

## **FINAL REPORT**

# **Lessons learnt from alcohol and tobacco for cannabis regulation**

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## EXECUTIVE SUMMARY

### Introduction, aims and methods

The aim of this work was to conduct a comprehensive review of the published meta-analyses and systematic reviews of alcohol and tobacco control. In doing so, this work sought to identify measures from the fields of alcohol and tobacco regulation that have proven successful in reducing the negative health impacts of these products and could potentially be transferred to the regulation of cannabis. The study was mandated and funded by the Swiss Federal Office of Public Health.

We reviewed structural regulatory measures for alcohol and tobacco that prevent or reduce harmful consumption and foster less harmful, less risky consumption patterns. Structural measures focus on the environment, the settings, and the control measures that can be implemented beyond a focus on any one individual.

As specified by the Swiss Federal Office of Public Health, the review concentrated on the following populations and outcomes: 1. prevention of high-risk consumption of alcohol or tobacco; 2. reduction of harms amongst those consuming alcohol and/or tobacco at high risk levels; 3. prevention of underage use of alcohol and/or tobacco; and 4. protection of third parties.

All systematic reviews and/or meta-analyses that reported empirical data on the effectiveness of alcohol or tobacco structural measures were obtained through systematic searches of multiple databases. Where there were regulatory measures that had not been subject to systematic review/meta-analysis, we used individual studies to assess the measure(s). The searches produced 5,475 papers (having removed duplicates). Many of the entries concerned interventions for alcohol or tobacco dependence (for example meta-analyses of medication options for alcohol dependence). Nevertheless, we used the master database of 5,475 to then structure our review: selecting from within the database the relevant articles for each regulatory measure under review.

### The regulatory measures

Eight regulatory areas were examined:

- Market structures (Chapter 3)
- Price/taxation measures (Chapter 4)
- Consumer information and product labelling (Chapter 5)
- Regulating product types and product modifications (Chapter 6)
- Restrictions on advertising (Chapter 7)
- Regulating retail sales and distribution (Chapter 8)
- Drink-drive countermeasures (Chapter 9)
- Regulating allowable places of consumption (Chapter 10)

Within each of these broad regulatory areas, specific measures were examined, as summarised in the below table. The final column indicates whether there have been systematic reviews and/or meta-analysis of the effectiveness of these measures in reducing alcohol or tobacco consumption and harms and/or harms to third parties (Yes/No), and where Yes, if the reviews have shown their effectiveness (✓).

	<b>Measures</b>	<b>Systematic reviews available (Y/N); evidence of effectiveness (v)</b>
<b>Market structure (Chapter 3)</b>		
	Government monopoly	Yes
	Private (for-profit)	Yes
	Not-for-profit	No
	Curtailing for-profit industry influence	Yes
<b>Pricing/taxation (Chapter 4)</b>		
	Higher retail price	Yes (v)
	Minimum unit price	Yes (v)
	Higher prices on more harmful forms	Yes (v)
<b>Consumer information (Chapter 5)</b>		
	Product labelling/consumer information	Yes
	Health warnings	Yes (v)
	Plain (standardised) packaging	Yes (v)
	Child resistant and tamper resistant packaging	Yes (v)
	Safer use guidelines	No
<b>Product types and product modifications (Chapter 6)</b>		
	Regulating psychoactive ingredients	Yes (v)
	Regulating different product types	Yes (v)
	Flavoured tobacco products	Yes (v)
<b>Advertising and promotion (Chapter 7)</b>		
	Full advertising bans	Yes (v)
	Partial advertising bans	Yes
	Point-of-sale advertising restrictions	Yes (v)
	Internet-based/social media marketing restrictions	No
	Film, television portrayal restrictions	Yes
	Sponsorship, sports events, merchandise restrictions	Yes (v)
	Industry self-regulation	Yes
<b>Retail sales (Chapter 8)</b>		
	Outlet density restrictions	Yes (v)
	Trading hours restrictions	Yes (v)
	Online sales	No
	Sales to minors	Yes (v)
	Responsible server training	Yes
	Alcohol server liability	Yes
	Rations/quantity purchase limits	No
	Enforcement of retail sales regulations	No
<b>Drink-drive countermeasures (Chapter 9)</b>		
	BAC limits	Yes (v)
	Checkpoints and random breath tests	Yes (v)
	Designated driver programs	Yes
	Interventions & license suspension for those convicted	Yes
<b>Regulating allowable consumption sites (Chapter 10)</b>		
	Smoke-free policies	Yes (v)

## Key findings

### Chapter 3: Market structures

**Market structure:** Evidence for a preferred market structure (comparing government monopoly, privatised for-profit, and community not-for-profit) for alcohol and tobacco largely comes from individual studies with only two systematic reviews concerned with market structure. Government monopoly arrangements (at wholesale, production and retail level, and whether individually or in hybrid models where both government and for-profit sit side by side) is associated with lower alcohol consumption and alcohol-related harms (Gilmore et al., 2011; Hahn et al., 2012; Mäkelä, 2002; Stockwell et al., 2009). As such, the cannabis market structure with the most public health gain would be a government monopoly model. The advantage of a government monopoly model is that the enforcement of the other regulatory aspects, such as promotions, labelling, retail sales hours and so on, all become part of the governmental system, and compliance and enforcement is not required. It also obviates the need to manage a for-profit industry, with goals that might conflict with public health goals.

**Privatised retail markets:** Natural experiments where government retail alcohol monopolies ceased and were replaced with privatised markets, have revealed that alcohol became more readily available, leading to increased consumption, leading to increased alcohol-related harms (Babor et al., 2010; Her et al., 1999). Individual-level studies of alcohol retail privatisation found increased drinking was greater for those already drinking at high-risk levels and may increase and sustain high-risk drinking among youth (Gohari et al., 2021). While a government monopoly is strongly evidence-based for public health outcomes, if one goal is to counteract the black market, accessibility of retail outlets would be important.

**Cannabis and government monopolies:** Government monopoly arrangements have received much attention when thinking about cannabis regulation (Rehm & Fischer, 2015). Haden et al., (2014) recommended setting up a governing body like a Cannabis Control Commission which would control cannabis production, packaging, distribution, retailing, and revenue allocation. A consensus of nine policy experts deliberated on cannabis market arrangements finding that a state monopoly for cannabis production, wholesale and retail operations was rated as most effective for three outcomes: reducing youth cannabis use, excessive cannabis use amongst the general population, and cannabis-impaired driving (Blanchette et al., 2022). There is some evidence from Canada of increased cannabis availability (significantly more stores per capita and longer retail hours) in hybrid models (private and government) when compared with government-only retail models (Myran et al., 2019).

**Not-for-profit models:** Compared to the evaluation literature on switching from a government run alcohol retail system to a privately owned and operated one, research on not-for-profit alcohol ownership is more descriptive in nature, with no systematic reviews evaluating the public health impacts of not-for-profit alcohol market structures. There is much literature on cannabis social clubs (one not-for-profit model) (Decorte & Pardal, 2017; Decorte et al., 2017; Jansseune et al., 2019; Obradors-Pineda et al., 2021; Pardal et al., 2020), but no empirical analyses comparing consumption and harms with other market structures.

**Industry influence:** The political influence of tobacco and alcohol industries has included deceptive and manipulative activity, tactics to prevent tax increases or other stricter forms of regulation, and lobbying on public health matters (McCambridge et al., 2019; Mialon & McCambridge, 2018; Petticrew et al., 2020; Savell et al., 2016). The role of a cannabis for-profit, private industry requires very careful monitoring for their influence on public health policy and research. There is already evidence of inappropriate influence (Adams et al., 2021; Rotering & Apollonio, 2022; Subritzky et al., 2016). Self-evidently a government monopoly at the production and retail ends of the market would circumvent this problem of industry influence. In its absence, and with some segments of the market open to competition from for-profit providers, the effectiveness of regulation (such as product price, advertising, and sales restrictions) becomes paramount.

**Enforcement:** In the absence of government monopoly, enforcement of any regulations in the production and retail sales of cannabis becomes crucial. Unfortunately, the compliance and enforcement literature for what works for alcohol and tobacco is not strong. There is strong evidence of non-compliance and evidence that the effects of enforcement decay over time, suggesting significant investment in routine compliance checks, across all stores, is necessary (Wagenaar et al., 2005a). The ways in which compliance can be checked (through routine inspections, test purchases, mystery shoppers) have not been compared for their relative cost-effectiveness in detecting non-compliance. The penalties that can be applied (fines, public shaming, loss of license/permit) have also not been compared for their effectiveness in deterring retailers from breaches.

#### Chapter 4: Price/taxation

**Price effects:** There is strong evidence from alcohol and tobacco that higher prices decrease population consumption and also decrease related harms (Sharma et al., 2017; Wagenaar et al., 2009). Meta-analysis has demonstrated that a 10% increase in the price of alcohol is expected to decrease overall consumption in the population by 5%, and some studies in tobacco demonstrate a similar range of effect (Gallet, 2007). Existing data on the elasticity of cannabis demand indicate similar cannabis elasticities, for example -0.418 (Halcoussis et al., 2017); -0.42 to -0.60 and -0.5 to -0.6 (Riley et al., 2020) (although acknowledging that cannabis elasticity studies have a more limited pool of data to draw from). It is therefore extremely likely that higher cannabis prices will contribute towards lower total population consumption and lower rates of harm than might be expected with lower market prices..

**Differential price effects (young people, heavy use, income):** While increased price/tax was found to reduce overall consumption, price elasticities of alcohol and tobacco varied among different cohorts, with young people found to be less responsive to alcohol price increases than the general population although more so for tobacco. People with heavy use were also found to be less price responsive, although still responsive (Elder et al., 2010; Scott et al., 2017). Given that people who drink more heavily have a higher rate of consumption, even if price impacts are more moderate than for the general population, they will yield a larger magnitude of reductions in consumption for this group, and the associated health gains could therefore be significant (Sharma et al., 2017). Income was found to have a moderating effect on the impact of price rises across both tobacco and alcohol (regardless of country) as those with higher disposable incomes can more readily absorb price increases (Bafunno et al., 2020; Elder et al., 2010; Wagenaar et al., 2009). Understanding how

people with different patterns of cannabis use and incomes respond to different price increases will be critical to implementing appropriate cannabis policies.

