some high-quality evidence, did offer value for money in terms of being cost saving, due to the health, economic and social benefits of preventing or reducing Foetal Alcohol Spectrum Disorder (FASD) and the cost-effectiveness of interventions (such as educational campaigns and information, warning labels and treatment for high-risk individuals).

Social norms or peer-based

Anderson et al.[123] conducted an umbrella review looking at the impact of changing collective social norms to reduce harmful use of alcohol. Only two relevant studies were identified. One review of community-based interventions found a study that demonstrated small changes in parental disapproval of under-age drinking. The other review focused on typologies defining drinking cultures rather than the effectiveness of interventions and stressed that collective social norms about drinking are malleable and not uniform in any one country. The authors concluded that they did not find any evidence whether or not purposeful changes in collective social norms that disfavour the harmful use of alcohol are effective at the population level and made three recommendations to help improve programs and fill the clear gap in evidence in this area: provide information about the consequences of the harmful use of alcohol, their causes and distribution; act on groups, not individuals; strengthen the environmental laws, regulations and approaches. In other words, changing the current norms of society for consuming harmful levels of alcohol requires population-wide interventions.

Foxcroft et al.[124] in their systematic review and meta-analysis on social norms- based interventions for university and college students found no substantive meaningful benefits associated with social norms interventions for prevention of alcohol misuse among college/university students. Seventy studies were included in the review with 63 in the meta-analysis. There was high heterogeneity in the results and effect sizes were often too small.

The only review identified of peer-led interventions to prevent alcohol use was by MacArthur et al.[125] Six out of 17 studies included peer-led programs on preventing alcohol use. Six studies representing 1,699 individuals in 66 schools demonstrated that peer-led interventions were associated with weak evidence of lower odds of lesser alcohol use. Outcomes of peer-led interventions ranged from no significant difference in alcohol use to delayed initiation of drunkenness, less alcohol consumption per occasion, less alcohol use, and lower substance use risk.

It should also be noted that two systematic reviews, one about online social networks for health behaviour change and one about the effectiveness of social media in addressing risk factors for chronic disease, did not include any studies that targeted alcohol; as such, the reviews are not discussed in this section.[126,127]

Combined health promotion strategies targeting priority populations

Two reviews were identified that looked at health promotion and public health interventions targeting pregnant women.

Crawford-Williams et al.[128] conducted a systematic review of public health interventions targeting pregnant women and studies were included if they reported alcohol consumption or levels of knowledge as outcome measures. The review included seven studies which included multimedia and educational interventions with text messaging, DVDs, and mass media campaigns or a combination of these. The authors found there was a lack of high-quality evidence in this area, and limited evidence to suggest that public health interventions successfully reduce alcohol consumption rates among pregnant women or increase knowledge about the harms of alcohol consumption in pregnancy.

Szewczyk et al.[129] conducted a systematic review of economic evaluations on maternal nutrition and promotion of alcohol abstinence. It found both types of intervention offers value for money and have the potential to considerably reduce healthcare costs. However, there were only two studies identified for maternal alcohol interventions. A media campaign was one of the most cost-effective strategies and was cost saving. The other interventions, such as warning labels and treatment for high-risk individuals, were also cost saving. This is because of the high economic and social cost of caring for those with FASD significantly outweigh the societal cost of interventions to reduce alcohol consumption in pregnancy. This study conducted a fairly broad search of literature on the cost-effectiveness of interventions for reducing FASD up to May 2019 and did not find any studies published since 2010. No economic evaluations of implementation strategies to increase the uptake of alcohol interventions were identified.

One review looked at community-based health promotion about alcohol and other drugs in multicultural communities in Australia – this will be discussed under the Priority populations section.

Mass media campaigns and social marketing

One umbrella review and three systematic reviews were identified on mass media campaigns. These studies generally found that there was a change in knowledge, attitudes and beliefs about alcohol consumption but little evidence that this flowed through to changes in actual consumption or alcohol-related harms. Two systematic reviews found no evidence on social media interventions for alcohol use. The evidence from single studies conducted in Australia and the UK supported these conclusions.

An umbrella review by Stead et al did not identify any systematic review on mass media campaigns targeting alcohol. It did find four studies that included alcohol alongside other lifestyle-related risk factors. The authors of the umbrella review concluded that there is limited evidence for the effectiveness of mass media campaigns for reducing alcohol use.[130]

Young et al conducted a systematic review of mass media campaigns designed to reduce alcohol consumption and harm. There were 24 studies included in this review and the research team concluded there is little evidence that mass media campaigns have reduced alcohol consumption, although most did not have that as a stated aim. Studies show recall of campaigns is high and that they can have an impact on knowledge, attitudes and beliefs about alcohol consumption. The majority of the studies (n=18) were rated as weak quality. There was some evidence that mass media campaigns generated increases in treatment seeking or information seeking, from a total of four studies reporting this outcome (all weak quality). In terms of behaviour, one study (moderate quality) reported that some respondents indicated they might change their behaviour but no further data were provided. In a second study (weak quality), the proportion who responded that they were likely to reduce their alcohol consumption increased significantly from 17 pre-test to 30% post-test. A third study (weak quality), compared those who reported they had seen the campaign to those who did not and viewers increased their intentions whereas non-viewers decreased their intention to reduce alcohol use.[131]

Janssen Meriam et al conducted a systematic review focusing on alcohol prevention interventions based on the principles of social marketing in the US and Canada. Among social marketing interventions and campaign studies, there seem to be an effect in two studies; The Road Crew intervention study, showed that bar patrons were less likely to drive themselves, or less likely to ride with an impaired driver after the ride service was offered; Just The Facts campaign significantly decreased the mean number of drinks consumed per week. There were mixed results from four other studies that reported effects for awareness outcomes but less evidence for actual changes in behaviour. For example, one study (Fourth-Year-Fifth) showed an association between being exposed to ≥4 campaign elements. In another study (Less is more), there was a significant decrease in the percentage of binge drinkers associated with alcohol drinking behaviour and driving a car while impaired. The third study (Be under your own influence) showed an association with recognition of campaign messages and alcohol drinking behaviour. The final study (Thanks for being a sober driver) showed an association with general awareness of a campaign but did not report effectiveness of the campaign on actual drinking.[132]

The third systematic review focused on mass media campaigns that sought to reduce alcohol-impaired driving and alcohol-related crashes across multiple countries. Overall, 19 studies on media campaigns were included. Results from individual studies on mass media campaigns suggested reduction in their respective outcome measures (alcohol-related crashes and alcohol-related crash injuries and fatalities, single-vehicle-night-time crashes, all night- time crashes, all single vehicle crashes and all crashes, and blood alcohol concentrations measurement) after intervention. A reduction was not observed in the pooled analysis of relative risk of alcohol-related injuries or fatalities by media campaigns probably due to heterogeneity in studies' methodology. Studies that measured the effects of concomitant enforcement activities in addition to media campaigns showed a median reduction in their outcome measures. Seven studies showed no evidence of media campaigns reducing the risk of alcohol-related injuries or fatalities.[133]

Two systematic reviews did not find any eligible studies targeting alcohol consumption in social media or online social network interventions. [126,127]

Dixon et al conducted a cross sectional, pre-post intervention evaluation to examine the effectiveness of a mass media campaign in Western Australia to raise women's awareness of the link between alcohol and cancer. Improvements in women's knowledge that drinking alcohol on a regular basis increases cancer risk were found. Knowledge of the recommended number of standard drinks for low risk in the long term increased between baseline and wave I, but not wave III. Among women who drink alcohol, the proportion expressing intentions to reduce alcohol consumption increased significantly between baseline and wave III. However, no significant reductions in recent drinking behaviour were found following the campaign.[134]

Johnston et al also conducted a cross sectional comparison of a mass media campaign in Western Australia, this time focusing on supporting parents to reduce adolescent alcohol use. Parental alcohol provision did not change significantly following either campaign period ($p = 0.499$) and neither did the percentages of parents who spoke to their child about the health effects of alcohol on the body and brain ($p = 0.547$).[135]

An evaluation of a mass media campaign in the UK by Lockwood et al found that the campaign was associated with significant changes in alcohol consumption, and significant increases in readiness to change and likelihood of using moderate drinking strategies. In qualitative analyses, men appreciated the friendly, non-threatening tone and that the message was straightforward, meaningful and achievable. However, one of the limitations of this study was that it relied on self-report of alcohol consumption without validation. [136]

Neil et al also analysed the effectiveness of a mass media campaign targeting alcohol, this time on its links with breast cancer. There was no outcome measure on frequency of alcohol consumption and only intention of alcohol consumption. The proportion of respondents indicating awareness of alcohol as a cancer risk factor was larger post-campaign compared to pre-campaign. There was no significant difference between increasing/higher risk drinkers who had/had not seen the campaign and intended to reduce consumption. There has also been a significant increase in 'strong support' for 'labels on alcohol containers showing nutritional value and calorie content'.[137]

Built environment changes

This category included interventions targeting access, availability, outlet density and licensing of alcohol at a local (community), state or national level. While many of these interventions require policy or legislative action by governments, for the purposes of this report they have been grouped under the heading of 'built environment changes'.

This category was separated into two further distinct subcategories: impact of built environment interventions and changes; and the association between the built environment and outcomes. Included in the impact category was any research or study that looked at the impact of a change to the built environment. The association category included any research or study that considered the association or relationship between built environment characteristics (such as outlet density) and health and other outcomes (including possible benefits) but could not summarise the impact or effectiveness of changing these characteristics.

Interventions in the built environment

The impact of built environment policy change was looked at in 43 studies. Eight of these studies were reviews and/or meta-analyses. The remaining 35 studies were single studies included to look at the impact and benefits of specific interventions in different contexts. The evidence suggested there are multiple health, social and other benefits to restricting alcohol availability and access through a range of mechanisms, particularly through reducing the number of licensed outlets in a defined geographic area and restricting trading hours of licensed venues. Other types of interventions, such as 'last drinks' (moving closing times of licensed venues forward to earlier in the evening) can be effective, although there is some uncertainty or mixed evidence as to the benefits of 'lockouts' (refusal of new patrons after a certain hour). Key benefits of built environment changes include: reductions in alcohol consumption; reduction in alcohol-related violence and assaults (including violence against women); reduction in emergency department presentations; and reduction in injuries and motor vehicle crashes. While many health and social benefits were identified, few studies reported mental health benefits and no studies reported economic benefits.

Reviews and meta-analyses

This category included one systematic review and meta-analysis, five systematic reviews and two reviews (non-systematic).

Sherk et al.[138] conducted a systematic review and meta-analysis of the evidence on the benefits of restricting the physical availability of takeaway alcohol through days and hours of sale and outlet density. They found restricting the physical availability of takeaway alcohol is an effective strategy for decreasing per capita alcohol consumption. The benefit of adding one additional day of sale was associated with per capita consumption increases of 3.4% (95% CI: 2.7,4.1) for total alcohol. Evidence from the US found a 1.0% increase in takeaway outlet density was associated with a 0.15% increase in total alcohol consumption, as well as significant increases in beverage-specific consumption. The authors suggest that decreasing the physical availability of takeaway alcohol will have the benefit of a decrease in per capita alcohol consumption.

Of the seven reviews, five looked at the benefits and impacts of regulating or changing opening times of licensed premises and/or outlet density (four systematic reviews and one review).