**Different types of taxation/price systems:** Systematic reviews of alcohol and tobacco did not make a comparison of which tax/price systems are the most beneficial in terms of public health.

Complicated tax regimes create the potential for industry loopholes. There are five main potential tax/price arrangements for cannabis:

- An excise tax based on THC content (that is products with higher THC content have a higher tax rate)
- a value added sales tax – as a fixed percentage of retail price, or of weight
- differential price by type of product (that is, additional taxes for more harmful forms or for certain forms to be discouraged)
- a minimum unit price (that is a floor price for any cannabis product)
- bans on price discounting and promotions

Determining the taxable amount based on THC content is complicated because of the presence of CBD – which mitigates some of the harmful effects of THC. One option is to consider tax rates based on the ratio of THC to CBD (rather than simply THC alone).

**Minimum Unit Pricing** also offers a potential model for setting base level prices of cannabis. The alcohol literature demonstrates that when implemented in conjunction with taxes, minimum unit pricing is effective at raising the prices of the cheapest drinks, often consumed by those who drink most heavily, so offering an effective policy option for tackling heavy use (Boniface et al., 2017). As revenue from minimum unit pricing flows to industry, ensuring that pricing policies are also supported by appropriate tax levels will be critical to maintain government revenue that may then be used for treatment and prevention strategies.

**Industry evasion:** The evidence from alcohol and tobacco shows that corporations will either try and find loopholes to avoid taxes (through the creation of new products or new tiers of products), or in some cases absorb taxes to retain market share. In addition to strategies such as minimum unit pricing, a ban on product discounting may also be effective in maintaining appropriate pricing levels. Bans on price discounting and promotions is especially important considering findings from tobacco literature that product discounting and coupons were used more readily by young people and those with lower socio-economic status (Golden et al., 2016; Guindon et al., 2020).

**Price effects, product substitution and nudge strategies:** Alcohol and tobacco research demonstrates that where tax or pricing policies (or other inputs) create differences in costs of products, substitution can occur (Ciapponi et al., 2021). Price signals for less harmful cannabis product types will be a potential ‘nudge’ strategy, as seen in individual studies of e-cigarettes (lower price) compared to cigarettes. The evidence from e-cigarettes suggests that flavoured products are likely to encourage consumption (and hence harms). Either banning flavours or placing an additional tax on flavoured cannabis product are regulatory options supported by evidence from tobacco control (Huang et al., 2017).

**Price and the black market and unrecorded/illicit consumption:** Minimising black-market activity is often cited as one of the main drivers and benefits of cannabis policy liberalisation. At least in the short run, this therefore requires that the price and availability of cannabis be set at a level which is equal to or more accessible than the black market (i.e., similar prices, similar availability). The



suggestion to implement lower prices of cannabis is in direct contrast to the public health arguments that have often been made for alcohol and tobacco – which aim to set the price as high as possible. While there is evidence from alcohol and tobacco showing that when prices increase, the extent of unrecorded consumption also increases (Krishnamoorthy et al., 2020; Miracolo et al., 2021), there are also studies showing that unrecorded alcohol consumption (a marker of the alcohol black market) did not automatically increase with increases in alcohol taxation (Rehm et al., 2022).

Price is not the only influencing factor on consumption rates (Pacek et al., 2019), with sociocultural factors, availability, convenience and taste also influencing price elasticities of alcoholic beverages and likely to also impact the price elasticity of cannabis products.

## Chapter 5: Consumer information and product labelling

**Product labels:** Consumer information about the product being purchased or consumed is important to increase awareness and enhance the likelihood of healthy choices. Alcohol includes standard drinks labelling and ethanol content; and cigarettes display the nicotine contents. There is strong evidence that consumer/health information labels lead to changes in awareness and knowledge, but only moderate evidence that such labels lead to changes in consumption behaviours (Shemilt et al., 2017; Wettlaufer, 2018). Current labelling requirements in legal cannabis markets include THC and often also CBD potency in milligrams, percentages and/or ratios. Recent research has shown poor consumer comprehension of THC amounts (Leos-Toro et al., 2020). This study showed that ‘traffic light’ labelling or ‘recommended doses’ were more effective in communicating THC levels.

**Health warning labels:** Evidence for behaviour change comes mostly from the experience with tobacco warning labels; the key to their success appears to be the use of large, prominent, graphic warnings (Clarke et al., 2021; Pang et al., 2021; Ünal & Metintaş, 2021). Warning labels on cannabis products may reduce cannabis consumption (and hence harms) moderately, and will be more effective depending on their size, shape, colours and placement (Kim et al., 2022). Mandating health warning labels for cannabis is more effective than voluntary cannabis warning labels (Goodman et al., 2022).

**Plain packaging:** The evidence for plain packaging comes from tobacco control, with consistent evidence that plain packaging of cigarettes reduced product appeal and deterred people from initiation to smoking (Moodie et al., 2021). Plain packaging also increased intentions to quit smoking. There is not, however, strong evidence for behavioural impacts on people who smoke (i.e. reduced tobacco consumption). We note that the major impediment to tobacco plain packaging has been industry legal action in the context of existing free trade agreements. For cannabis, there are no free trade agreements, and as such plain packaging could be introduced without industry interference.

**Child-resistant and tamper-resistant packaging:** In relation to tobacco, and notably e-liquids and e-cigarette cartridges, one review has shown that child resistant packaging reduced child exposure to nicotine (Jo et al., 2017). In Canada, all cannabis-containing edibles are required to have tamper-proof and child-resistant packaging.

**Safer use (low risk) guidelines:** Low-risk alcohol consumption guidelines do not have strong evidence of effectiveness in preventing high risk consumption or in reducing the harms amongst

those consuming at high risk levels (Holmes et al., 2020). At the same time, they do no harm and are not a costly intervention.

## **Chapter 6: Regulating product types and product modifications**

**Regulating the psychoactive ingredient:** In attempting to apply the lessons from alcohol and tobacco to cannabis, it is important to recognise the unique characteristics and different harm profiles for each substance. The psychoactive ingredient in alcohol is the main source of harm from the product, while much of the harm from cigarettes and other smoked tobacco products does not come directly from nicotine, the main psychoactive ingredient, but from the route of administration (smoking) and the carcinogens found in different tobacco products. For cannabis the psychoactive profile is more complex and there are differences in types and degrees of potential harm between different potencies, cannabinoid composition, and modes of use (as well as consumption patterns).

Setting appropriate limits in potency for cannabis products will be a critical consideration, not just for THC but also the balance of THC and CBD. In US states where cannabis is legal, the regulations for THC content are specified as maximum THC levels per serving (varying by state, but between 5mg and 10mg for combustibles, higher for edibles) (Gourdet et al., 2017). Noting the complexity of specifying a standard dose, a recommendation for a 5mg THC content has been proposed (Freeman & Lorenzetti, 2020).

The evidence in relation to capping the level of nicotine (through research on Very Low Nicotine Cigarettes) suggests that if the caps on THC levels are such that they nullify the psychoactive effects of the product, consumers will source cannabis from alternative sources. However, some people may be encouraged to take up products with lower psychoactive properties especially where there are significant differences in price.

**Regulating product types:** A number of cannabis researchers, especially from the US, have been documenting the proliferation of cannabis products and modifications (Goodman et al., 2020) with some concern. The prevailing assumption is that a greater range and number of cannabis products and types is associated with increased likelihood of cannabis uptake or continuation – which would suggest limiting the range of product types available. We did not locate any alcohol or tobacco systematic reviews that could confirm this.

One lesson from tobacco research on e-cigarettes shows that increasing the availability of lower-harm forms of nicotine will have public health benefits but is associated with concerns of youth uptake. In line with e-cigarette research, vaping of cannabis offers a method of consumption with fewer harms than smoking, although with the same discussion around whether or not the availability of vaping encourages or acts as a gateway to smoking cannabis (Budney et al., 2015).

**Flavoured cannabis products:** The evidence from the tobacco literature demonstrates that flavoured products are potentially more attractive to a younger cohort. Flavoured smoked tobacco is banned in many countries for this reason along with banning names similar to childhood confectionary. Given the evidence on the link between flavours and use of tobacco products in children, a ban on flavoured cannabis products and names/brands marketed to children could also be applied. Given the evidence from the US that retailers may try and subvert such bans (for instance rebranding from 'grape' to 'purple'), a large scope and clear guidance will likely be necessary alongside appropriate

enforcement mechanisms. Another strategy is to place an additional tax on flavoured cannabis products.

### **Chapter 7: Restrictions on advertising and promotion**

The evidence on the association between exposure to advertising/promotion of alcohol and tobacco and increased consumption and/or intentions to consume alcohol or tobacco products is strong (Capella et al., 2011; Paynter & Edwards, 2009; Robertson et al., 2016). These impacts are felt across all locations of promotion including traditional media, point-of-sale, sporting events and social media. It is a reasonable assumption that cannabis advertising will be associated with the same or similar positive intentions to consume cannabis and greater uptake of cannabis consumption.

The extent of advertising restrictions – whether a full ban on cannabis advertising or a partial ban – is linked to decisions about the market structure. We assume that if a government monopoly were chosen, there would likely be a full advertising ban. With a hybrid or privatised market (with for-profit and/or not-for-profit retailers), the regulations around advertising and their effective enforcement become important.

Evidence from tobacco studies and from studies on Norwegian alcohol advertising bans suggest that total advertising bans would be more effective than partial bans (although evidence is still largely indicative). Ensuring that total bans include appropriate regulation to moderate online and social media promotions will be critical. The tobacco advertising meta-analysis by Capella et al., (2008) suggests that advertising bans initiated at the introductory stages of the product life cycle are likely to yield a significant impact. This suggests that cannabis advertising bans should be implemented at the outset, before the product lifecycle matures. This is in line with the argument that it is better to introduce stricter regulation at the start, leaving the opportunity for future loosening of regulations.

Multiple marketing violations by current cannabis businesses, particularly in-store promotions and content posted online (Carlini et al., 2022), suggest that appropriate regulatory mechanisms will also need strong compliance infrastructure to be effective.