Callan et al.[139] reviewed the impact of the UK's Licensing Act 2003, which abolished set hours for licensed premises and allowed these to be regulated at a local level, along with a staggering of pub closing times. The authors looked at 11 studies, concluding there is mixed evidence the Act has prevented crime and disorder or improved health outcomes. Four studies found the introduction of the Act resulted in a reduction in assault and injuries in healthcare settings although three studies found an increase in assault. Four studies in the police setting found no difference in violence levels while three found a reduction in violent crime. Six studies found a change in the temporal distribution of violent offences (i.e. increased proportion occurring in the early morning). Some studies found an association between intensity of local licensing policy and rate of reduction in alcohol-related hospital admissions. However, the authors noted the evidence available was poor quality and only one was an interrupted time-series analysis with the remainder uncontrolled pre/post observational studies. There was a high level of methodological heterogeneity in terms of outcome measures with not all studies peer reviewed as they were government evaluations and this affects the picture of evidence.

Sanchez-Ramirez et al.[140] compiled existing evidence from multiple countries including Australia, US, UK, Canada, Sweden, the Netherlands and Germany related to the impact of policies regulating alcohol trading hours/days. Results support the premise that policy interventions regulating the time of alcohol trading and consumption can reduce injuries, alcohol-related hospitalisations/emergency department visits, homicides and other crime. The impact of alcohol trading policies in assault or violence and motor vehicle crashes and fatalities is also positive, but requires further investigation. In terms of health benefits such as injury prevention, one study in the Netherlands reported 34% more alcohol-related injuries (violent and non-violent) were reported with one -hour extension in alcohol trading. Lower injury risk was also linked to restricted alcohol sales during holidays (Good Friday and Christmas) compared with control periods in Newcastle, Australia. In terms of social benefits such as reduction in assaults and violence, a study in Brazil found a 17% reduction in assaults against women when bars changed from 24-hour opening to restricted opening hours. Another study suggested a one-hour extension in alcohol trading resulted in a 70% increase in violent assaults and a 47% increase in road crashes in Perth, Australia.

Smriti et al.[141] looked at the effects of trading hours extension and restrictions on the incidence of assault and injury. The authors concluded that harm typically increases after extensions in on-license alcohol trading hours, and suggested alcohol-related harm decreases when on and off-license trading hours are restricted. Even reductions in 30–90 minutes of trading hours were followed by large reductions in assault according to some studies included in the review. The authors cited numerous studies as evidence, including an Australian study that found a 3:30 am closing time and 1.30 am lockout in Newcastle resulted in a 47% reduction in hospital presentations for alcohol-related injuries. They also cited evidence from a Norway study where a restriction of closing by 30-60 minutes was associated with a 20% reduction in the incidence of assault. In England and Wales, there was a 13% decrease in the incidence of traffic crashes relative to Scotland over the same period, with the greatest decrease among 18- 25-year-olds and during late nights and early hours of weekends. They concluded that restricting off-license trading is followed by reductions in hospitalisations, particularly among young people.

Wilkinson et al.[142] conducted an Evidence Check style systematic review143 of the evidence published between 2005 and 2015, looking at the impact of changes to trading hours of liquor licences on alcohol-related harm. Restrictions on packaged liquor trading resulted in a reduction of 25–40% in alcohol intoxication hospital admissions for teenagers and young adults in Switzerland; and a study of banning takeaway alcohol sales between 10pm and 5am in a German state found a significant reduction in hospitalisations among teenagers and young adults. Legislative limits on trading hours of pubs, bars and hotels found a 37% reduction in assaults in Newcastle between 10pm and 6am and this was sustained during the five years following intervention. Another study reported that trading hour restrictions are more effective than various policing and safety measures implemented in Geelong, Australia. Other studies included in the review found an increase in traffic accidents, recorded assaults and ambulance attendances from extended trading hours. The authors of the review concluded that evidence of effectiveness is strong enough to consider restrictions on late trading hours for bars and hotels.

The mapping review by Taylor et al.[144] summarised evaluations of policy restrictions in night-time entertainment precincts (NEPs). The majority (89%) of studies looking at outlet density as the sole factor found increased on-licence outlet density was associated with increased levels of crime and violence. There is a strong empirical link between increased trading hours and increased levels of harm in NEPs. In Australia, all evaluations of restrictions on trading hours have demonstrated a decreased level of violence. For example, banning the sales of shots and beverages with high alcohol content after 10 pm or 12am has seen a moderate amount of success at reducing alcohol-related assaults and harms, and in preventing crime. A study in Sydney found small decreases in violence could be attributed to the timing of the 'lockout' laws, followed by a larger decrease attributed to restricted trading hours. Density of on-premise outlets had a significant, positive, linear relationship with alcohol-related assault rates in an Australia context and was significantly associated with increased assault rates in inner-urban, advantaged suburban and disadvantaged suburban areas. Increased drink promotions, lower minimum unit prices, and increased trading hours were all significant predictors of increased alcohol-related violence, but when modelled together only promotions and increased trading hours remained significant. The authors noted that evidence on the effectiveness of alcohol restrictions in NEPs relies heavily on rare large-scale interventions that introduce multiple types of alcohol restrictions into NEPs, usually all at once. This means ascertaining the causal pathways between specific components of interventions and their impacts is challenging. The authors also cautioned reliance on police datasets for evaluation, noting it can be an unreliable measure of alcohol-related crime and disorder because changes in police enforcement behaviour (e.g. targeted police activities) can directly influence the number of assaults recorded.

The review by Kearns et al.[38] considered both the impact of alcohol policies on preventing intimate partner violence (IPV) as well as associations between outcomes. The most consistent research showed a higher density of alcohol outlets associated with greater rates of IPV, with one study reporting an increase of 10 alcohol outlets per 10,000 persons was associated with 34% increase in male-to-female partner violence. Another study found each additional off-premise outlet was associated with a 4% increase in IPV-related police calls and 3% increase in IPV-related crime reports. Research from the US found alcohol outlet density increased risk for perpetration of violence against women. In terms of interventions from studies in a range of countries, it was suggested changes to hours or days of sales has no significant impact on assaults against women. A study in Brazil noted there was a significant decrease in homicide rates after implementation. There is less evidence that alcohol pricing policies are associated with a change in IPV outcomes and the authors noted significant research gaps in this area.

One systematic review looked at the evidence on prohibiting public drinking in urban spaces (street drinking bans). Pennay et al.[145] aimed to identify community-based evaluations of street drinking bans and included 16 studies. The authors concluded there was no evidence that street drinking bans reduce alcohol-related harm or benefit the community in other ways, aside from improvements to perceptions of safety and improvement to amenity. The authors also noted such bans have evidence of negative impacts for already marginalised groups.

Single studies – Australia

Evaluations of built environment interventions in an Australian context (local community or state or territory) were included in 25 of 35 single studies. Six of the Australian studies were based on Aboriginal or Torres Strait Islander communities – see 'Interventions for priority populations' section.

NSW

Seven of 19 studies (outside of an Indigenous community) were evaluations of interventions occurring in NSW. Two of these studies looked at the benefits and impacts of the Newcastle intervention in 2008 with earlier pub and bar closing times.[146,147] According to these evaluations, the changes produced a large relative reduction in assaults of 37% compared to a control area, and also led to a sustained reduction of 31% in alcohol-related facial injuries. The other five NSW studies included four studies looking at the impact of the Sydney lockout or last drinks laws from 2014, modelled on the Newcastle laws.[148-151] These evaluations indicate the laws had multiple benefits, including a significant decrease in hospital admissions for serious injury and trauma; substantial reductions in assaults in inner Sydney by a third; and reduction in police-recorded assaults. Some evidence also suggested the last drinks component of the interventions may have been more effective than the lockout components, although disentangling the benefits of these two components when introduced simultaneously is challenging.

One study also modelled the benefits of restricting licensed premises trading hours at the state-wide level.[152] This study found a linear relationship between venues closing earlier and reduction in alcohol-related harms including ED presentations, hospitalisations and alcohol-related violence. Extending bottle shop hours increased harms as well as moderate and heavy levels of alcohol consumption. The 1 am or 3 am closing times for licensed venues across NSW produced significant reductions in ED presentations and hospitalisations, particularly among female drinkers (moderate and heavy), and resulted in a significant reduction of alcohol-related violence. Earlier closing times were highly effective at reducing harm. In comparison, extension of bottle shop closing times to 11 pm, 12 am or 2 am significantly increased harms, including increased consumption of alcohol at moderate and heavy levels. The study concludes there is a likelihood that decreasing availability of alcohol late at night across the whole state of NSW will have health and social benefits.

Other Australian states and territories

The 12 remaining Australian studies were conducted in Queensland only (n=9), Victoria and Queensland (n=1), Victoria only (n=1) and Western Australia (n=1).

Most of the studies in Queensland were quasi-experimental or pre/post studies of policy change, particularly in NEPs in South East Queensland. Some of the evidence was mixed, for example studies showing 3 am 'lockouts' likely ineffective[153], liquor restrictions introduced in 2016 had no impact on police-recorded serious assaults[154], and changes may have inadvertently contributed to more harmful behaviours, such as 'pre-loading' of alcohol earlier in the evening.[155] Other studies suggested last drinks restrictions were associated with a reduction in the proportion of patrons highly intoxicated in NEPs[156], delivery of acute services for alcohol-related harms shifted to earlier to in the evening[157], and the combined impact of later closing times and higher levels of outlet density significantly increased the likelihood of serious assaults.[158] Some studies noted interventions such as risk-based licensing did not result in a decrease in the incidence of assault.[159]

One study by Dorman et al.[160] in Far North Queensland found there were decreases in ocular trauma hospital presentations after alcohol management plans were introduced in both Indigenous and non-Indigenous communities. Ocular trauma decreased most significantly in Indigenous communities (with significant effects across female, male and paediatric sub-groups) but decreases were also found across the population. However, the proportion of alcohol-related assaults remained unchanged. Another study in rural Queensland suggested that alcohol management plans in small outback communities may inadvertently result in population movements to larger regional centres and mining towns, which may result in increases in alcohol-related injury hospital presentations and disproportionately affect men, especially Aboriginal men.[161]

Curtis et al.[162] compared the impact of risk-based licensing of alcohol venues across Queensland and Victoria using time series analysis methodology, finding that these measures may have been associated with a small reduction in ED presentations among men aged 20-39 years in Victoria. However, overall the measures were not associated with broader reductions in ED injury presentations across the general population in Queensland and Victoria.

Scott et al.[163] conducted a simulation modelling study to evaluate the impacts of last drinks and lockouts in Victoria. They found additional hours between lockout and last drinks could reduce aggression by easing transport demand, while minimising revenue loss to venue owners. All lockout policies resulted in greater consumption-related harms among inner city residents. The authors concluded that policies to minimise late night transport-related disputes should be considered as a more direct way of reducing aggression in the night-time economy.

In Western Australia, Liang et al.[164] found a significant reduction in alcohol-related injury presentations observed for public holiday periods with alcohol restrictions. The crude injury risk (incidence rate of injuries presenting at EDs) was considerably lower during the alcohol restriction periods compared to control periods in both metropolitan and non-metropolitan areas. The protective effect observed on the days of the alcohol restrictions remained significant, and largely unchanged, when potential confounding effects were controlled for.

Single studies - New Zealand and UK

Two of the 10 studies were from New Zealand with one study finding the intervention of restricting opening hours of off-license and on-license premises was successful at reducing hospitalisations and assaults, particularly for the 15-29-year-old age group. The study also found weekend hospitalisations for assaults were reduced by 11% and 9.7% fewer night-time assaults per week.[165] The other study from New Zealand found there was no significant reduction in the proportion of ED attendances due to acute alcohol consumption after the introduction of New Zealand's Sale and Supply of Alcohol Act 2012, however, the authors noted weaknesses with the study design.[166]

The remaining eight studies were from the UK. Three studies were either time series or interrupted time series analyses. de Vocht et al.[167] found that implementation of more active licensing policies, including cumulative impact zones and refusal of new licences, can lead to a reduction in alcohol-related hospital admissions, violent crimes and sexual crimes (but not necessarily anti-social behaviour). Humphreys David et al.[168] looked at whether and how trends in violence changed in a large city in northern England after implementation of the Licensing Act in 2003. They found no evidence that a national policy increasing the physical availability of alcohol affected the overall volume of violence. There was, however, evidence suggesting that the policy may be associated with changes to patterns of violence in the early morning (3 am to 6 am). Pliakas et al.[169] aimed to understand how, and to what extent, the new UK alcohol policies affected alcohol licensing decisions, and how this impacted on temporal, economic and spatial alcohol availability and alcohol-related harms. The new policy had no impact on license application rates but post-intervention, applications involved fewer trading hours with resulting decreases in overall crime rates and units of alcohol sold.

The other five UK studies looked at the impact of bar trading hours[170-173] finding that longer bar opening hours generally result in increased consumption and increased worker absenteeism. de Vocht et al.[174] also looked at the impact of individual alcohol licensing decisions at the local level, indicating that local governments can positively impact on health and crime in their local areas by closing or restricting alcohol venues and improving local licensing guidance. Local closure of a nightclub can have a strong and immediate benefit in terms of antisocial behaviour but not for other outcomes such as local crime rates, hospital admissions or ambulance callouts.

Associations with the built environment

Seven reviews were included that looked at the association between specific built environment characteristics and health and/or other outcomes. Common built environment characteristics considered in these studies were alcohol outlet density and distance to licensed premises. Some research found there was a relationship between availability and accessibility of alcohol in the local built environment and increased use of alcohol. Occasionally other outcomes such as suicides were measured. However other studies suggested this evidence base was lacking and causal effects and relationships were unclear.

Bryden et al.[175] conducted a systematic review on community level availability and marketing of alcohol. This review found community level availability and advertising of alcohol is associated with a negative effect on alcohol use, particularly for adolescents. However, there were inconclusive results regarding association between alcohol availability at a local level and alcohol use. Some evidence that greater exposure to advertising in the community can be associated with higher levels of alcohol use. No evidence that preventive health messages at the community level influenced drinking behaviours. The authors noted the limitations of assessing causality, given studies only looked at associations. Further research needs to examine causal pathways between exposure to alcohol availability and advertising, and alcohol use.

Foster et al.[176] also looked at the association between access or proximity to alcohol outlets and impact on alcohol consumption in young adults, using a longitudinal birth cohort study based in Western Australia (the Raine study). This study found that number and type of liquor licenses at the local level was associated with alcohol consumption (i.e. at 20 and 22 years of age, more liquor licences nearby were associated with increased alcohol consumption). The authors indicated an 8% increase in alcohol consumption per liquor store. They suggest a possible causal relationship whereby increases in proximity to liquor stores and licences are associated with increased alcohol consumption for young adults, likely due to increased availability of alcohol, reduced cost of alcohol, and improved convenience of purchasing alcohol. The authors conclude that interventions targeting availability and access to alcohol could reduce alcohol consumption amongst young adults.

Jackson et al.[177] examined the multi-level evidence of neighbourhood effects on adolescent alcohol use. They found alcohol outlet density is linked with adolescent alcohol consumption. High levels of both adult and adolescent alcohol use in the community appeared to be associated with alcohol use while protective effects were found for enforcement of liquor laws. However, the majority of studies found no association between adolescent alcohol use and residential mobility, neighbourhood disorder or crime, employment or job availability, neighbourhood attitudes to drinking, or social capital and collective efficacy. The authors note the lack of high-quality evidence to inform preventative and policy interventions to address adolescent alcohol use.

Xuan et al.[178] conducted a systematic review of the peer reviewed literature looking at the association between alcohol policies and suicide. Although the evidence was inconsistent, the literature tended to support the protective effect of restrictive alcohol policies on reducing suicide as well as the decreased level of alcohol involvement among suicides. Four of the 17 studies specifically looked at outlet density and suicide, showing greater availability of liquor outlets was generally associated with higher rates of suicides, although there was a differential effect for males.

Gmel et al.[179] reviewed the association between density of alcohol outlets and harm. They concluded that despite overall evidence for an association between density and harm, there is little evidence on causal direction (i.e. whether demand leads to more supply or increased availability increases alcohol use and harm). When outlet types (e.g. bars, supermarkets) are analysed separately, studies are too methodologically diverse and partly contradictory to permit firm conclusions besides those pertaining to high outlet densities in areas such as entertainment districts. Outlet density commonly had little effect on individual-level alcohol use, and the few 'natural experiments' on restricting densities showed little or no effects.

Hughes et al.[180] reviewed evidence from nine countries to identity environmental factors in drinking establishments that are associated with increased alcohol consumption and associated harm. Factors that contributed to alcohol-related problems included a permissive environment, cheap alcohol availability, poor cleanliness, crowding, loud music, a focus on dancing and poor staff practice. However, findings were not always consistent across studies. The authors noted that while nightlife can play an important role for the economy and community, poorly managed licensed venues can become a focus for drunkenness, public disorder, violence, injury and crime.

The study by Holmes et al.[181] was a critical review of the methodology and research gaps on the relationship between spatial and temporal availability of alcohol and harms. They noted reducing general availability of alcohol through spatial and temporal restrictions is effective, but local-level specific recommendations are lacking.

Behavioural economics and 'nudge'

This report identified no relevant studies that used behavioural economics or 'nudge' interventions targeting alcohol use at the primary prevention level.

Healthy lifestyle interventions targeting multiple risk factors

Two previous Evidence Check rapid reviews were considered for this section – the literature that informed the previous Value of prevention review[182], and the review by Harris et al.[183] looking at the effectiveness of healthy lifestyle interventions targeting alcohol consumption, physical activity, healthy eating and obesity.

In the first Value of prevention review[182], some reviews of strategies targeting multiple risk factors for chronic disease were included in the evidence synthesis. These reviews found increasing the price of alcohol and limiting alcohol availability had a moderate level of evidence, but that counselling and support programs targeting alcohol consumption had very little evidence of effectiveness, as did multi-component interventions. Other reviews included in the Evidence Check also suggested legislative restrictions and higher price of alcohol had strong evidence of effectiveness at reducing alcohol consumption in children and young people, but there was weak evidence about online self-help interventions and interventions across multiple settings.

The Evidence Check by Harris et al.[183] identified 31 reviews addressing alcohol consumption through coaching or behavioural interventions. They also looked at digital (eHealth and mHealth), workplace-based and community-based interventions. Some 21 reviews focused on alcohol only, while the other 10 addressed alcohol and other risk factors. The evidence suggests brief interventions for non-alcohol dependent people demonstrate only small reductions in the number of drinks per week and effect sizes were small. For mHealth, eHealth or telephone interventions, they found they demonstrated moderate reductions in frequency and amount of alcohol consumed, however, studies tended to be of low-moderate quality. For workplace-based interventions, only one review was included, finding that workplace interventions reduced the number of drinks for those employees with already high consumption. Whole-of-community interventions could also reduce harms from alcohol use. Overall, they summarise that more research is needed for interventions to address alcohol consumption, especially for CALD groups and Indigenous populations. There was also insufficient evidence looking at the effectiveness and sustainability of interventions beyond 12 months. No studies looked at longer term outcomes such as rates or cases of cancer.

It should be noted that healthy lifestyle interventions using health promotion programs (including eHealth and mHealth) to target multiple risk factors, such as alcohol and tobacco use, have been discussed under the previous relevant sections. We also note there are promising healthy lifestyle interventions developed in different jurisdictions in Australia, including the alcohol program component of the NSW Government's Get Healthy telephone coaching service.[184] However, we did not identify any published evaluations of this component, and previous evaluations of the service have focused on other health behaviours and outcomes such as diet, weight and physical activity.[185,186]

Other strategies

Other strategies not listed or discussed in the previous sections included: a change to the alcohol social supply law in New Zealand[187]; a review of effectiveness of community alcohol partnerships with the alcohol industry[188]; and a mixed methods evaluation of a local government intervention in Australia.[189]

Huckle et al.[187] aimed to assess the early impacts of a 2013 law change to restrict the social supply of alcohol to under 18-year-olds in New Zealand by assessing changes in social suppliers' behaviour. The authors found evidence of some early reductions in social supply in relation to the law change, in particular where the legislation aimed to have effect; specifically, less supply to friends under 18 years of age. They found no effect of the new law on parental supply as quantities supplied are still very high. This signifies further policy restriction and public health interventions are warranted.

Petticrew et al.[188] looked at Community Alcohol Partnerships (CAPs), which are partnerships between the alcohol industry and local government focusing on alcohol misuse and anti-social behaviour among young people in the UK. This study found three out of 88 CAP evaluations met the inclusion criteria with the most robust evaluations finding little change in anti-social behaviour. There was no evidence that CAPs reduced alcohol harms or had any benefit for local communities, with the authors concluding that CAPs are likely a corporate social responsibility strategy for the alcohol industry.

Ward et al.[189] did a mixed methods evaluation of a volunteer-staffed mobile van and secure sheltered area with lighting and amenities provided by a local government area in Australia. The evaluation found the shelter and van were frequently used and highly regarded in the social or physical context but there was no significant association with a reduction in the proportion of alcohol-related ED presentations or police incident reports.

Interventions for priority populations

We identified a body of evidence looking at strategies to reduce alcohol use in Aboriginal and Torres Strait Islander populations and communities in Australia. Some of these strategies, particularly more structural (built environment or policy-based) and multi-component interventions, seemed effective. In comparison, there was little evidence relating to culturally and linguistically diverse (CALD) populations and lesbian, gay, bisexual, trans, intersex, queer or questioning (LGBTIQ+) populations.

Aboriginal and Torres Strait Islander populations

Multiple strategies and multi-component interventions

One systematic review was identified that examined studies of Indigenous community-led legal interventions to control alcohol in high-income countries. This study found Indigenous-led community controls can be effective at improving health and social outcomes. Eleven studies reported interventions that were effective in reducing crime, injury, deaths, hospitalisations or lowering consumption. However, six interventions were found to be ineffective or harmful and results were inconclusive in another. Controls are more effective if they were context-specific (to avoid unintended consequences), have community involvement at design and implementation, and are sustained over long periods (not repealed and reinstated with changing leadership). [190]

Symons et al.[191] evaluated a community-led FASD prevention strategy in Western Australia. Components included: mass media campaigns on the effects of prenatal alcohol exposure and FASD; health promotion messaging delivered through local Aboriginal organisations; alcohol use screening by community midwives; increased screening for FASD in child health services; and community-led alcohol control/ built environment changes limiting availability of alcohol. The evaluation found significant reductions in alcohol use during pregnancy. Younger mothers reported less alcohol use, particularly in the third trimester, although they found a higher proportion of older women drinking in the third trimester. The authors found community-led, multi-component initiatives can improve Aboriginal women's health outcomes, reduce consumption of alcohol during pregnancy and reduce prenatal alcohol exposure. Strengths of this study include that it was community-driven and built upon locally identified priorities of preventing prenatal alcohol exposure and building community capacity to respond to high rates of FASD.