### **Chapter 8: Regulating retail sales**

**Outlet density:** Research shows that when there are more alcohol and tobacco outlets in a given area, overall consumption and harms increase (Popova et al., 2009; Sherk et al., 2018; Valiente et al., 2021). The research on young people smoking and tobacco outlet density reinforces that regulating outlet density may prevent underage consumption (especially outlet density in residential areas) (Finan et al., 2019). Regulating cannabis store outlet density is supported by this research from alcohol and tobacco. Furthermore, research has shown that a greater density of medical cannabis stores has been associated with increased cannabis use and presentations to hospitals for cannabis-related problems (Berg et al., 2018).

**Trading hours and days restrictions:** The evidence from alcohol points to a strong correlation between longer sales times and greater days of week, and higher consumption and alcohol-related harms (for example Hahn et al., 2010; Middleton et al., 2010; Popova et al., 2009; Sanchez-Ramirez & Voaklander, 2018; Sherk et al., 2018; Wilkinson et al., 2016). Limiting the days of the week and the

trading hours for cannabis sales is likely to be an effective regulatory measure based on the alcohol literature (Haden & Emerson, 2014).

**Online sales:** There are no systematic reviews of the effectiveness of online sales regulations for alcohol and tobacco, and as such, no empirical evidence to transfer across to cannabis. Whether legal online sales of cannabis are allowed or not could be informed by the general principles surrounding availability and access – for alcohol and tobacco where availability and access is high, consumption is high, and where consumption is high, harms are high.

**Specialist stores only:** There are no systematic reviews investigating the impact of limiting retail trade to specialist stores on consumption of alcohol or tobacco, although they have certainly been instigated as a method of reducing access, particularly by people under the age of 18. Accessibility is linked to consumption and harms, and so instigation of specialist retailers may be informed by general principles surrounding availability and access. We note that restricting cannabis sales to specialist outlets only is a model used in the Netherlands and parts of the US, and an initiative suggested by some as having relevance for cannabis (Transform Drug Policy Foundation, 2022).

**Sales to minors:** Rates of alcohol and tobacco consumption amongst people under the age of 18 are lower than those over the age of 18. Whether this is driven by the ban on sales to minors or is a simple age-effect is not able to be precisely determined, but there is little disagreement that a ban on sales to minors is a sensible policy. For alcohol, there is limited empirical evidence about setting the age at 18 years compared to 21 years of age as the legal age for purchase and/or consumption, but when the legal age is lowered, alcohol-related harms appear to be higher (Baldwin et al., 2022; Stockings et al., 2016).

**Responsible service training, alcohol server liability:** Responsible server training for alcohol does not have a strong evidence-base. Research on alcohol server liability has shown that liability laws are associated with reductions in driving-related alcohol harms (Rammohan et al., 2011), in the context of on-premise alcohol consumption.

**Rations or quantity purchase limits:** While there are no systematic reviews of the public health effects of alcohol quantity purchase limits, historical experience of rationing systems (e.g. Bratt system, Sweden) suggests that when such limits are removed, total alcohol consumption increases (Room, 2012). Given that the rationing schemes arose following alcohol prohibition (the parallel with cannabis), this suggests that cannabis rations or purchase quantity limits may reduce the levels of total population consumption.

**Enforcement of retail regulations:** There is limited evidence to inform enforcement regimes around retail sales regulations: either in terms of methods for detecting non-compliance with retail regulations, or assessment of the effectiveness of different penalties. There is evidence from both alcohol and tobacco literature that enforcement effects decay over time (Wagenaar et al., 2005a), suggesting significant investment in routine compliance checks is necessary.

## **Chapter 9: Drink-drive countermeasures**

Drink-drive countermeasures have been regarded as a highly successful public health measure that has reduced alcohol-related harm – both for people consuming alcohol and for third parties.

Drink-driving countermeasures that have been demonstrated to be effective are those which legally specify a blood alcohol limit for drivers and enforce that limit through checkpoints and/or random breath tests (Esser et al., 2016; Morrison et al., 2003). Legal consequences for exceeding BAC levels (i.e. license suspension) have mixed evidence for effects on road traffic crash reductions (McArthur & Kraus, 1999). Remedial programs, which aim to provide treatment and education to people who have been convicted for drink-driving, appear to be effective at reducing recidivism rates (Miller et al., 2015).

In terms of communicating the risks of driving under the influence, mass media campaigns have not been shown to be highly effective for alcohol but may play a role to reduce the likelihood of driving under the influence (Elder et al., 2004). For cannabis, as a stand-alone tool, it is unlikely to be effective (and given the absence of strong evidence of cannabis-impaired driving, the factual basis for any such campaign could be questioned).

Research on cannabis and driving is still emerging, with some evidence that cannabis does impair driving, although modestly (Alvarez et al., 2021; Sevigny, 2021). The key to the success of the drink-drive countermeasures has been the ability to specify a legal limit of alcohol in a driver's blood that is associated with impairment and increases the risk of a road accident, known as *per-se* laws.

There is no strong evidence yet that a specific range of THC concentration is strongly correlated with driving impairment (Arnell et al., 2021) and detection methods remain a pressing research priority. In Canada, however, they are using sobriety/impairment tests plus have a *per se* THC threshold for driving of  $\leq 2$  ng/mL and  $\leq 5$  ng/mL, despite considerable uncertainty (Peng et al., 2020; Windle et al., 2021). While this research agenda emerges, a parsimonious cannabis regulation would be to avoid specifying a legal limit given the unknown evidence for any such limit and provide strong advice to not drive after consuming cannabis (the "wait" policy). One review of medicinal cannabis and driving found the driving impairments from cannabis tended to be most prominent in the 2-hours after reaching the 'subjective high', then gradually decrease in the subsequent 4-hours (Neavyn et al., 2014). An 8-hour wait time was therefore suggested as a 'conservative' recommendation. However, some studies found some impairment over the 24-hours post-consumption (Neavyn et al., 2014).

There is strong evidence that the combination of alcohol and cannabis is associated with higher crash risk (Neavyn et al., 2014). Enforcing drink-driving laws (through random breath testing) is likely therefore to have an effect on driving-related crashes involving cannabis and alcohol.

## Chapter 10: Regulating allowable places of consumption (smoke-free policies)

**Smoke-free policies:** Smoke free policies for tobacco (given the health harms of both smoking and exposure to second-hand smoke) have been a highly effective public health measure for both decreasing tobacco consumption and protecting the health of third parties (Callinan et al., 2010; Faber et al., 2017).

Comprehensive smoking bans have been associated with reductions in smoking behaviours, including smoking prevalence and quantity of cigarettes smoked (Callinan et al., 2010). In addition, there have been considerable positive health outcomes from comprehensive smoke-free policies, such as reduced heart and lung disease (Faber et al., 2017). Comprehensive smoking bans have also

been associated with reduced respiratory infections, asthma, and second-hand smoke exposure for children, as well as reduced smoking initiation in young people (Been et al., 2014; Freedman et al., 2012).

The implementation of the Framework Convention on Tobacco Control with its ban on public smoking of tobacco could be extended to cover cannabis (Steinberg et al., 2019). In Canada, most provinces ban cannabis consumption (smoking or vaping only) where similar tobacco consumption is prohibited (Shanahan & Cyrenne, 2021). The face-validity of regulations banning cannabis smoking in public places relies on evidence of harms from second-hand cannabis smoke. Some people mix their cannabis with tobacco when smoking, and in those cases, the second-hand tobacco smoke is well-known to be toxic to third parties (Carreras et al., 2019). There is also evidence of second-hand cannabis smoke toxicity (independent of tobacco) (Chatkin et al., 2019; Holitzki et al., 2017). The research on whether there are second-hand harms from vaping cannabis is nascent (Cone et al., 2015; Wilson, 2016).

Although it has been suggested that public smoke-free policies could increase smoking in the home (with children present), this has not eventuated with tobacco (Nanninga et al., 2018). Whilst it is unclear whether the same would apply for cannabis, ensuring public venues are free from second-hand cannabis smoke, particularly when children are present, should remain a priority.

Further considerations may be whether other non-inhalation forms of cannabis consumption are allowable in public (such as edibles). It may require considering the intention of the policies – is it to reduce consumption (as is one of the intentions of tobacco smoking bans) or to reduce the harms associated with second hand-smoke exposure? If the intention is to reduce consumption, placing bans on consuming other forms of cannabis may be considered. However, if the primary goal is to prevent harms to third parties, then evidence of such harms would be required to justify such a policy.

### **Other considerations (Chapter 11)**

Beyond the specific effectiveness of the above regulatory measures, there are several other considerations when applying lessons from the alcohol and tobacco literature to cannabis.

**The substances differ:** Like alcohol and tobacco, cannabis is a potentially harmful substance. While the adverse health effects of cannabis are less severe than alcohol and tobacco (Weissenborn & Nutt, 2012), cannabis is still a dependence producing drug, and prolonged use can be associated with poor psychosocial outcomes, mental health concerns, and cardiovascular disease (Hall, 2017). The distribution of consumption for cannabis is also similar to other psychoactive substances – that is a majority of the substance is consumed by a small proportion of people using heavily (Rehm et al., 2019). Therefore, some of the public health concerns that animate alcohol and tobacco regulation – for instance around harm minimisation and protecting vulnerable populations susceptible to dependence – are also relevant for cannabis regulation. Like tobacco, cannabis is commonly smoked, which warrants regulations like banning indoor smoking. Cannabis is also associated with acute intoxicating effects, which like alcohol, might require prioritising measures like drug driving or regulating the potency of the substance.

**Underlying population prevalence:** The underlying population prevalence matters for the choice and relative emphasis between regulatory control measures. Effective regulation differs for low prevalence versus high prevalence substances. The current prevalence of use in Europe differs significantly between the three substances (last month consumption: alcohol = 60%; tobacco = 18%, cannabis = 4%). The stage of an epidemic is an important issue to consider when applying regulatory strategies (Caulkins, 2007). Prevention strategies are most important early on when prevalence is low; harm reduction and treatment strategies are more important later, when prevalence is higher.

**Policy goals: reduce adult population consumption versus reduce harmful adult consumption**

The most common outcome measure used in alcohol (and to a lesser extent tobacco) control research is total population consumption, rather than high-risk or harmful consumption. Regulatory measures are regarded as effective if they reduce total population consumption. This is because the levels and patterns of drinking at a total population level are directly related to the levels of heavy drinking and alcohol-related harm. Known as the ‘total population consumption’ model of alcohol (Room & Livingston, 2017), this has driven the public health approach to reducing alcohol-related harm.

Regulatory measures are regarded as effective if they reduce total population consumption. Assuming the population distribution of cannabis consumption follows the same pattern as alcohol (that is higher total population consumption is associated with greater harms), then public health focussed cannabis regulation would be concerned with reducing total population prevalence. This is an assumption that should be empirically interrogated for its application to cannabis.

**Current socio-political context:** The alcohol and tobacco policy research is situated within particular socio-cultural times. All the recent alcohol control research is within the context of a privatised market, with the global shift away from large government and high levels of state intervention in countries where most of the research takes place. Moving from prohibition to a regulated market means that many lessons may come from the cessation of alcohol prohibition, yet this occurred in a very different socio-cultural time.

**The ‘harm to others’ paradigm:** A key feature of tobacco policy is the success of the ‘harm to others’ framing. Passive smoking harms opened an avenue for policy reform that introduced smoke-free places, premised on protecting the ‘innocent’ population members from the ill-effects of second-hand tobacco smoke. Evidence for harms from second-hand cannabis smoke is emerging, for vaping it remains unknown, and evidence for harms to third parties from other forms of consumption (e.g. edibles) is unknown.

**Vulnerable populations and equity considerations:** Some population groups are more susceptible to higher consumption and/or greater harms from alcohol and tobacco, including people of low socio-economic status, sexual and gender minorities (LGBTIQ+) and ethnic and racial minorities. Most regulatory policy levers fail to account for differential impacts on vulnerable populations. There is strong evidence of alcohol and tobacco industry marketing to racial minorities (and in poorer neighbourhoods) (Grier & Kumanyika, 2008). Retailers are less compliant with regulations in poorer neighbourhoods (Higgins et al., 2019). For cannabis regulation, this suggests attention to both the location of retail outlets, and strong enforcement of regulations in poorer neighbourhoods.

Regulatory levers should not increase inequity. The application of higher prices for tobacco and alcohol has been shown to increase health equity (that is provide positive health outcomes for people of lower socio-economic status) but at the same time reduce economic equity (that is higher prices have a greater impact on the poverty of poorer people). Balancing health equity and economic equity is a challenge.

**Black market and public health:** Much literature on cannabis regulation is concerned with reducing the black market but does the presence of a cannabis black market matter for public health outcomes? Are there better health impacts in a legal cannabis market compared to an illegal cannabis market, especially when emergence of a legal market will most likely increase population consumption? Research evidence is lacking, but these questions are useful to consider when formulating regulations from a public health perspective.

### **Limitations**

Our review focussed on English-language published systematic reviews and meta-analysis. There are thousands of empirical studies of alcohol and tobacco and their regulation, which examine public health outcomes. While randomised controlled trials are unusual (because regulatory features mostly cannot be randomised, just observed) other methods are employed to ensure valid comparisons between a regulatory intervention and a suitable comparison or control, including cohort studies, case control studies, time-series analyses, and cross-sectional studies. Systematic reviews take all these individual studies and synthesise findings across studies. They represent the highest level of evidence, and they overcome the potential confounds in any one individual study. Focussing on systematic reviews also made the three-month project manageable. The limitation is that for some regulatory interventions there were no systematic reviews (to date), or only one or two systematic reviews available. We moderate our conclusions in these circumstances, and in some cases, we cite selected strong individual empirical studies as indicative of effectiveness.

We did not conduct an analysis as applied to the Swiss context specifically – there will be particular cultural, social, and normative aspects in Switzerland where some of the English-language literature is less likely to be applicable; and where the regulatory options need to be shaped by local conditions.



## **PART 1 INTRODUCTION**

## Chapter 1: Introduction and background

On 25 September 2020, the Swiss Parliament passed an amendment to the Federal Act on Narcotics and Psychotropic Substances (NarcA). With its new Article 8a NarcA, the revised Act provides a legal basis for conducting scientific pilot trials with cannabis that are limited in terms of both time and place. In addition, the Federal Office of Public Health (FOPH) is to conduct accompanying departmental research in order to obtain scientific evidence for a possible new regulation of cannabis for non-medical purposes as soon as possible.

With the decision of the Social Security and Health Committees (SSHC) of both chambers of Parliament to follow up on the parliamentary initiative to regulate the cannabis market for better youth and consumer protection, the urgency for evidence-based results for the new regulation of cannabis has once again been reinforced. The initiative aims to create a legal cannabis market and to comprehensively regulate the cultivation, production, trade and consumption of cannabis containing THC. The SSHC of the National Council has initiated a corresponding legislative procedure to prepare a draft decree. The FOPH is therefore pushing ahead with the corresponding departmental research. The most important findings on cannabis regulation from a public health perspective are to be included into a Federal Council report, which is currently being drafted. To this end, lessons from the regulation of other already legal addictive substances, in particular alcohol and tobacco, are to be drawn for the regulation of cannabis.

Switzerland is moving in line with many other countries to regulate the legal supply and consumption of cannabis. With this, a question commonly explored is whether public health measures used to address other legal substances – like alcohol or tobacco – can inform cannabis regulation.

In the first instance, it is important to understand both the similarities and the differences between alcohol, tobacco and cannabis. Substances can differ with reference to prevalence and patterns of use, intoxication, constituent parts and active ingredients, contaminants, routes of administration, overdose, as well as other features such as home production, and the size of the black market. In the below section we articulate the key similarities and differences.

### 1.1 Comparing alcohol, tobacco and cannabis

Any comparison of regulatory measures across substances needs to take into account both similarities and differences between the substances, as summarised in the below table.

*Table 1: Summary of similarities and differences between alcohol, tobacco, and cannabis on key dimensions*

	<b>Alcohol</b>	<b>Tobacco</b>	<b>Cannabis</b>
Prevalence and patterns of use (EU) – last month use	In 2019, 60% of the EU adult population had consumed alcohol in the last month.	In 2019, 18.4% of the EU adult population reported daily smoking (22.3% men; 14.8% women).	In 2019, 3.9% of the EU adult population had consumed cannabis in

	<b>Alcohol</b>	<b>Tobacco</b>	<b>Cannabis</b>
	<p>Abstention from alcohol in the past year was 26.2%.</p> <p>8.4% of the EU adult population consumed alcohol daily (4% of females and 13% of males), 28.8% weekly, and 22.8% monthly (eurostat: hlth_ehis_al1e)</p>	<p>Abstention from tobacco in the past year was 74% (European Commission, Public Health, Tobacco Overview)</p>	<p>the last month<sup>1</sup> (Manthey et al., 2021)</p> <p>Abstention from cannabis in the past year was 93.2%</p>
Active ingredients and constituent parts	Ethanol	Nicotine	THC; CBD. CBD limits the psychoactive/intoxicating effects of THC
Route of administration	Oral (drunk)	Inhalation (through smoke or vaporised) Oral (snus/chewing tobacco)	Inhalation (through smoke or vaporised) Oral (edibles)
Contaminants	Rare, but methanol is the most common and dangerous contaminant (Lachenmeier et al., 2021; Neufeld & Rehm, 2018)	Nitrosamines, carbon monoxide, tar	Pesticides, fungi, mould, bacteria solvents, microbes, heavy metals (Dryburgh et al., 2018; Subritzky et al., 2017)
Intoxication	Yes	No	Yes
Overdose	Yes (Lachenmeier & Rehm, 2015)	Yes (but very rare) (Lachenmeier & Rehm, 2015)	No (Lachenmeier & Rehm, 2015)
Home production	Yes	No	Yes
Black market	25% of alcohol consumption is 'unrecorded' (Lachenmeier et al., 2021), one measure of the alcohol black market.	8% (EU) of all cigarettes smoked (KPMG, 2020)	100%
Other	<p>Social supply: yes</p> <p>Consumption sites: home/social settings/public venues</p>	<p>Social supply: yes</p> <p>Consumption sites: home/social settings/public venues</p>	<p>Social supply: yes</p> <p>Consumption sites: home/social settings/public venues</p>

<sup>1</sup> Data for Switzerland from 2016 indicates 3% total population use over the last 30 days (Gmel, 2017; Vogel et al., 2019)

Prevalence of use differs significantly between the three substances (see Table 1). The widely different prevalence rates speak to the social acceptability and norms surrounding regular alcohol, tobacco or cannabis consumption. The stage of an epidemic is an important issue to consider when applying regulatory strategies, as per Caulkins' work (2007) demonstrating regulatory effectiveness is impacted by the epidemic stage. Prevention strategies are most important early on when prevalence is low; harm reduction and treatment strategies are more important later on when prevalence is higher. This would suggest that given the current low population prevalence of cannabis use (see Table 1) relative to tobacco and alcohol, a focus on regulations that support prevention of commencement of consumption would be most appropriate.

In terms of the damaging health effects of the three substances, tobacco (nicotine) does not produce intoxication, unlike both alcohol and cannabis. Overdose from alcohol occurs and can be fatal whereas while nicotine overdose can produce very unpleasant effects, it is rarely fatal. Cannabis does not have any known mortality associated with excessive consumption (other than when used in combination with other substances) (Hall, 2017). All three substances are dependence-forming and can lead to substance use disorder (Hall, 2017). From a pool of people initiating cannabis use, one in five develop cannabis use disorders (Leung et al., 2020). In terms of overall health risk, applying the Margin of Exposure approach<sup>2</sup> Lachenmeier has shown that cannabis represents an overall very low risk, and alcohol and tobacco a very high risk (Lachenmeier & Rehm, 2015). Thus, despite cannabis sharing features with both tobacco and alcohol, it is less harmful than each (Caulkins & Kilborn, 2019).

The population distribution of cannabis consumption is similar to other psychoactive substances – that is, a substantial majority of the substance is consumed by a small proportion of people who consume heavily (Room & Örnberg, 2019), in line with the “Pareto Principle” (80% of the total amount consumed is being consumed by 20% of the consumers). Therefore, the public health concerns that animate alcohol and tobacco regulation – for instance protecting vulnerable populations susceptible to dependence, decreasing the likelihood of harmful levels of consumption, and regulating availability and price – are also relevant for cannabis regulation.