Jainullabudeen et al.[192] also looked at a community-led primary prevention intervention targeting binge drinking in Queensland. 'Beat da Binge' was a two-year project targeting binge drinking amongst Aboriginal and Torres Strait Islander young people aged 18-24 years. The program used participatory approaches, actively engaged young people in its design, implementation and evaluation, and sought to create a partnership with researchers. Intervention components covered three broad themes: raising awareness of safe drinking practices; promotion of enjoyable alcohol-free activities as alternatives to events with alcohol; and diversionary activities to alleviate boredom and motivate achievement and self-empowerment. Results indicated there were reductions in the proportion of people engaging in short-term risky drinking and in the frequency of risky drinking sessions. There was a 10% reduction in the number of young people reporting they had engaged in short-term risky drinking along with increases in awareness of binge drinking and standard drinks. More people reported participating in physical activity training as their weekday activity and the study found increases in the number of family/friend activities that did not involve alcohol along with a decrease in personal expenditure on alcohol during risky drinking sessions. This study suggests projects led and designed by Indigenous communities, and evaluated in partnership with researchers, can be potentially effective at reducing harmful drinking behaviours and generating social and other co-benefits for communities.

Built environment interventions

Six built environment studies were conducted in Aboriginal or Torres Strait Islander communities in Australia, five in Queensland and one in Western Australia. These studies all looked at implementation of restrictions regarding alcohol access and availability at the local level through alcohol controls and alcohol management plans.

Margolis et al.[193] identified health benefits from increasing alcohol restrictions in four remote Indigenous communities, specifically prohibiting the supply of alcohol or restricting alcohol supply to low alcohol beer at a licensed premise reduced serious injury air retrievals. It suggests that more restrictive supply controls for alcohol can result in a substantial, significant and consistent decrease, however, this should be complemented by demand reduction strategies.

Clough et al.[194] used a time series analysis design to evaluate the impact of alcohol controls in four remote Indigenous communities in Queensland. This study suggests alcohol management plans and availability controls can reduce hospital air retrievals and interpersonal violence. Alcohol availability restrictions reduced hospital air retrievals (-29.4% between phase 1 and 2; -13.9% between phase 1 and 3) and availability restrictions reduced assault occurrences and assault victims (-34.1% & -21.1% respectively between phase 1 and 2; -15.0% and -13.4% between phase 1 and 3). However, the authors noted that rates of harm trended upwards from the end of the study period.

Two studies by West et al.[195,196] compared two remote Indigenous communities in far north Queensland, with one community increasing alcohol restrictions and the other prohibiting alcohol altogether. The authors found alcohol controls through alcohol management plans can reduce injury presentations to hospitals, with the highest reduction in assault-specific presentations. Reduction in female-related assault were particularly pronounced in both communities, indicating increased restrictions and prohibition can have positive benefits for this group. These strategies can also reduce domestic violence rates, as female-specific assault was significantly reduced in both communities (54% and 23%). Reductions in assault were larger in the prohibition community (30%) compared to increased restrictions (3%).

Sun et al.[197] also found alcohol restrictions (prohibiting the sale of high alcohol content drinks and restrictions on time of sales) in two remote towns in Western Australia resulted in health benefits such as significant declines in hospitalisations, injury and ED presentations, as well as social benefits such as significant declines in domestic violence.

Clough et al.[198] noted in their study on 10 Indigenous communities with alcohol management plans that many in the communities surveyed generally supported the favourable benefits of these plans on reducing violence, improving the safety of women and children, improving school attendance and improving community amenity. Some 71% of participants also agreed that the plans resulted in an increased awareness of the harms of alcohol. However, there were unintended consequences of the intervention, including the social impacts of criminalisation and discrimination.

Culturally and linguistically diverse (CALD) populations

A systematic review by O'Mara et al.[199] aimed to identify effective techniques and approaches for health promotion that reduces the risk of problems with drugs in culturally and linguistically inclusive ways in Australia. Three studies were included and all were rated as weak evaluations. They demonstrated effective community engagement but found there is no conclusive evidence of effective health promotion about alcohol and other drugs with refugees and migrant communities from CALD backgrounds in Australia.

Lesbian, gay, bisexual, trans, intersex, queer or questioning (LGBTIQ+) populations

One systematic review by Glynn et al.[200] set out to identify evidence on interventions for reducing harmful substance use among transgender people but only found two relevant studies. Both studies noted that specialist health promotion programs for the transgender community can reduce alcohol use through components such as motivational interviewing and brief individualised health promotion education. However, the available evidence is scarce.

A pilot study in the US by Charlebois et al.[201] looked at the benefits of preventive alcohol interventions in LGBTIQ+ bars. The interventions included freely available water, media campaigns and normative feedback about alcohol consumption. The study found bars in the intervention group reported lower levels of blood alcohol content, and lower levels of hazardous and binge drinking. More people in the intervention group also reported they intended to decrease their drinking compared with the control group.

Discussion

Summary of evidence

Health burden and economic costs of alcohol use

Alcohol use has a significant impact on Australian individuals, families, communities and governments in terms of health burden and economic costs.

Based on the findings of the Australian Burden of Disease Study 2018, overall health burden attributable to alcohol as measured by disability-adjusted life years (DALYs) was 222,108 DALYs in 2018, or 4.46%. The majority of this is fatal burden as measured by years of life lost (YLLs) at 132,845 YLLs, compared with non-fatal burden as measured by years of healthy life lost due to disability (YLDs) at 89,263. According to the ABDS 2018 estimates, there were 6,512 deaths (4.09% of all deaths) attributable to alcohol in 2018, and this has steadily been increasing over time from 5,033 in 2003.

The studies identified by this report accounted for a diverse range of non-healthcare costs to Government, such as taxation effects, road accidents, police, criminal courts, prisons, child protection services and out-of-home community services. One study by the NSW Auditor General found alcohol misuse cost the NSW government $1.3 billion and $645 million in healthcare costs (indexed to 2016-17 dollars). This study found an additional $2.1 billion in productivity costs to other sectors due to alcohol misuse (indexed to 2016-17 dollars).

A recent, comprehensive analysis by the National Drug Research Institute of the costs attributable to alcohol for the whole of Australia estimated net costs of:

- $2.6 billion related to premature mortality
- $0.7 billion for hospital mortality
- $2.1 billion for other healthcare costs
- $4 billion in workplace productivity costs
- $3.1 billion related to crime
- $2.4 billion due to road traffic crashes
- $1.1 billion of alcohol purchases by people that have an alcohol dependency
- $2.2 billion in other tangible costs.

The authors also calculated $48.7 billion of intangible costs, which is the monetisation of health loss through alcohol-related premature mortality and morbidity.

The health, social and economic benefits of primary prevention strategies targeting alcohol use

Multiple strategies and multi-component interventions

Multiple strategies and multi-component interventions that target multiple parts of the system and the various drivers of alcohol supply and consumption can produce significant health benefits. Some of these interventions are also cost-effective (i.e. have economic benefits as well as health and other benefits). Such interventions usually include measures and strategies addressing price, availability and marketing of alcohol products as well as implementing health promotion and education-based strategies. Other evidence also suggested the importance of community design and consultation when developing such context-specific interventions, and that multi-component interventions need to be sustained over longer periods in order to demonstrate benefits.

Health promotion programs

Health promotion programs and strategies included both individual-level interventions, such as eHealth and mHealth, as well as settings-based interventions, which involved programs or strategies targeting or embedded within specific settings, such as schools, universities, workplaces and sports clubs.

There was some evidence that eHealth and mHealth interventions could produce benefits such as reducing short-term alcohol use and other alcohol-related outcomes, including behavioural intentions and attitudes. However, this evidence was mixed, and most reviews of interventions only included alcohol-related outcomes, with very few including non-health benefits. There was limited evidence about cost-effectiveness of these interventions, though some reviews and one cost-effectiveness analysis indicated that eHealth or mHealth interventions could be cost-effective, likely because of the reach of the intervention (i.e. a greater number of people could be engaged through the intervention at a lower cost).

School-based interventions such as integrating alcohol education into curriculum and skills development generally had some or limited evidence of generating health benefits such as improving alcohol-related outcomes. Combined interventions, such as combining school-based and family or community-based interventions to prevent and address alcohol use, seemed to be effective. Interventions targeting multiple risk factors usually reported on benefits other than alcohol-related outcomes. There was limited evidence regarding the effectiveness or benefits of workplace health programs on alcohol-related outcomes. Very little economic evidence was identified for school-based, community-based and workplace programs.

Sports clubs were identified as promising settings for beneficial health promotion interventions targeting alcohol use. The evidence included in this review suggested these interventions were valuable because of their health, social and economic benefits for local sports clubs and participants.

Other types of health promotion programs, such as social norms or peer-based interventions, had mixed results and effect sizes were small. Although the evidence was mixed, combined health promotion programs targeting pregnant women may be effective and cost-effective given the health, economic and social benefits of preventing FASD.

Mass media and social marketing (including online social networks)

These studies generally found that there was a change in knowledge, attitudes and beliefs about alcohol consumption, which are important health benefits and outcomes. However, there is limited evidence that these types of benefits necessarily flow through to other health benefits such as changes in alcohol consumption or a reduction in alcohol-related harms. We found no evidence on social media interventions for alcohol use, which could be an area for future research.

We also note that most mass media and social marketing campaigns tend to be part of a broader intervention or strategy targeting alcohol use, which some studies identified, for example changes to local alcohol policy combined with a mass media campaign with information and education.

Built environment

The evidence suggests there are multiple health, social and other benefits to restricting alcohol availability and access through a range of mechanisms, particularly through reducing the number of licensed outlets in a defined geographic area and restricting trading hours of licensed venues. Many built environment changes had a number of health benefits and other co-benefits, including reductions in violence and motor vehicle crashes. While many health and social benefits were identified, few studies reported mental health benefits and no studies reported economic benefits. Some research found there was an association between availability and accessibility of alcohol in the local built environment and increased use of alcohol. Occasionally other outcomes such as suicides were measured. However, other studies suggested this evidence base was lacking and causal effects and relationships were unclear.

Behavioural economics and ‘nudge’ interventions

This review identified no relevant studies that used behavioural economics or ‘nudge’ interventions targeting alcohol use at the primary prevention level – an area of possible future research.

Healthy lifestyle

We looked at a limited number of studies that included alcohol use as part of healthy lifestyle programs. Some demonstrated a small benefit in terms of improving alcohol-related outcomes and other lifestyle factors, but very few looked at longer term benefits and outcomes.

Priority populations

There is some promising evidence of interventions aimed at Aboriginal and Torres Strait Islander communities and populations. There is much less published evidence for other priority populations such as CALD and LGBTIQ+ populations.

Recommendations for future research and policy

1. Effective preventive action requires a comprehensive approach based on implementing a range of interventions targeting alcohol supply and use.

Alcohol use in Australia is associated with a substantial amount of health burden and economic cost, including productivity impacts. There are a range of evidence-informed interventions available to improve population health in terms of addressing and reducing alcohol consumption. The most effective and cost-effective interventions - advertising restrictions and financial levers (i.e. taxes) – were excluded from this report due to the already existing robustness of evidence in those areas. This report identifies other promising interventions that are effective and possibly cost-effective, including:

1. Multi-component interventions and multiple strategies that target the various drivers of alcohol consumption, including sale and supply as well as individual behaviours
2. Built environment changes and geographic or place-based restrictions, particularly relating to changes in the accessibility and availability of alcohol. Many of these interventions often produce non-health co-benefits
3. Health promotion programs that can be sustained and scaled up in different settings, such as the opportunities presented by eHealth and mHealth interventions in terms of reach. Strategies such as co-design and engagement with end users are also important, as identified in the small number of studies with Aboriginal and Torres Strait Islander communities.

This report identified a consistent body of evidence from reviews and single studies showing structural or policy-based changes in the built environment, such as restrictions to the availability and accessibility of alcohol through limited trading hours and reduced outlet density, can prevent the harms associated with alcohol use and have a range of health, social and other benefits. Much of this evidence was gained through high-quality, rigorous evaluations of interventions, particularly in Australia.