Like tobacco, cannabis is commonly smoked, which warrants considering regulations like banning indoor smoking. But cannabis is also associated with acute intoxicating effects, which like alcohol, might require prioritising measures like drug-driving or regulating the potency of the substance. Where cannabis diverges from alcohol and tobacco is in the variety of edible products. Yet the psychoactive components (ethanol, nicotine, THC) can be the focus of regulation (Matheson & Le Foll, 2020).

The size of the existing black market in a product will influence the choice and strength of different regulatory strategies, especially if the regulatory goal is to reduce the size of the black market. The WHO estimate for “unrecorded alcohol” is 25% (World Health Organization, 2018, p. 43) that is, the proportion of alcohol consumed that is not recorded in any official statistics. The alcohol industry

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<sup>2</sup> The Margin of Exposure (MOE) is a novel approach to compare the health risk of different compounds and to prioritize risk management actions. The MOE is defined as the ratio between the point on the dose response curve, which characterizes adverse effects in epidemiological or animal studies (the so-called benchmark dose (BMD)) and the estimated human intake of the same compound. Clearly, the lower the MOE, the larger the risk for humans (Lachenmeier & Rehm, 2015).

has been keen to point out the risks of an alcohol black market and there is suspicion that this issue is exaggerated to counteract increasing taxation (with arguments that increasing taxes will support a black market). The black market for illicit tobacco, estimated by KPMG to be around 8% of all cigarettes consumed in Europe, is smaller than for alcohol. For cannabis, the black market is currently 100%. The size of the black market reflects the accessibility and availability of a substance and thus the need to shape regulations such that they compete with the established illegal market. This challenge seems to be key (Caulkins & Kilborn, 2019; Crépault et al., 2021; Watson et al., 2019).

Throughout this report, readers should keep in mind these differences between alcohol, tobacco, and cannabis and hence the implications for cannabis regulation. Finally, we would point out that harms related to alcohol and tobacco persist at high levels despite the public health measures designed to address them, which suggests that approaches used to minimise their harms are unlikely to be enough to minimise the harms related to cannabis (Hall, 2017). Indeed, both alcohol and tobacco remain leading causes of premature death, “so the question may not be, How can we regulate cannabis like alcohol or tobacco? but rather, How can we regulate cannabis *better* than we have regulated alcohol and tobacco?” (Caulkins & Kilborn, 2019). ‘Better’ might mean implementing stronger public health approaches than those currently in place when regulating alcohol or tobacco (Caulkins & Kilborn, 2019; Hall, 2017). Better might also mean different and more creative policy approaches. And finally, ‘better’ may also be specific to cannabis, given that the underlying assumptions surrounding effective alcohol and tobacco regulation (total consumption model and harm to others) need to be tested for cannabis (see Chapter 11).

## 1.2 Aims

The aim of this work was to conduct a comprehensive review of the published meta-analyses and systematic reviews of alcohol and tobacco control in order to identify measures from the fields of alcohol and tobacco regulation that could potentially be transferred to the regulation of cannabis.

There are thousands of empirical studies of alcohol and tobacco and their regulation which examine public health outcomes. While randomised controlled trials are somewhat unusual (because regulatory features mostly cannot be randomised, just observed) other methods are employed to ensure valid comparisons between a regulatory intervention and a suitable comparison or control. These include cohort studies, case control studies, timeseries analyses, and cross-sectional studies. When reviewing the scientific literature, we should preference the strongest empirical designs: those with the most likelihood of producing valid conclusions and reducing any bias. This ‘hierarchy of evidence’ places systematic reviews and meta-analysis as the highest level of evidence (above individual cohort, case control, time series, and cross-sectional studies). Systematic reviews and meta-analyses take all the individual studies which meet empirical and design criteria and analyse the overall results of an intervention across the body of empirical literature.

For this project, we focussed on systematic reviews: this is the highest level of evidence, and it overcomes the potential confounds in any one individual study. It also made the three-month project manageable.<sup>3</sup> The result is a focus on the strongest level of evidence and conclusions that can be made with confidence about the evidence for effective regulation of alcohol and tobacco to improve public health outcomes. The limitation is that for some regulatory interventions there were

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<sup>3</sup> It is entirely beyond the scope of this project to review all of the original studies against all of the regulatory interventions.

no systematic reviews (to date), or only one or two systematic reviews. We moderate our conclusions in these circumstances, and in some cases we cite selected strong individual empirical studies as indicative of effectiveness.

### 1.3 Scope of the review

The focus of this review of alcohol and tobacco control is at the regulatory level with structural measures that prevent or reduce harmful consumption and foster less harmful, less risky consumption patterns. Structural measures focus on the environment, the settings and the control measures that can be implemented beyond a focus on any one individual. Structural measures can include regulations about the physical environment (such as smoke-free policies), economic incentives (such as price and taxation), consumer information, sales regulations and limits on advertising, the social norms around alcohol or tobacco consumption and ultimately changing the underlying social conditions (such as poverty) that contribute to increasing the risks of harmful alcohol and tobacco consumption. Structural prevention measures have become more prominent in the Non-Communicable Disease public health arena because of recognition that individual healthcare measures (such as screening and treatment) have limited population-level impact. While this review, therefore, does not include screening, brief intervention or treatment services for alcohol and tobacco use, these remain effective at changing individual's behaviours (and as such should not be forgotten).

### 1.4 Populations and outcomes of interest

As specified by the Swiss FOPH, this review concentrated on the following populations and outcomes:

#### 1. Prevention of high-risk consumption of alcohol or tobacco

The population of interest here are people who may already be consuming alcohol/tobacco, and the public health outcome is to prevent escalation of their use to high-risk levels. In the case of the alcohol, this means remaining within low-risk consumption guidelines.

#### 2. Reduction of harms amongst those consuming alcohol and/or tobacco at high risk levels

The population of interest here is people who are consuming alcohol/tobacco at harmful levels (in alcohol, referred to as 'heavy drinking' or 'heavy episodic drinking'). The public health goal is to reduce harmful consumption, and reduce the harms associated with that consumption.

#### 3. Prevention of underage use of alcohol and/or tobacco

The population of interest here is young people, under the age of 18 years, and the outcome being sought is to prevent commencement of alcohol/tobacco use.

#### 4. Protection of third parties

The population of interest here is the general population who may experience harms from other people's alcohol/tobacco consumption. For alcohol this includes violence, injury, and road accidents; for tobacco this includes exposure to second-hand smoke.

The most common outcome measure used in alcohol (and to a lesser extent tobacco) control research is total population consumption, rather than high-risk or harmful consumption. Regulatory measures are regarded as effective if they reduce total population consumption. This is because the levels and patterns of drinking at a total population level are directly related to the levels of heavy

drinking and alcohol-related harm. Known as the ‘total population consumption’ model of alcohol (Room & Livingston, 2017), this has driven the public health approach to reducing alcohol-related harm. It directs regulatory attention to population control measures, such as price, restrictions on retail sales, health warning labels and so on. Illicit drugs research, inclusive of past cannabis research, has been less concerned with total population consumption (with the exception of preventing initiation to drug use). Indeed, arguably illicit drugs research has been at pains to point out non-harmful consumption patterns (recreational use) which has supported drug law reform efforts. These issues are picked up in more detail in Chapter 11 but suffice to say that the following chapters predominantly focus on total population consumption outcomes; because that is what has largely been measured in alcohol and tobacco regulatory research.

## Chapter 2: Methods

We sought to search for, locate and analyse all systematic reviews and/or meta-analyses that reported empirical data on the effectiveness of alcohol or tobacco structural prevention measures. The inclusion criteria for the literature were:

- Meta-analyses/systematic reviews which reported empirical data on alcohol and/or tobacco structural prevention measures;
- Studies published in peer-reviewed journals, and limited to full-text English-language;

Where there were regulatory measures that had not been subject to systematic review/meta-analysis, we sought individual studies in order to assess the measure(s). Where there were multiple systematic reviews to draw from and where it was possible, we have attempted to distinguish results between Western and non-Western nations due to cultural, historical, and social relevance for Switzerland.

### 2.1 The search parameters

The three search criteria were:

1. Substance – alcohol, tobacco and all associated synonyms for alcohol and tobacco  
AND
2. Systematic review, meta-analysis, systematic literature review and all associated synonyms for systematic reviews  
AND
3. Regulatory control/structural prevention measures.

In order to effectively search for relevant literature to meet this third criterion, we developed a preliminary list of all potential regulatory measures, engaged in discussions with the FOPH to add to that list, then conducted preliminary searches to identify the relevant keywords to use for each regulatory measure. The list of regulatory measures (and associated descriptors) is given in the table below.

*Table 2: Regulatory measures and descriptors used to then identify “keywords” and “subject/topic” words for the systematic searches.*

Regulatory measures	Potential search terms
Pricing/taxation	Tax Price Cost Minimum unit price Excise Duty
Availability (restrictions on sales/distribution)	Availability, Outlet density, Hours of sales, On-premise, Off-premise Trading hours Physical availability Lockouts



<b>Regulatory measures</b>	<b>Potential search terms</b>
	Age limits Minimum legal age Test purchasing Rationing, quantity limits
Licensing systems	Licensing ID scanners Responsible Beverage Service Responsible Service of Alcohol Dram shop liability License revocation Staff training
Market structure	Monopoly Remonopolisation Free market Self-regulation Alcohol trusts Privatisation Market structure
Restrictions on certain (non-commercial) consumption sites	Smoke-free zones Alcohol-free zones Consumption site bans Restrictions on consumption Public consumption
Driving laws	Drink driving regulations/policy/controls DUI Driving under the influence Alcohol-Impaired Driving Blood alcohol limits Sobriety checkpoints Random breath testing
Advertising/promotion	Advertising Promotion Sponsorship Packaging Package labels Labelling Media exposure, TV, film advertising Product placement Industry self-regulation Advertising bans. Mystery shoppers/test purchase
Product quality control	Ethanol content Nicotine content
Product packaging and information	Plain packaging Health warnings Warning labels Labelling Product labelling
Harm reduction initiatives & Safe use guidelines	Harm reduction Safer use Safe drinking guidelines

Regulatory measures	Potential search terms
	Safe consumption guidelines Drinking guidelines Alcohol guidelines Dietary guidelines Structural harm reduction Environmental prevention
Other terms	Passive smoking Third party harms Workplace measures/workplace incidents Home brew Self-supply "Nudge"

## 2.2 The databases and search results

We searched five databases: PubMed, Embase, Psycinfo, PAIS, and the Cochrane Library. A librarian was consulted to help develop search strategies for each database.

Each database is set up with slightly different approaches to the use of search terms, subject areas and keywords. The specific subject topics and keywords (as they applied to each of the five databases) are provided in Appendix 1.

The searches produced 5,475 papers which met the three search criteria (having removed duplicates). Many of the entries turned out to be not relevant to our analysis, notably many reviews concerned with individual interventions for alcohol or tobacco dependence (for example meta-analyses of medication options for alcohol dependence). Nevertheless, we used the master database of 5,475 to then structure our review: selecting from within the database the relevant articles for each regulatory measure under review.

## 2.3 The structure to the review

There are several different ways of theorising and classifying alcohol and tobacco control measures. In Babor et al's (2010) alcohol policy book, *No Ordinary Commodity*, interventions are sorted into the following categories:

- Regulating physical availability
- Taxation and Pricing
- Altering the drinking context
- Education and persuasion
- Regulating alcohol promotion
- Drinking-driving countermeasures
- Treatment and early intervention (out of our scope)

The Framework Convention on Tobacco Control uses the following categories:

- Measures relating to the reduction of demand for tobacco
  - Price and tax measures to reduce the demand for tobacco
  - Non-price measures to reduce the demand for tobacco
  - Protection from exposure to tobacco smoke
  - Regulation of the contents of tobacco products
  - Regulation of tobacco product disclosures

- Packaging and labelling of tobacco products
- Education, communication, training and public awareness
- Tobacco advertising, promotion and sponsorship
- Demand reduction measures concerning tobacco dependence
- Measures relating to the reduction of the supply of tobacco
  - Illicit trade in tobacco products
  - Sales to and by minors
  - Provision of support for economically viable alternative activities
- Protection of the environment

The WHO *Global Strategy to Reduce the Harmful Use of Alcohol* uses the following policy response categories:

- (a) leadership, awareness and commitment
- (b) health services' response
- (c) community action
- (d) drink-driving policies and countermeasures
- (e) availability of alcohol
- (f) marketing of alcoholic beverages
- (g) pricing policies
- (h) reducing the negative consequences of drinking and alcohol intoxication
- (i) reducing the public health impact of illicit alcohol and informally produced alcohol
- (j) monitoring and surveillance.

None of these categorisations felt perfectly suited to our analysis of effective alcohol and tobacco control measures in order to apply lessons to cannabis. As a result, we have used the following categories to summarise the alcohol and tobacco literature:

- Market structure
- Pricing/taxation
- Consumer information
- Product type and product modification
- Advertising and promotion
- Retail sales
- Drink-drive countermeasures
- Regulating allowable consumption sites

Within each of these broad regulatory areas, specific measures were examined, as summarised in the below table (Table 3). The final column indicates whether there have been systematic reviews and/or meta-analysis of the effectiveness of these measures in reducing alcohol or tobacco consumption and harms and/or harms to third parties (Yes/No), and where Yes, if the reviews have shown their effectiveness (v).

Table 3: Measures, availability of systematic reviews

	Measures	Systematic reviews available (Y/N); evidence of effectiveness (v)
<b>Market structure (Chapter 3)</b>		
	Government monopoly	Yes
	Private (for-profit)	Yes
	Not-for-profit	No
	Curtailing for-profit industry influence	Yes
<b>Pricing/taxation (Chapter 4)</b>		
	Higher retail price	Yes (v)
	Minimum unit price	Yes (v)
	Higher prices on more harmful forms	Yes (v)
<b>Consumer information (Chapter 5)</b>		
	Product labelling/consumer information	Yes
	Health warnings	Yes (v)
	Plain (standardised) packaging	Yes (v)
	Child resistant and tamper resistant packaging	Yes (v)
	Safer use guidelines	No
<b>Product types and product modifications (Chapter 6)</b>		
	Regulating psychoactive ingredients	Yes (v)
	Regulating different product types	Yes (v)
	Flavoured tobacco products	Yes (v)
<b>Advertising and promotion (Chapter 7)</b>		
	Full advertising bans	Yes (v)
	Partial advertising bans	Yes
	Point-of-sale advertising restrictions	Yes (v)
	Internet-based/social media marketing restrictions	No
	Film, television portrayal restrictions	Yes
	Sponsorship, sports events, merchandise restrictions	Yes (v)
	Industry self-regulation	Yes
<b>Retail sales (Chapter 8)</b>		
	Outlet density restrictions	Yes (v)
	Trading hours restrictions	Yes (v)
	Online sales	No
	Sales to minors	Yes (v)
	Responsible server training	Yes
	Alcohol server liability	Yes
	Rations/quantity purchase limits	No
	Enforcement of retail sales regulations	No
<b>Drink-drive countermeasures (Chapter 9)</b>		
	BAC limits	Yes (v)
	Checkpoints and random breath tests	Yes (v)
	Designated driver programs	Yes
	Interventions & license suspension for those convicted	Yes
<b>Regulating allowable consumption sites (Chapter 10)</b>		
	Smoke-free policies	Yes (v)

These eight types of regulatory control measures are dealt with in individual chapters (3 through 10). Choices in one area, such as market structure (Chapter 3), will influence the approach in other areas, such as retail sales regulations (Chapter 8). Pricing considerations (Chapter 4) need to take into account product types (Chapter 6). At the conclusion of each Chapter we summarise the findings and their application to cannabis regulation, giving consideration to intersecting regulatory measures. A concluding chapter (Chapter 11) provides a summary of the alcohol and tobacco literature, followed by some broader considerations for cannabis regulations when lessons from alcohol and tobacco are being considered. This final chapter concludes with limitations and research gaps.

## **PART 2 REVIEW OF MEASURES**

## Chapter 3: Market structure

Market structures refer to the arrangements for suppliers and for retailers with reference to the extent of competition (or not) between suppliers and between retailers, and the ownership of supply and retail companies (whether government, for-profit, or not-for-profit). There have been, and are, a variety of market structures for both alcohol and tobacco (Camara et al., 2009; Hawkins et al., 2018; Jernigan & Ross, 2020; Lee & Eckhardt, 2017; Pasitska, 2017). Market structures influence product availability, price, advertising and promotion, product range, enforcement and compliance, and product packaging and labelling. Empirical evidence for the relationship between market structure and public health impacts is the subject of this chapter, noting that empirical evidence from systematic reviews is very limited.

Before examining the relevant literature on public health impacts of differing market structures, we firstly clarify some key terms. In traditional economics, there are four basic types of market structure: pure competition (where there are multiple suppliers for the same product), monopolistic competition (multiple suppliers with product differentiation), oligopoly (a few suppliers) and pure monopoly (a single supplier).<sup>4</sup>

The literature indicates that the type of owner can have an impact on public health. In this context there are three different types of owners: private (for profit) companies, government, and not-for-profit/community owners.

Lastly, there are two different market levels of relevance here: the production/wholesale level<sup>5</sup> and the retail level. This distinction is important because there can be a (government) monopoly on retail sales but not production, or production and not retail.<sup>6</sup> And at the retail level, there is a division in most alcohol regulatory systems between sale for “on-premise” and sale for “off-premise”<sup>7</sup> consumption.

In theory then this leaves us with a matrix of different options, as displayed in Table 4.

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<sup>4</sup> <https://thismatter.com/economics/market-models.htm>

<sup>5</sup> We combine production and wholesale for the sake of simplicity

<sup>6</sup> We draw this distinction because it needs to be thought through for cannabis: it is plausible to have cannabis produced under a government monopoly but then retailed through private sellers; or the reverse.

<sup>7</sup> Also referred to as “on-trade” and “off-trade” sales

Table 4: Matrix of potential market structures

STRUCTURE	SUPPLIER		
	Government	Private	Not-for-profit
<b>Pure competition</b>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>
<b>Monopolistic competition</b>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>
<b>Oligopoly</b>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>
<b>Pure monopoly</b>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise)</li> </ul>	<ul style="list-style-type: none"> <li>• Production/wholesale AND/OR</li> <li>• Retail (on/off premise))</li> </ul>

When applying this matrix of potential options to alcohol and tobacco, broadly speaking the most commonly discussed arrangements<sup>8</sup> are:

- Government 'monopoly' on wholesale/production and/or on retail sales
- Private (for-profit) competitive market (for both production and retail sales)<sup>9</sup>
- Not-for-profit/community ownership for production and/or retail sales

Table 5 presents the main characteristics of each of these arrangements.

Table 5: Alcohol and tobacco market types with brief characteristics

Market arrangement	Characteristics
Government 'monopoly'	<ul style="list-style-type: none"> <li>• Production, importation and wholesale and/or retail stores government owned and run</li> <li>• Profit is part of government revenue</li> <li>• Staffed by government employees, paid at civil-service rates</li> <li>• For government retail monopolies, the state controls what liquor products are sold, where, and when, and can set the price(s)</li> </ul>
Privatized system (for-profit)	<ul style="list-style-type: none"> <li>• Private production and/or retail sales</li> <li>• Profit to owners/shareholders</li> <li>• Staffed by private employees</li> </ul>

<sup>8</sup> These are not mutually exclusive and usually appear blended. Furthermore we note that there are many other combinations and permutations around the globe for market structure and ownership arrangements. For simplicity we focus on those that have been discussed most prominently in the literature.

<sup>9</sup> Note for tobacco, this is largely an oligopoly – dominance of a small number of companies.