However, these types of structural, complex policies and changes are highly contested by alcohol industry groups and can have mixed levels of community support. This has been seen for more recent interventions such as Sydney's last drinks laws, of which evaluations included in this report noted the changes were effective at reducing alcohol-related violence and hospital admissions[148-150], yet these laws were ultimately repealed after a sustained campaign and negative media coverage.[202] Changes to the built environment and other effective preventive interventions may require careful consideration by decision-makers and governments before and during implementation in order to ensure longer-term sustainability.

2. Robust evaluation frameworks need to be combined with implementation of programs to enhance the evidence and help demonstrate the health, social and other benefits of preventive strategies addressing alcohol use.

This report identified many studies and publications on interventions and strategies targeting children and young people. We identified a large body of research on health promotion and education interventions targeting children and young people across different settings, both in terms of single studies and systematic reviews.

However, this report found there is mixed or limited evidence for the effectiveness and benefits of these approaches, particularly school-based approaches. This was surprising given the widespread use of such strategies and interventions. Despite the very large body of evidence available, the evidence identified for this report suggests the benefits can be quite small or limited. Many of the systematic reviews noted poor-quality trials with very short-term follow-up and small numbers of participants. We also found examples of interventions that aimed to address multiple risk factors that sometimes cluster together in children and young people, such as tobacco use and illicit drug use. To evaluate whether such interventions are effective requires a large enough study population and follow-up over longer periods of time to determine impact on outcomes such as alcohol use. Often these trials and programs were evaluated in a short time frame (e.g. <6-12 months), whereas benefits may only appear in the longer term. For example, this could be possible through use of longitudinal or cohort studies. Robust evaluation frameworks need to be combined with implementation of programs targeting this cohort in Australia to enhance the evidence in this area.

More robust and comprehensive evaluations are particularly required for complex interventions that generate multiple benefits. Demonstrating the value of prevention is about being able to measure impact and change in behaviours, particularly over longer periods of time at both the individual and population level. Research and evaluation need to be embedded and the results shared, including in the peer-reviewed literature, so that this evidence can be easily identified and included in updated systematic reviews and other types of evidence generation and appraisal to inform policy change. Examples of this can be found in this report in regard to built environment interventions and specific settings-based interventions (e.g. in sports clubs) where many high-quality evaluations were identified that measured multiple outcomes or benefits.

Randomised controlled trials (RCTs) – the 'gold standard' of evidence generation and hypothesis testing – are not always feasible or appropriate, particularly for real-world policy changes and interventions that affect the whole population. We found some examples of sophisticated, high quality methods that can generate robust evidence. Different types of research designs and evaluations are particularly important for natural experiments of built environment changes or of settings-wide interventions. For such evaluations, it is important to embed research as part of the evaluation process in policy and practice.

There are other types of promising and novel research designs, such as simulation modelling studies which can help project possible impacts of interventions in the future prior to implementation and aid decision-making by governments. We note the updated guidance from the UK regarding complex intervention evaluation[203] which may be a useful guide for governments and researchers to further generate high quality evidence in this area relating to alcohol and prevention.

There is also some evidence about the health benefits of eHealth and mHealth approaches, but far less as to the benefits of mass media and social marketing campaigns. This may be because there is less evaluation data published about such strategies, which represents an opportunity for future research in order to improve program and strategy implementation, given information and education campaigns are popular and common primary prevention strategies for specific health behaviours like alcohol use.

Furthermore, there is a clear need for more evidence to inform interventions targeting priority populations, particularly Aboriginal and Torres Strait Islander communities, CALD communities and LGBTIQ+ communities.

3. More economic evidence is required to help demonstrate the overall economic value of prevention.

There is a limited body of economic evidence for many primary prevention interventions targeting alcohol use. Given the significant health and economic costs of alcohol use in Australia, and the effective interventions in this area, there is an opportunity to generate robust economic evidence to help inform the case for more investment in prevention, as has been done in other areas such as tobacco control and obesity prevention to aid decision makers.

We identified a significant lack of evidence about economic costs and benefits of primary prevention interventions targeting alcohol. The low number of economic studies was not in proportion to the burden on societal welfare, given the significant cost of alcohol to individuals, families, communities and governments noted in review question 1. This is a clear gap in the evidence, which is an area for future policy-relevant research given many of the benefits identified in this report can be costed (e.g. hospital admissions due to alcohol-related injuries or violence) for example, see Laslett et al.[204] More recent economic evaluations (not included in this report) exist of specific interventions, such as using a societal perspective to cost the impact of alcohol-related assaults in Sydney, by Deeming et al.[205] However, these studies are the exception rather than the rule.

The body of economic evidence could be improved through prevention agencies, public health units and research groups partnering with health economists early in the implementation and evaluation stage of new alcohol programs and interventions, to ensure appropriate data is collected for economic analyses of relevance to policy makers.

Limitations

There are several limitations to this report. This was a rapid review and, while systematic searching methods were employed, it is not the same in terms of evidence grading as a systematic review. The prioritisation of umbrella reviews and systematic reviews due to the breadth of literature may also mean that some studies were missed. For example, though it was included in the search strategy, no reviews or studies were identified about the benefits from behavioural economics or 'nudge' interventions. This may be a true reflection of the state of the evidence on these types of interventions as they relate to alcohol or more precision is required in a focused and thorough systematic review specifically relating to this type of intervention only.

In terms of identifying all the benefits associated with prevention, a review such as this is dependent on what is reported in the primary documents and systematic reviews. Evidence on non-health or social benefits may exist but have been missed by the focus of the present study on high-level evidence and focus on reviews for review question 2.

Although grey literature was searched for review question 1, it was determined that sufficient high-level evidence was identified for review question 2, obviating the need for grey literature evidence. Although 99 systematic or systematic-like reviews were included in the present report from the peer-reviewed literature, many of which were published in the last five years, some relevant additional evidence may exist outside the system of peer-reviewed journals.

Due to the large number of results and extensive areas covered by this report, a full quality assessment for each study was not performed; instead, a summary of the study's assessment of evidence quality was provided, including any assessment frameworks used and whether limitations were provided. This assessment of the quality of the underlying evidence is also likely to be of more relevance to the reader than an assessment of the quality of an umbrella review, for example.

The available evidence in this report was also heterogeneous, making synthesis and comparison difficult, particularly when comparing different strategies and interventions. Few meta-analyses were identified because of this heterogeneity of data and the different interventions, strategies and settings. Providing definitive answers on which interventions or strategies are best is therefore difficult for such a broad review. Conclusions that we can make about the evidence based on umbrella reviews and systematic reviews depends entirely on the synthesis, analysis and interpretation of the underlying evidence by the authors of those reviews. Many statements made in reviews in summing up the evidence are vague or skewed and do not necessarily accurately and clearly reflect the strength of evidence of included studies.

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Appendix 1: Included studies, review question 1

Table 6: Review question 1, health burden of alcohol use

Author & Year	Title	Publication type - study design	Population(s)
AIHW 2021	Australian Burden of Disease Study 2018	Burden of Disease	Australia
GBD Risk Factor Collaborators 2019	Global burden of 87 risk factors in 204 countries and territories, 1990–2019: a systematic analysis for the Global Burden of Disease Study 2019	Burden of Disease	Australia
Arriaga 2017	The burden of cancer attributable to modifiable risk factors: the Australian cancer-PAF cohort consortium	Burden of Disease	Australia

Table 7: Review question 1, economic burden of alcohol use

Author & Year	Title	Publication type - study design	Population(s)
Cancer Council WA 2021	Alcohol use in Western Australia, drinking patterns and harms	Fact sheet	Western Australia
Crosland 2019	The economic cost of preventable disease in Australia: a systematic review of estimates and methods	Systematic review	Australia NSW
Li 2016	Alcohol industry and governmental revenue from young Australians	Economic analysis	Australia
Smith 2019	The social and economic costs and harms of alcohol consumption in the NT	Cost of illness	Northern Territory
Whetton 2021	Examining the social and economic costs of alcohol use in Australia: 2017/18	Cost of illness	Australia
Wilkinson 2018	Older Australians: Trends and impacts of alcohol and other drug use. National Drug Research Institute, Curtin University, Perth Western Australia	Literature review	Older Australians

Appendix 2: Included studies, review question 2

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Afshin et al 2016	Information Technology and Lifestyle: A Systematic Evaluation of Internet and Mobile Interventions for Improving Diet, Physical Activity, Obesity, Tobacco, and Alcohol Use	Systematic review	Multiple (high & middle-income)	Health promotion and education (eHealth & mHealth)
Agus 2019	Cost-effectiveness of a combined classroom curriculum and parental intervention: economic evaluation of data from the Steps Towards Alcohol Misuse Prevention Programme cluster randomised controlled trial	Cost-effectiveness analysis	UK	Health promotion (settings based)
Alfred 2020	An integrative literature review exploring the impact of alcohol workplace policies.	Review	Multiple [US (n=5), Australia (n=4), and then (n=1) each from Taiwan, Sweden and England. N=2 involved several countries from across Europe]	Health promotion (settings based)
Anderson 2018	Changing collective social norms in favour of reduced harmful use of alcohol: a review of reviews	Umbrella review	Multiple	Health promotion and education (social norms or peer based)
Anderson 2018	City-based action to reduce harmful alcohol use: review of reviews	Umbrella review	Multiple - high income only	Multiple
Atkinson 2018	Impacts of licensed premises trading hour policies on alcohol-related harms	Modelling study	Australia (NSW)	Built environment (intervention)
Atkinson 2018	Harnessing advances in computer simulation to inform policy and planning to reduce alcohol-related harms	Modelling study	Australia (NSW)	Multiple
Baid 2021	Return on investment of workplace wellness programs for chronic disease prevention: a systematic review	Systematic review (economic)	US	Health promotion (settings based)
Bastola et al 2020	The Effectiveness of Mobile Phone-Based Text Messaging to Intervene with Problem Drinking in Youth and Younger Adult Population: A Meta-Analysis.	Systematic review and meta-analysis	Multiple (high-income - US, UK, Switzerland)	Health promotion and education (eHealth & mHealth)
Bellanger 2020	Cost-effectiveness of lifestyle-related interventions for the primary prevention of breast cancer: a rapid review	Systematic review (economic)	Multiple	Multiple