Market arrangement	Characteristics
	<ul style="list-style-type: none"> <li>• Government regulates private industry via laws, policy and regulations</li> <li>• Subject to government regulations, competition and free trade determines how product addresses its market (product choice, price, packaging etc).</li> </ul>
Not-for-profit ownership (community organisation) <sup>10</sup>	<ul style="list-style-type: none"> <li>• Revenue is returned to community owners for distribution back to community</li> <li>• Where licensing is used, community purchases license</li> <li>• Subject to government regulations, dual interests of community benefit and enterprise viability determines how product addresses its market (product choice, price, packaging etc).</li> </ul>

It is important to note that these are idealised types of arrangements. In most places, blended models exist. For example, at the retail level, it is possible to have a system which is partly government-run and partly private enterprise, or partly privately-run with also some community owned retailers for example, government monopolies for off-premises alcohol sales in many Nordic countries, while in New Zealand in some communities, alcohol is sold via community-owned liquor stores (Stewart & Casswell, 1992).

Government monopoly arrangements do not appear to exist for production of alcohol or tobacco in Western nations anymore, although for alcohol they still exist at the wholesale level, for instance in most Canadian provinces (Room, 2020). Room (2000) notes that most of the monopoly systems of the Nordic countries and in the US were established at the end of alcohol prohibition so they did not involve the State taking over existing private industries/interests (of relevance for cannabis)<sup>11</sup>. There are examples of joint ventures between state-owned entities and private companies (e.g. beer production in China). Babor et al., (2010) note the general trend away from state controls over production and distribution (most are privatised/commercial operations). Within fully private markets there are also differences in ownership of production (large global corporations or multiple smaller brewers or a mix). For tobacco, government monopolies were present in Europe up until the early 2000s, still exist in other parts of the world and are estimated to account for 40% of world tobacco consumption, with the Chinese tobacco monopoly being the largest state-owned tobacco company (Gilmore et al., 2011).

Three other features of market structure are worth highlighting before we move to the evidence for the public health impacts of these arrangements. Firstly, the government level for any regulatory control may be national, sub-national or local. For example, in a number of countries local or provincial/state governments regulate the for-profit industry with respect to granting liquor licenses, whereas in other places, a federal regulatory system applies.

<sup>10</sup> There is a potential distinction between a strictly not-for-profit non-government ownership, and a community-owned enterprise that might be for-profit, but these further distinctions are beyond the scope of this review.

<sup>11</sup> We do note that in some cases it was connected to WW1 and WW2 where the State did take over private interests in order to get control over important agricultural crops that can be used equally in liquor production and food supply.

Secondly the relationship between production/wholesale and retail levels is a potential source of regulatory control by preventing vertical integration. Vertical integration is where the same supplier controls production, wholesale and retail sales. In the US, they forbid this type of vertical integration for alcohol (the so-called “three tier” system)<sup>12</sup> at the end of national prohibition to reduce alcohol-related harms (and due to concerns about monopolistic behaviour), although the “three tier” system has since been considerably compromised in a number of US states.

Thirdly, in relation to alcohol, product type matters. A distinction between hard liquor, wine and beer has been made in many jurisdictions, where the market structure for liquor (e.g., government monopoly) sits alongside a different market structure (e.g., pure competition) for wine and/or beer. (Most commonly it is the beverages with a higher alcohol content that are under a government monopoly in a partially monopolized system).

We now turn to evidence for the relationship between these various market arrangements for alcohol and tobacco and the associated public health impacts, firstly considering the production/wholesale level, followed by the retail level.

### **3.1 Market structures – production and wholesale arrangements and impacts on public health**

Monopolies at the wholesale level are an efficient means of ensuring government revenue from wholesale taxes. In addition, as Room (2000) argues there are three ways in which government monopoly at the wholesale level may have relevance for public health: firstly, by ensuring purity of supply; secondly by discouraging illicit markets and thereby ensuring price controls (which in turn limit consumption); and thirdly in reducing the influences of private interests in promoting consumption. Arrangements where there is a private market dominated by a few for-profit companies have been argued to have negative impacts on health due to the power of the companies to influence policy (and arguably marketing) (Babor et al., 2010; Lee & Eckhardt, 2017). This last point, on the role of industry interests in public health and policy-making, is taken up in section 3.4.

We found no systematic reviews of the public health impacts of production/wholesale market arrangements for alcohol and only one for tobacco (Gilmore et al., 2011) but there are commentaries and historical studies which do not lend themselves to systematic review. We have drawn on those studies here.

Most experts agree that a government monopoly at the wholesale/production level of the market is likely to be of benefit to public health. In comments about the American state-based alcohol wholesale monopolies, whereby the state monopolises the distribution of alcohol, but not the on-premise retail sale of alcohol (Room, 2008), researchers have noted that such systems reduce

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<sup>12</sup> In the US, state monopolies operate in a market with a three-tier distribution, whereby “suppliers (the first tier—e.g., brewers, vintners, and distillers) are required to sell only to wholesalers (the second tier—e.g., distributors and shippers) who, in turn, are required to sell only to retailers (the third tier—e.g., liquor stores, restaurants, and bars)” (Back, 2020). However it is not only state alcohol monopolies that operate in this system - it is also true for systems with privately owned stores. (Also: no US state runs an on-premise monopoly, and beer is not monopolised in any US state, so there is a private retail interests everywhere).

competition and keep the prices of alcohol high, reduce access to youths, and reduce overall levels of alcohol consumption (Pacula et al., 2014).

Evidence from the privatisation of state monopolies of tobacco production in Europe and Eurasia during the 1990s and 2000s suggests that privatisation poses a threat to public health with prevalence and consumption increasing once monopolies ceased (Gilmore et al., 2011). For instance, in the first year of privatisation in Russia, the number of women smoking doubled, and the rates for men significantly increased. Such increases in Europe and Eurasia were found to be linked to establishment of marketing specifically aimed at encouraging uptake among 'key' demographics (young people and women), and a lowering of prices/taxes that occurred due to privatisation. The type of privatised market seemed not to matter with marketing and increased consumption for instance, existing in markets with private monopolies, oligopolies, and those with more spread competition (Gilmore et al., 2011). Corporations in privatised markets were also found to lobby for lower regulation and less taxes, and to try and circumvent legislation – an experience found in other reviews cited in this report (see for instance section 4.4.1), whereas in monopolies government maintained direct regulatory control.

At the wholesale level there might be some evidence that the purported advantages of a government monopoly may not always be realised. This evidence is circumstantial but comes from places where a government monopoly system was replaced with a privatised system (for alcohol, USA). Under a privatised system, the popular expectation was that prices would fall (that is, the advantage of government monopoly for price control would be lost). This was not the case in Washington State at least, where increased taxes on alcohol counteracted any reduction in alcohol prices (Williams et al., 2020).

Another level of production/wholesale is the informal and home-brewing markets. We note differences of opinions on health risk/harm minimisation of home brewing and distilling – some studies argue that there are potential issues with methanol poisoning; others position small brewers as producing less potent beverages (Babor et al., 2010; Luu et al., 2014; Manning & Kowalska, 2021). There is very little research examining home-brewing and we found no research on the relationship between home-brewing regulation and public health impacts.

In summary, there is one systematic review on the relationship between the market structure of production for public health outcomes for tobacco that demonstrates government monopolies for production have fewer public health harms than private market production. Beyond this review there is an absence of research evidence on the structure of wholesale/ production markets for alcohol in preventing high risk consumption, reducing harms from consumption, preventing underage consumption, and protecting third parties.<sup>13</sup> The prevailing expert opinion, and the experience from tobacco has been that government monopolies at the production/wholesale level of the alcohol market are advantageous for public health, largely through the ability of government to exercise direct regulatory control. We now turn to the retail level of the market, and the relationship between retail level market structures and public health outcomes.

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<sup>13</sup> Most studies of alcohol market privatisation are of the privatisation of both wholesale and retail levels together – which is why there are not particular studies of wholesale privatisation.

## 3.2 Market structures – retail sales and impacts on public health

We found one systematic review of the public health impacts of retail arrangements of alcohol. Drawing on 19 individual studies, Hahn et al., (2012) conclude there is “strong evidence that privatization of retail alcohol sales leads to increases in excessive alcohol consumption”. The review draws on studies of 12 privatization events and one study of monopolization.<sup>14</sup> Given only one systematic review we also draw on relevant individual research studies below.

### 3.2.1 Impact on alcohol consumption

Hahn’s systematic review (2012) found 18 studies using alcohol consumption as an outcome measure (17 using sales data and one study drawing on survey data). In this review, 12 separate privatization events between 1950 and 2000 in the US, Canada and Finland were drawn on. All related to the privatization of the off-premise retail market, and all but one study used alcohol sales data as the outcome measure (proxy for population level alcohol consumption) (Hahn et al., 2012). This systematic review concluded that there is strong evidence that privatization increases alcohol consumption at the general population level. Averaging data across all the privatization events, alcohol consumption of privatized off-premise beverage sales increased by a median of 44%, ranging from 0 to 305% (inter-quartile range 4.5-122.5). Sales of beverages only available through monopoly retail (not part of the privatization) fell by a median of 2.2%.

A single study used survey data to assess the impact of privatization of medium-strength beer in Finland (Mäkelä, 2002). Per capita alcohol consumption increased by 46% after privatization, and 86% per cent of this increase was due to medium-strength beer. Drawing on a large representative population survey conducted before and after the privatization, the authors found self-reported consumption increased by all drinking groups, but it was the people who drank most heavily who were affected by the new law to a greater extent than people who drank more moderately (Mäkelä, 2002). The authors note that further research was needed to determine if the differential effect of alcohol privatisation by initial consumption level is generalizable, noting that the greater effect for heavy drinking may have been a result of ‘pent-up demand’ under Finland’s previously comparatively tight alcohol control. The authors conclude that “a best estimate for the differential impact of future increases in alcohol consumption is that moderate and particularly heavy drinkers will be affected to a greater extent than will light drinkers or abstainers” (Mäkelä, 2002).