Appendix 2: Included studies, review question 2

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Young 2018	Effectiveness of Mass Media Campaigns to Reduce Alcohol Consumption and Harm: A Systematic Review	Systematic review		Mass media campaigns and social marketing
Bhochhibhoya et al 2015	The use of the internet for prevention of binge drinking among the college population: A systematic review of evidence.	Systematic review	Multiple (US & Netherlands)	Health promotion and education (eHealth & mHealth)
Bolier 2011	Alcohol and Drug Prevention in Nightlife Settings: A Review of Experimental Studies	Review	Multiple - high income (Europe, North America and Australia)	Multiple
Bonell 2013	The effects of the school environment on student health: A systematic review of multi-level studies	Systematic review	Multiple (US, Canada, UK, Norway, Australia, Israel, Netherlands, Belgium, Germany, Spain and Thailand,with one study on the US and Australia)	Multiple
Brennan 2011	Interventions for disorder and severe intoxication in and around licensed premises, 1989–2009	Review	Multiple	Multiple
Bryden 2012	A systematic review of the influence on alcohol use of community level availability and marketing of alcohol	Systematic review	Multiple (high income countries - US, Aus, Canada, Netherlands, NZ and Switzerland).	Built environment (association)
Burton 2016, Burton 2017	The public health burden of alcohol and the effectiveness and cost-effectiveness of alcohol control policies: An evidence review	Umbrella review	Multiple	Multiple
Cadigan et al 2015	Personalized drinking feedback: A meta-analysis of in-person versus computer-delivered interventions.	Systematic review and meta-analysis	US	Health promotion and education (eHealth & mHealth)
Cairns 2014	Combining school and family alcohol education: a systematic review of the evidence	Systematic review	High-income countries	Health promotion (settings based)
Callan 2018	Has the Licensing Act 2003 affected violence rates in England and Wales? A systematic review of hospital and police studies	Systematic review	UK	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Calverley et al 2021	A systematic review of alcohol education programs for young people: do these programs change behavior?	Systematic review	Multiple	Health promotion and education (other)
Champion 2013	A systematic review of school-based alcohol and other drug prevention programs facilitated by computers or the Internet	Systematic review	Multiple (Australia, US, Netherlands and UK)	Health promotion and education (eHealth & mHealth)
Champion 2016	Prevention of alcohol and other drug use and related harm in the digital age: What does the evidence tell us?	Systematic review	Multiple (Australia, US and Netherlands)	Health promotion and education (eHealth & mHealth)
Champion 2019	Effectiveness of school-based eHealth interventions to prevent multiple lifestyle risk behaviours among adolescents: a systematic review and meta-analysis	Systematic review and meta-analysis	Multiple	Health promotion and education (eHealth & mHealth)
Chan 2020	Systematic review of the impact of worksite wellness programs	Systematic review	US	Health promotion (settings based)
Charlebois 2017	Impact of a Structural Intervention to Address Alcohol Use Among Gay Bar Patrons in San Francisco: The PACE Study	Pilot	US (San Francisco)	Multiple
Chisholm 2018	Are the "Best Buys" for alcohol control still valid?	Cost-effectiveness analysis	Multiple	Multiple
Clough et al 2017	Alcohol management plans in Aboriginal and Torres Strait Islander (Indigenous) Australian communities in Queensland: community residents have experienced favourable impacts but also suffered	Systematic review and meta-analysis	US	Health promotion and education (eHealth & mHealth)
Clough et al. 2018	A longitudinal observation study assessing changes in indicators of serious injury and violence with alcohol controls in four remote indigenous Australian communities in far north Queensland (2000-2015)	Time series analysis	Australia (QLD)	Built environment (intervention)
Connor 2021	Changes in the incidence of assault after restrictions on late□night alcohol sales in New Zealand: evaluation of a natural experiment using hospitalization and police data	Natural experiment	New Zealand	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Coomber 2018	Short-term changes in nightlife attendance and patron intoxication following alcohol restrictions in Queensland, Australia	Pre/post study	Australia (QLD)	Built environment (intervention)
Crawford-Williams 2015	A critical review of public health interventions aimed at reducing alcohol consumption and/or increasing knowledge among pregnant women	Systematic review	Multiple	Health promotion and education (other)
Curtis 2017	Effectiveness of community-based interventions for reducing alcohol related harm in two metropolitan and two regional sites in Victoria, Australia	Time series analysis	Australia (VIC)	Multiple
Curtis 2019	Risk-based licensing of alcohol venues and emergency department injury presentations in two Australian states	Time series analysis	Australia (QLD and VIC)	Built environment (intervention)
Das 2016	Interventions for adolescent substance abuse: an overview of systematic reviews	Umbrella review	Multiple	Multiple
de Andrade 2016	Trouble in paradise: The crime and health outcomes of the Surfers Paradise licensed venue lockout	Time series analysis	Australia (QLD)	Built environment (intervention)
De Visser 2016	Voluntary temporary abstinence from alcohol during "Dry January" and subsequent alcohol use	Prospective longitudinal study	United Kingdom	Health promotion and education (eHealth & mHealth)
de Vocht 2017	The intervention effect of local alcohol licensing policies on hospital admission and crime: a natural experiment using a novel Bayesian synthetic time-series method	Time series analysis	UK (England)	Built environment (intervention)
de Vocht 2020	Evaluating the causal impact of individual alcohol licensing decisions on local health and crime using natural experiments with synthetic controls	Natural experiment	UK (England)	Built environment (intervention)
Devilly 2019	A big night out getting bigger: Alcohol consumption, arrests and crowd numbers, before and after legislative change	Pre-post study	Australia (QLD)	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Devilly 2019	Crisis support services in night-time entertainment districts: Changes in demand following changes in alcohol legislation	Pre-post study	Australia (QLD)	Built environment (intervention)
Dietrich 2016	A systematic literature review of alcohol education programmes in middle and high school settings (2000-2014)	Systematic review	Multiple (Australia, Canada, US, UK, Germany, Northern Ireland, Central Scotland, Switzerland, and Israel)	Health promotion (settings based)
Dixon 2015	Using a mass media campaign to raise women's awareness of the link between alcohol and cancer: cross-sectional pre-intervention and post-intervention evaluation surveys	Cross sectional study	Australia (WA)	Mass media campaigns and social marketing
Dorman et al 2020	Epidemiology of severe ocular trauma following the implementation of alcohol restrictions in Far North Queensland	Pre-post study	Australia (QLD)	Built environment (intervention)
Drost 2016	A web-based computer-tailored alcohol prevention program for adolescents: cost-effectiveness and intersectoral costs and benefits	Cost-effectiveness analysis	The Netherlands	Health promotion and education (eHealth & mHealth)
Fitzgerald 2016	Gender differences in the impact of population-level alcohol policy interventions: evidence synthesis of systematic reviews	Umbrella review	Multiple	Multiple
Flynn 2015	Independent evaluation of middle school-based drug prevention curricula a systematic review	Systematic review	US	Health promotion (settings based)
Ford 2018	Alcohol-related emergency department attendances after the introduction of the Sale and Supply of Alcohol Act 2012	Cross sectional study	New Zealand	Built environment (intervention)
Foster 2017	Liquor landscapes: Does access to alcohol outlets influence alcohol consumption in young adults?	Longitudinal (cohort) study	Australia (WA)	Built environment (association)
Foxcroft 2011	Universal family-based prevention programs for alcohol misuse in young people.	Systematic review	Multiple (11 in US and 1 in Netherlands)	Multiple

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Foxcroft 2011	Universal multi-component prevention programs for alcohol misuse in young people	Systematic review	Multiple (20 in US, 1 in Netherlands, 1 in Australia and 1 in India)	Multiple
Foxcroft 2011	Universal school-based prevention programs for alcohol misuse in young people	Systematic review	Multiple (41 in North America, 6 in Europe and 6 in Australia)	Multiple
Foxcroft et al 2015	Social norms information for alcohol misuse in university and college students.	Systematic review and meta-analysis	Multiple (high & middle income; US, Aus, Brazil, NZ, UK)	Health promotion and education (social norms or peer based)
Fulde 2015	Presentations with alcohol-related serious injury to a major Sydney trauma hospital after 2014 changes to liquor laws	Retrospective analysis	Australia (NSW)	Built environment (intervention)
Giesbrecht et al., 2014	Implementing and Sustaining Effective Alcohol-Related Policies at the Local Level: Evidence, Challenges, and Next Steps	Review	Multiple- Australia, Canada, Finland, New Zealand, Norway, Sweden, and the US	Multiple
Gilligan 2019	Family–based prevention programmes for alcohol use in young people	Systematic review	Multiple (US, Netherlands, Sweden, Poland, Germany and India)	Multiple
Glynn 2017	A systematic review of interventions to reduce problematic substance use among transgender individuals: a call to action	Systematic review	Multiple	Multiple
Gmel et al., 2016	Are alcohol outlet densities strongly associated with alcohol-related outcomes? A critical review of recent evidence	Systematic review	US, Australia, Canada	Built environment (association)
Gold et al 2021	Effectiveness of digital interventions for reducing behavioral risks of cardiovascular disease in nonclinical adult populations: Systematic review of reviews.	Umbrella review & meta-analysis	Multiple (high income)	Health promotion and education (eHealth & mHealth)
Green et al., 2014	Did liberalising bar hours decrease traffic accidents?	Modelling study	UK	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Green et al., 2015	Longer Opening Hours, Alcohol Consumption and Health	Modelling study	UK (England and Wales)	Built environment (intervention)
Green et al., 2016	Play Hard, Shirk Hard? The Effect of Bar Hours Regulation on Worker Absence	Modelling study	UK & Spain	Built environment (intervention)
Gulliver et al 2015	Technology-based interventions for tobacco and other drug use in university and college students: a systematic review and meta-analysis.	Systematic review & meta-analysis		Health promotion and education (eHealth & mHealth)
Hale 2014	A systematic review of effective interventions for reducing multiple health risk behaviors in adolescence	Systematic review	Multiple (US, Canada, Namibia, Australia, Hong Kong, and Europe)	Multiple
Harris et al 2019	Review of effectiveness of certain healthy lifestyle interventions to reduce alcohol consumption, increase levels of physical activity and healthy eating and reduce overweight and obesity (2014-2019). An Evidence Check rapid review brokered by the Sax Institute (www.saxinstitute.org.au) for the Cancer Institute NSW	Review		Healthy lifestyle
Hennessy 2019	Effectiveness of brief school-based interventions for adolescents: a meta-analysis of alcohol use prevention programs	Systematic review and meta-analysis	Multiple (North America, Europe and Asia)	Health promotion (settings based)
Hennessy et al 2019	Comparative effectiveness of brief alcohol interventions for college students: results from a network meta-analysis.	Meta-analysis	Multiple (USA, Aus, Brazil)	Health promotion (settings based)
Hoffman et al., 2017	Liquor legislation, last drinks, and lockouts: the Newcastle (Australia) solution	Pre-post study	Australia (NSW)	Built environment (intervention)
Howse et al 2021	The value of prevention	Review		Healthy lifestyle
Huckle et al., 2019	A restrictive alcohol social supply law change is associated with less supply to friends under 18 years	Longitudinal (cohort) study	New Zealand	Other

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Hughes et al., 2011	Environmental factors in drinking venues and alcohol-related harm: the evidence base for European intervention	Systematic review	nine countries-US, Australia, UK, Canada, France, Bulgaria, Netherland, Spain, Sweden	Built environment (association)
Humphreys 2021	Identification of Behavior Change Techniques From Successful Web-Based Interventions Targeting Alcohol Consumption, Binge Eating, and Gambling: Systematic Review	Systematic review	Multiple (US, UK, Netherlands, Sweden, Germany, New Zealand, Australia, Korea, Switzerland, Canada, Alaska, Czech Republic, and Brazil)	Health promotion and education (eHealth & mHealth)
Humphreys et al., 2013	Evaluating the Impact of Flexible Alcohol Trading Hours on Violence: An Interrupted Time Series Analysis	Interrupted time series analysis	UK (England)	Built environment (intervention)
Humphreys et al., 2014	Do flexible alcohol trading hours reduce violence? A theory-based natural experiment in alcohol policy	Natural experiment	UK (England)	Built environment (intervention)
Hurley 2019	A systematic review of parent based programs to prevent or reduce alcohol consumption in adolescents	Systematic review	Multiple (US, Estonia, Russia, and Sweden)	Health promotion (settings based)
Hutton et al 2020	mHealth Interventions to Reduce Alcohol Use in Young People: A Systematic Review of the Literature	Systematic review	Multiple (high income)	Health promotion and education (eHealth & mHealth)
Jackson et al., 2014	Social and socio-demographic neighborhood effects on adolescent alcohol use: A systematic review of multi-level studies	Systematic review	Multiple- US,, Sweden, Iceland, Canada, New Zealand, Denmark	Built environment (association)
Jainullabudeen et al 2015	The impact of a community-based risky drinking intervention (Beat da Binge) on Indigenous young people	Other	Australia (QLD)	Multiple
Janssen Meriam 2013	Effectiveness of alcohol prevention interventions based on the principles of social marketing: a systematic review	Systematic review	Multiple (US and Canada)	Mass media campaigns and social marketing
Jiang 2019	Can public health policies on alcohol and tobacco reduce a cancer epidemic? Australia's experience	Modelling study	Australia	Multiple

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Johnston Robyn 2018	Evaluation of a public education campaign to support parents to reduce adolescent alcohol use.	Cross sectional study	Australia (WA)	Mass media campaigns and social marketing
Jones et al., 2011	Reducing harm in drinking environments: A systematic review of effective approaches	Systematic review	Multiple-US, Australia, UK, Sweden, Canada	Multiple
Kaner et al 2017	Personalised digital interventions for reducing hazardous and harmful alcohol consumption in community-dwelling populations.	Systematic review	Multiple	Health promotion and education (eHealth & mHealth)
Kazemi et al 2017	A systematic review of the mHealth interventions to prevent alcohol and substance abuse.	Systematic review	Multiple (high income)	Health promotion and education (eHealth & mHealth)
Kearns et al., 2105	The Role of Alcohol Policies in Preventing Intimate Partner Violence: A Review of the Literature	Review	Multiple-US, Australia, Sweden, Brazil, Finland,	Built environment (intervention)
Kemp 2021	Effectiveness of family-based eHealth interventions in cardiovascular disease risk reduction: A systematic review	Systematic review	US	Health promotion and education (eHealth & mHealth)
Kingsland 2013	Alcohol consumption and sport: a cross-sectional study of alcohol management practices associated with at-risk alcohol consumption at community football clubs	Cross sectional study	Australia (NSW)	Health promotion (settings based)
Kingsland 2016	Interventions in sports settings to reduce risk alcohol consumption and alcohol-related harm: a systematic review	Systematic review	Multiple	Health promotion (settings based)
Kolves 2020	Impact of alcohol policies on suicidal behaviour: a systematic literature review	Systematic review	Multiple	Multiple
Kypros et al., 2011	Effects of restricting pub closing times on night-time assaults in an Australian city	Time series analysis	Australia (NSW)	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Kypros et al., 2020	Incidence of assault in Sydney, Australia, throughout 5 years of alcohol trading hour restrictions: controlled before-and-after study	Ecological study	Australia (NSW)	Built environment (intervention)
Langford 2015	The World Health Organization's Health Promoting Schools framework: a Cochrane systematic review and meta-analysis	Systematic review	Multiple (US, Canada, Europe, Australasia, China, India, Mexico, Egypt and Tanzania)	Health promotion (settings based)
Lee 2016	What works in school-based alcohol education: A systematic review	Systematic review	Multiple (Australia, Germany, Europe, the Netherlands, Sweden, UK, India, Norway, US)	Health promotion (settings based)
Liang 2016	The effect of short-term alcohol restriction on risk of alcohol-related injury: A state-wide population-based study	Other	Australia (WA)	Built environment (intervention)
Lippy 2016	Exploring alcohol policy approaches to prevent sexual violence perpetration	Umbrella review		Multiple
Lockwood 2020	"Have a little less, feel a lot better": Mixed-method evaluation of an alcohol intervention	Mixed methods - evaluation	UK	Mass media campaigns and social marketing
MacArthur 2016	Peer-led interventions to prevent tobacco, alcohol and/or drug use among young people aged 11-21 years: a systematic review and meta-analysis	Systematic review and meta-analysis	Multiple (UK, Australia, Norway, Spain, Poland, Chile and Swaziland)	Health promotion and education (social norms or peer based)
MacArthur 2018	Individual-, family-, and school-level interventions targeting multiple risk behaviours in young people.	Systematic review and meta-analysis	Multiple [high-income countries (n=67), one in lower-middle income country (n=1) and one upper-middle income country (n=1) and joint study between upper-middle and high-income country]	Multiple
Maher et al 2014	Are health behavior change interventions that use online social networks effective? A systematic review.	Systematic review		Mass media campaigns and social marketing

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Margolis et al 2011	Increasing alcohol restrictions and rates of serious injury in four remote Australian Indigenous communities	Pre-post study	Australia (QLD)	Built environment (intervention)
Martin 2018	Population Level Effects of a Mass Media Alcohol and Breast Cancer Campaign: A Cross-Sectional Pre-Intervention and Post-Intervention Evaluation	Cross sectional study	North East of England	Mass media campaigns and social marketing
Martineau 2013	Population-level interventions to reduce alcohol-related harm: an overview of systematic reviews	Umbrella review	Multiple	Multiple
Mason 2015	Text messaging interventions for adolescent and young adult substance use: a meta-analysis	Systematic review and meta-analysis	US	Health promotion and education (eHealth & mHealth)
McFadyen 2019	Sustaining the implementation of alcohol	Umbrella review		Multiple
Melendez-Torres 2016	Does integrated academic and health education prevent substance use? Systematic review and meta-analyses	Systematic review and meta-analysis	Multiple (US, UK and Australia)	Health promotion (settings based)
Menéndez et al., 2015	The effects of liquor licensing restriction on alcohol related violence in NSW, 2008–13	Time-series structure modelling	Australia (NSW)	Built environment (intervention)
Menéndez et al., 2017	The effect of liquor licensing restrictions on assault: a quasi-experimental study in Sydney, Australia	Time-series structure modelling	Australia (NSW)	Built environment (intervention)
Mewton 2018	Universal prevention of alcohol and drug use: an overview of reviews in an Australian context	Umbrella review	Australia	Multiple
Miller 2011	Do community interventions targeting licensed venues reduce alcohol-related emergency department presentations?	Time series analysis	Australia (VIC)	Multiple
Mita et al 2016	Effectiveness of social media in reducing risk factors for noncommunicable diseases: A systematic review and meta-analysis of randomized controlled trials.	Systematic review & meta-analysis	Multiple (high income)	Mass media campaigns and social marketing

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Moore 2015	Socioeconomic gradients in the effects of universal school-based health behaviour interventions: a systematic review of intervention studies.	Systematic review	Multiple [Europe (n= 58) or North America (N= 24), with 9 from Australasia, 4 from South America and 3 from Asia]	Health promotion (settings based)
Muhunthan et al 2017	Global systematic review of Indigenous community-led legal interventions to control alcohol	Systematic review	Multiple (Indigenous communities in high-income countries)	Multiple
Navarro 2013	Does increasing community and liquor licensees' awareness, police activity, and feedback reduce alcohol-related violent crime? A benefit-cost analysis	Cost-effectiveness analysis	Australia (NSW)	Multiple
Nepal et al., 2019	Effects of a Risk-Based Licensing Scheme on the Incidence of Alcohol-Related Assault in Queensland, Australia: A Quasi-Experimental Evaluation	Quasi-experimental	Australia (Qld)	Built environment (intervention)
Newton 2017	A systematic review of combined student- and parent-based programs to prevent alcohol and other drug use among adolescents.	Systematic review	Multiple (US, Croatia, Australia, Netherlands, India)	Multiple
Ni Mhurchu et al 2019	A co-designed mHealth programme to support healthy lifestyles in Māori and Pasifika peoples in New Zealand (OL@-OR@): a cluster-randomised controlled trial	Cluster RCT	New Zealand	Health promotion and education (eHealth & mHealth)
O Rourke et al 2016	Electronic communication based interventions for hazardous young drinkers: A systematic review.	Systematic review	Multiple (high income)	Health promotion and education (eHealth & mHealth)
OECD 2015	Tackling harmful alcohol use, economics and public health policy	Cost-effectiveness analysis	Multiple (Canada, Germany, Czech Republic)	Multiple
O'Mara 2020	Community-based health promotion about alcohol and other drugs in a multicultural Australia - what works? A review of evidence	Systematic review	Australia	Health promotion and education (other)
Onrust 2016	School-based programmes to reduce and prevent substance use in different age groups: What works for whom? Systematic review and meta-regression analysis.	Systematic review and meta-analysis	NA	Health promotion (settings based)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Oosterveen et al 2017	A systematic review of eHealth behavioral interventions targeting smoking, nutrition, alcohol, physical activity and/or obesity for young adults.	Systematic review	Multiple (high income)	Health promotion and education (eHealth & mHealth)
Palmer et al 2018	The effectiveness of smoking cessation, physical activity/diet and alcohol reduction interventions delivered by mobile phones for the prevention of non-communicable diseases: A systematic review of randomised controlled trials.	Systematic review	Multiple (high income)	Health promotion and education (eHealth & mHealth)
Pennay 2012	Prohibiting public drinking in urban public spaces: a review of the evidence	Systematic review	Multiple	Built environment (intervention)
Petticrew 2018	Community alcohol partnerships with the alcohol industry: what is their purpose and are they effective in reducing alcohol harms?	Systematic review	UK	Other
Phillips 2020	Effectiveness of occupational e-mental health interventions: A systematic review and meta-analysis of randomized controlled trials	Systematic review and meta-analysis	Multiple [US (n=7), Germany (n=10), Japan (n=7), Netherlands (n=5), UK (n=5), Sweden (n=3), Finland (n=1), Norway (n=1), Australia (n=1), and Hong Kong (n=1)]	Health promotion and education (eHealth & mHealth)
Pliakas et al., 2018	Increasing powers to reject licences to sell alcohol: Impacts on availability, sales and behavioural outcomes from a novel natural experiment evaluation	Interrupted time series analysis	UK	Built environment (intervention)
Porthe 2020	Community-based interventions to reduce alcohol consumption and alcohol-related harm in adults	Systematic review	Multiple	Multiple
OECD 2015	Tackling harmful alcohol use, economics and public health policy	Cost-effectiveness analysis	Multiple (Canada, Germany, Czech Republic)	Multiple
Quigg et al., 2018	Drink Less Enjoy More: effects of a multi-component intervention on improving adherence to, and knowledge of, alcohol legislation in a UK nightlife setting	Pre-post study	UK	Multiple
Rodriguez Daniel 2014	A systematic review of computerised serious educational games about alcohol and other drugs for adolescents	Systematic review	Multiple (US and UK)	Health promotion and education (eHealth & mHealth)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Rowland 2012	Association of risky alcohol consumption and accreditation in the 'Good Sports' alcohol management programme	Cross sectional study	Australia (VIC, SA)	Health promotion (settings based)
Rowland 2012	Drink-driving in community sports clubs: adopting the Good Sports alcohol management program	Cross sectional study	Australia (VIC, SA)	Health promotion (settings based)
Rowland 2012	Impact of alcohol harm reduction strategies in community sports clubs: pilot evaluation of the Good Sports program	Cross sectional study	Australia (VIC, Tas, SA)	Health promotion (settings based)
Rowland 2015	Alcohol management practices in community football clubs: Association with risky drinking at the club and overall hazardous alcohol consumption	Cross sectional study	Australia (NSW)	Health promotion (settings based)
Rowland 2019	The impact of an alcohol consumption intervention in community sports clubs on safety and participation: an RCT	RCT	Australia (NSW)	Health promotion (settings based)
Sanchez-Ramirez et al., 2018	The impact of policies regulating alcohol trading hours and days on specific alcohol-related harms: a systematic review	Systematic review	Multiple- Australia, UK, US, Canada, Sweden, Brazil, Colombia, Germany, the Netherlands and Norway	Built environment (intervention)
Scott et al., 2017	Using simulation modelling to examine the impact of venue lockout and last-drink policies on drinking-related harms and costs to licensees	Modelling study	Australia (VIC)	Built environment (intervention)
Shackleton 2016	School-Based Interventions Going Beyond Health Education to Promote Adolescent Health: Systematic Review of Reviews	Umbrella review	Multiple (Australia, UK, Canada, Netherlands, Finland, Mexico, Brazil and China, Germany, Italy, Japan, Denmark, Nigeria, Ethiopia, Portugal, Pakistan, Malawi, and South Africa)	Health promotion (settings based)
Shakeshaft 2014	The effectiveness of community action in reducing risky alcohol consumption and harm: a cluster randomised controlled trial	Cluster RCT	Australia (NSW)	Multiple
Sherk et al., 2018	Alcohol consumption and the physical availability of take-away alcohol: systematic reviews and meta-analyses of the days and hours of sale and outlet density.	Systematic review and meta-analysis	Multiple-Sweden, US, Canada	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Siegfried 2019	Do alcohol control policies work? An umbrella review and quality assessment of systematic reviews of alcohol control interventions (2006-2017)	Umbrella review	Multiple	Multiple
Singh 2017	Impact of school policies on noncommunicable disease risk factors	Systematic review	Multiple (US (15), Australia (4), UK (2),	Health promotion (settings based)
Smriti et al., 2020	Effects of Extensions and Restrictions in Alcohol Trading Hours on the Incidence of Assault and Unintentional Injury: Systematic Review	Systematic review	Multiple-Australia, Canada, German, Norway, the Netherlands, Sweden, Switzerland, UK, US	Built environment (intervention)
Song Ting et al 2019	Mobile Health Interventions for Self-Control of Unhealthy Alcohol Use: Systematic Review.	Systematic review	Multiple	Health promotion and education (eHealth & mHealth)
Staiger et al 2020	Mobile apps to reduce tobacco, alcohol, and illicit drug use: Systematic review of the first decade.	Systematic review	Multiple	Health promotion and education (eHealth & mHealth)
Stead 2019	Mass media to communicate public health messages in six health topic areas: a systematic review and other reviews of the evidence	Umbrella review	Multiple	Mass media campaigns and social marketing
Stockings 2018	Whole-of-community interventions to reduce population-level harms arising from alcohol and other drug use: a systematic review and meta-analysis	Systematic review	Multiple	Multiple
Strom 2014	Effectiveness of school-based preventive interventions on adolescent alcohol use: a meta-analysis of randomized controlled trials.	Systematic review and meta-analysis	Multiple (US and Australia)	Health promotion (settings based)
Sun et al 2019	The impact of alcohol restriction on hospital and emergency department service utilizations in two remote towns in the Kimberley region of Western Australia	Time series analysis	Australia (WA)	Built environment (intervention)
Symons et al 2020	A reduction in reported alcohol use in pregnancy in Australian Aboriginal communities: a prevention campaign showing promise	Other	Australia (WA)	Multiple
Szewczyk 2021	A systematic review of economic evaluations of antenatal nutrition and alcohol interventions and their associated implementation interventions	Systematic review (economic)	Multiple	Health promotion and education (other)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Taylor et al., 2021	The combined impact of higher-risk on-license venue outlet density and trading hours on serious assaults in night-time entertainment precincts	Modelling study	Australia (QLD)	Built environment (intervention)
Taylor et al., 2018	A mapping review of evaluations of alcohol policy restrictions targeting alcohol-related harm in night-time entertainment precincts	Review	Multiple- UK, New Zealand, US, Canada, Netherlands, Australia	Built environment (intervention)
Taylor et al., 2019	The Impact of Liquor Restrictions on Serious Assaults across Queensland, Australia	Time series analysis	Australia (Qld)	Built environment (intervention)
Tong Huong Ly et al 2021	Personalized mobile technologies for lifestyle behavior change: a systematic review, meta-analysis, and meta-regression.	Systematic review and meta-analysis	Multiple (Aus, Canada, UK)	Health promotion and education (eHealth & mHealth)
Tremblay 2020	Primary substance use prevention programs for children and youth: A systematic review	Systematic review	Multiple (US, Australia, Germany, China, and 7 European countries)	Multiple
Usher et al 2017	Is population flow an unintended consequence of alcohol management plans?	Time series analysis	Australia (QLD)	Built environment (intervention)
Vodopivec-Jamsek et al 2012	Mobile phone messaging for preventive health care.	Systematic review		Health promotion and education (eHealth & mHealth)
Ward 2018	Evaluation of a local government "shelter and van" intervention to improve safety and reduce alcohol-related harm	Mixed methods - evaluation	Australia	Other
West et al 2018	Injuries and alcohol management plans in remote Indigenous communities: a two-community comparison.	Other	Australia (QLD)	Built environment (intervention)
West et al 2018	Have Alcohol Management Plans Reduced Violence Against Women in Cape York, Australia?	Other	Australia (QLD)	Built environment (intervention)
Wilkinson 2016	Impacts of changes to trading hours of liquor licences on alcohol-related harm: a systematic review 2005-2015	Systematic review	Australia, UK, Canada, Germany, Netherlands, Norway, Switzerland and US	Built environment (intervention)

Appendix 2: Included studies, review question 2 continued

Author and Year	Title	Publication type - study design	Country	Primary prevention strategy
Wilson 2014	Alcohol interventions, alcohol policy and intimate partner violence: a systematic review	Systematic review	Multiple	Multiple
Wilton 2013	A randomized trial comparing telephone versus in-person brief intervention to reduce the risk of an alcohol-exposed pregnancy	RCT	US	Health promotion and education (eHealth & mHealth)
Wolfenden 2018	Strategies to improve the implementation of workplace-based policies or practices targeting tobacco, alcohol, diet, physical activity and obesity	Systematic review	Multiple [US (n=4), England (n=1), and Brazil (n=1)]	Health promotion (settings based)
Wolfenden, 2016	The impact of alcohol management practices on sports club membership and revenue	Cluster RCT	Australia (NSW)	Health promotion (settings based)
WHO 2015	Preventing youth violence: an overview of the evidence	Systematic review and meta-analysis	Multiple (Australia, Canada, the United Kingdom and the US)	Multiple
Wright et al., 2021	The effect of alcohol policy on intensive care unit admission patterns in Central Australia: A before–after cross-sectional study	Cross sectional study	Australia (NT)	Multiple
Xuan 2016	Alcohol policies and suicide: a review of the literature	Systematic review	Multiple	Built environment (association)
Yadav 2015	A systematic review: effectiveness of mass media campaigns for reducing alcohol-impaired driving and alcohol-related crashes	Systematic review	Multiple (Thailand, Italy, and Australia, New Zealand, and US)	Mass media campaigns and social marketing

Appendix 3: Inclusion and exclusion criteria

Review question 1: What is the health burden and economic costs of alcohol consumption?

	Inclusion	Publication type - study design
Date	2011-2021	<2011
Language	English	Non-English language
Country	Australia	Other countries not listed
Publication or study type	Scientific literature: • Primary studies • Systematic reviews and/or meta-analyses (if available) Grey literature: • Burden of Disease study • Report • Evidence Check • Review	Other publication types not listed, including other types of non-systematic reviews.
Primary risk factor	Alcohol use or consumption	Any other risk factors not listed.
Population	Adults Children	
Primary outcomes	The publication or study must include at least one of these outcomes or measures: • Proportion or amount of **economic costs** attributable to alcohol. These costs include: o Healthcare costs o Productivity costs o Non-healthcare costs and other government expenditure (e.g. Welfare, tax)	• Prevalence of risk factors • Association or relationship between the risk factors and other outcomes.

Appendix 3: Inclusion and exclusion criteria

Review question 2: What are the health, social and economic benefits of primary prevention strategies which address alcohol consumption; and which strategies are most cost-effective?

	Inclusion	Publication type - study design
Date	2011-2021	<2011
Language	English	Non-English language
Country	Scientific literature: • High income, OECD Grey literature: • Australia • Canada • New Zealand • UK • International organisations	• Other countries not listed. • Low and middle-income countries.
Publication or study type	Scientific literature: (in order of priority as per the evidence hierarchy) • Umbrella review (review of systematic reviews) and/or meta-review (review of meta-analyses) • Systematic review and/or meta-analysis • RCTs • Other study designs such as modelling studies, quasi-experimental analytical or evaluation studies, association studies (for built environment or policy change only), economic evaluations • Non-systematic reviews – such as scoping or integrative reviews. Grey literature [note – government literature prioritised]: • Report • Evidence Check • Review • Evaluation	Other publication types not listed, including commentaries, protocols, psychological lab-based trials or experiments, qualitative research (e.g. Interviews and focus groups), non-randomised studies, cohort studies and descriptive, prevalence or observational studies including cross-sectional studies. For economic studies, cost minimisation and cost analysis will be excluded. .
Primary risk factor addressed by intervention or strategy	Alcohol use and/or consumption [standard drinks where available]	Other risk factors not listed.
Population	• Adults • Children • Adolescents • Young adults • Students • General population • Aboriginal, Torres Strait Islander, Indigenous or First Nation populations • LGBTIQ+ populations • CALD populations	• Healthcare workers and professionals • People already with conditions or at high risk e.g. People with alcohol use disorders and

	Inclusion	Publication type - study design
Intervention or strategy	One of the listed population-wide primary prevention interventions that addresses alcohol use, consumption or behaviours: • Social marketing or Mass media campaign • Health promotion programs – apps, eHealth, mHealth, telephone coaching, digital, and new and emerging methods (e.g. Peer-based; social media) • Behavioural economics • Healthy built environment initiatives – policies, regulation and legislation to limit alcohol access, density, licensing, closing and open time of venues • Healthy lifestyle or community-based interventions targeting multiple risk factors • Other settings-based interventions in universities, colleges, schools, or workplaces, including interventions such as Brief Interventions and motivational interviewing in non-healthcare settings.	• Treatment • Secondary prevention (including screening) • Tertiary prevention • Pharmacotherapy • Psychological therapy • Self-help groups • Individual-level healthcare, emergency department or primary care interventions including brief interventions in health or clinical settings. • Complementary or alternative medicine • Interventions part of sexual violence prevention strategies • Drink driving laws and policies • Alcohol taxation, fiscal policies and minimum unit pricing • Alcohol labelling including front of pack labelling and warning signs, and packaging or unit size changes • Educational policing interventions • Alcohol advertising bans or restrictions
Primary outcomes	The effectiveness, impact, benefit, or positive outcome(s) from the intervention at the individual, community or system level which could include: Health • Reduction in cancer risk and cancer-related outcomes • Reduction in chronic disease or disease risk, including liver disease and cardiovascular disease • Reduction in alcohol consumption (incl problematic alcohol use and binge drinking) • Abstaining from alcohol consumption • Improvement in other health behaviours • Reduction in injuries • Benefits to the health system - e.g. Reduction in hospitalisations or ED presentations • Reduction in cases or prevalence of Foetal Alcohol Spectrum Disorder (FASD) • Reduction in overweight, obesity, body mass, BMI, or improvement to BMI • Improvement / increase to health knowledge and attitudes (e.g. immediate benefits for mass media campaigns and health promotion)	• Implementation, feasibility or acceptability of interventions • Methodological reviews of interventions • Any treatment or screening related outcome

	Inclusion	Publication type - study design
Intervention or strategy	**Mental health** • Improved mental or psychological wellbeing • Reduction in mental health problems • Reduction in mental disorders • Reduction in stress • Reduction in substance misuse • Improvement in self-esteem • Reduction in suicide and/or self-harm **Social** • Improvements in health and social equity • Improvement in safety and amenity • Reduction in traffic accidents • Reduction in crime or violence • Reduction in drink driving • Improvement in social participation • Improvement to school attendance • Increased employment • Reduction in domestic or family violence/ intimate partner violence **Economic / cost effectiveness** • Reduction in health care expenditure and costs associated with alcohol consumption • Reduction in productivity losses, presenteeism, absenteeism, welfare payments etc • ICER • Cost per QALY gained or DALY averted • Reduction in years of production or income lost due to premature mortality or morbidity • Improvement to GDP.	

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