Evidence consistent with the 2012 systematic review conclusion that privatization of alcohol retail sales is associated with increased alcohol consumption comes from individual studies. For example, privatization of hard liquor (e.g., vodka, rum, whiskey) in Washington D.C. found the sales of these products increased by ~6.5% in the subsequent two years (Dilley, 2019). A 2021 study of alcohol privatisation in Canada suggests this change was associated with increased drinking among young people (Gohari et al., 2021). Another study examined per capita alcohol consumption in British Columbia when government retailers existed alongside private retailers (Stockwell et al., 2009). They found that the number of private stores per 10,000 residents was associated significantly and positively with per capita sales of alcohol, while the reverse held for government liquor stores. The percentage of liquor stores in private versus government ownership was also significantly associated with per capita alcohol sales when controlling for density of liquor stores and of on-premise outlets (Stockwell et al., 2009). The

<sup>14</sup> That all but one study was of instances of retail sales moving from monopolies to private sales (rather than the other direction) reflects a broader international trend towards greater liberalisation of alcohol since the mid twentieth century.

authors conclude that “the trend towards privatisation of liquor outlets between 2003/04 and 2007/08 in British Columbia has contributed to increased per capita sales of alcohol and hence possibly also to increased alcohol-related harm”. A 2018 simulation modelling study (Stockwell et al., 2018) estimated the impacts on alcohol consumption and harms if the Swedish off-premise monopoly system, Systembolaget, were to privatise alcohol sales. Two privatized market structures were modelled: privately owned liquor stores or alcohol sales in grocery stores. Study authors concluded that annual population level alcohol consumption would increase by 20-31% with privatisation (Stockwell et al., 2018).

### 3.2.2 Impact on alcohol-related harms

The impact of different retail arrangements on alcohol-related harms is less clear than the impact on population alcohol consumption. Hahn et al.’s systematic review (2012) included a small number of studies examining alcohol-related harms (car accidents, liver cirrhosis, hospitalisations). In the strongest study design Ramstedt (2002) examined the re-monopolization of medium-strength beer in Sweden, from privately owned convenience stores to the state-owned monopoly, and found evidence that reversing privatization led to reduced alcohol-related harms. Alcohol-related hospitalizations, such as psychosis, injuries and accidents decreased in the four years following the switch in availability, although the only decrease to reach significance was for motor vehicle crashes, which decreased by 14% for all but those aged 20-29 years (Ramstedt, 2002).

The 2018 study by Stockwell et al. (2018) modelling impacts should Sweden privatise off-premise alcohol retail sales found that depending on the methods used to model impacts, alcohol attributable deaths (liver cirrhosis, deaths from injuries and suicide) would increase by 763 to 1,418 per year and alcohol attributable hospitalisations, including from assaults and drink-driving offences, by 29-42%.

In summary, there is one systematic review (Hahn et al., 2012) of the relationship between retail market arrangements and public health outcomes for alcohol or tobacco. The evidence that privatisation of retail markets (following government monopoly arrangements) increases general population alcohol consumption is strong; the evidence is more mixed that private markets increase alcohol-related harms compared to government monopolies. The prevailing evidence and expert opinion is that privatisation of retail sales increases alcohol consumption via increases in the number of outlets, hours of sale and advertising, and introducing the profit motive for expanding sales (Babor et al., 2010; Her et al., 1999). However, the impact of privatisation depends on the effectiveness of the government regulation over the resulting private market (such as regulating outlet density etc). A discussion of the regulation of retail sales (outlet density, bans on alcohol sales, etc.) is presented in Chapter 8. We now turn to the evidence concerning not-for-profit market models and their relationship with public health outcomes.

### 3.3 Not-for-profit market models

Compared to the evaluation literature on switching from a government run alcohol retail system to a privately owned and operated one, research on not-for-profit alcohol ownership is more descriptive in nature. To date, there are no systematic reviews evaluating the public health impacts of not-for-profit alcohol market structures. Academic work that does touch on community and public health impacts is limited and have mixed findings.

Research on Licensing Trusts (Rychert & Wilkins, 2019), an extant form of not-for-profit alcohol retail ownership specific to New Zealand, has tentatively suggested that Licensing Trusts appear to provide more restricted access to alcohol than their private commercial counterparts. There are also claims

that alcohol prices are higher in communities where Licensing Trusts exist. Trust community owners have also claimed that alcohol related harm is lower in Trust communities than elsewhere, although these claims are contested (Rychert & Wilkins, 2020) and not easily verified by routine health and crime statistics.

Case studies of not-for-profit alcohol outlets operated by Aboriginal community councils in Australia find examples where community health benefits seem to apply through supporting moderate alcohol consumption (Brady, 2017). But there are also clear counterexamples, where despite the not-for-profit approach, the sale of alcohol can still become a major source of funds for a resource-strapped community; in such cases, due to the conflict of interest between revenue raising and protecting at-risk members of the population (Shanthosh et al., 2018), the not-for-profit approach can be at risk in practice (Brady, 2017).

### 3.4 Industry influences

Given the predominance of a private market structure for alcohol and tobacco, there has been great interest in analysing the influence that the private for-profit industry may have on government decision-making. There is an extensive literature on this, especially following the well-known egregious behaviour of Big Tobacco in denying the health harms associated with cigarettes. Indeed, in tobacco research a measure of the degree of interference has been developed – the Tobacco Industry Interference (TII) Index (Assunta & Dorotheo, 2016; Chamberlain et al., 2020).

Several systematic reviews have collated strategies and tactics used by the tobacco industry to influence governments and the public health agenda (Amul et al., 2021; Lee et al., 2012; Savell et al., 2014; Smith et al., 2013; Weishaar et al., 2012). The tactics and strategies have included so-called corporate social responsibility, deceptive/manipulative activity, tactics to prevent tax increases, political influence and direct and indirect lobbying, the promotion of voluntary codes and alternative policies, and the formation of alliances with other industrial sectors. There are considerable commonalities between tobacco and alcohol industry political activity, as shown in further systematic reviews of alcohol industry tactics (McCambridge et al., 2019; Mialon & McCambridge, 2018; Petticrew et al., 2020; Savell et al., 2016).

There have also been reviews of the mechanisms that can help limit corporate influence in health policy, science and practice (Mialon et al., 2021). The main objectives of the mechanisms are to manage conflicts of interest and ethical issues and increase the transparency of public-private interactions. Mechanisms to limit influence can apply to the work of governments, international organizations, universities, the media, and civil society. In their paper Mialon et al., (2021) identified 49 different mechanisms (for 41 of these mechanisms, they found examples where they have been implemented but do not analyse effectiveness).

In addition to influence in health policy-making, industry has been shown to influence public health research: a number of systematic reviews in relation to tobacco industry research influence confirm this (Etter et al., 2007; Fabbri et al., 2018; Martinez et al., 2018; Pisinger et al., 2019). The same has been found for the alcohol industry (McCambridge & Mialon, 2018). One example is pertinent. Gallagher and colleagues (2019) examined tobacco industry data on the size of the illicit tobacco

trade.<sup>15</sup> They reviewed 35 different industry studies of the size of the illicit trade in tobacco, finding that in 31 of the 35 studies the industry estimate was higher than independent assessment (Gallagher et al., 2019).

### 3.5 Market structures - Implications for cannabis regulation

**Market structure:** We considered two different market levels: production/wholesale and retail and endeavoured to assess the evidence for preferred market structures (government monopoly, privatised for-profit and community not-for-profit). In reality, most systems are blended (having market arrangements that simultaneously include some government, some private and some not-for-profit); additionally most of the evidence comes from changes to both production/wholesale and retail levels simultaneously. While there is an absence of systematic reviews or meta-analysis, a number of individual studies (with reference to alcohol) show that government monopoly (at wholesale and retail) is associated with lower consumption and harms (Hahn et al., 2012; Mäkelä, 2002; Stockwell et al., 2009). As such, the cannabis market structure with the most public health gain would be a government monopoly model. The advantage of a government monopoly model is that the enforcement of the other regulatory aspects, such as promotions, labelling, retail sales hours and so on, all become part of the governmental system, and compliance and enforcement is not required. It also obviates the need to manage a for-profit industry, with goals that might conflict with public health goals.

Despite no systematic reviews showing the impact of different governmental systems (for example Treasury, Agriculture, Public Health) that would oversee and manage the market structures, which arm of government manages the systems will frame the regulatory context and policy goals. For instance, placed within a finance or treasury office, income/profit becomes the main concern; placed within a health office, public health goals become the main concern.

**Privatised retail markets:** Natural experiments where government retail alcohol monopolies ceased and were replaced with privatised markets, have revealed that alcohol became more readily available, leading to increased consumption, leading to increased alcohol-related harms (Babor et al., 2010; Her et al., 1999). Individual-level studies of alcohol retail privatisation found increased drinking was greater for those already drinking at high-risk levels and may increase and sustain high-risk drinking among youth (Gohari et al., 2021). While a government monopoly is strongly evidence-based for public health outcomes, if one goal is to counteract the black market, accessibility of retail outlets would be important.

**Cannabis and government monopolies:** Government monopoly arrangements have received much attention when thinking about cannabis regulation (Rehm & Fischer, 2015). Haden et al., (2014) recommended setting up a governing body like a Cannabis Control Commission which would control cannabis production, packaging, distribution, retailing, and revenue allocation. A consensus of nine policy experts deliberated on cannabis market arrangements finding that a state monopoly for cannabis production, wholesale and retail operations was rated as most effective for three outcomes: reducing youth cannabis use, excessive cannabis use amongst the

<sup>15</sup> Industry here are presumed to inflate estimates of the illicit trade in order to argue for lowering regulations.

general population, and cannabis-impaired driving (Blanchette et al., 2022). This paper also notes: “Policies regulating cannabis businesses and products were judged more effective than policies targeting consumer use and behavior” (Blanchette et al., 2022). There is some evidence from Canada of increased cannabis availability (significantly more stores per capita and longer retail hours) in hybrid models (private and government) when the retail sales are compared with government-only models (Myran et al., 2019).

**Not-for-profit models:** Compared to the evaluation literature on switching from a government run alcohol retail system to a privately owned and operated one, research on not-for-profit alcohol ownership is more descriptive in nature, with no systematic reviews evaluating the public health impacts of not-for-profit alcohol market structures. There is much literature on cannabis social clubs (one not-for-profit model) (Decorte & Pardal, 2017; Decorte et al., 2017; Jansseune et al., 2019; Obradors-Pineda et al., 2021; Pardal et al., 2020), but no empirical analyses comparing consumption and harms with other market structures.

**Industry influence:** The political influence of tobacco and alcohol industries has included deceptive and manipulative activity, tactics to prevent tax increases or other stricter forms of regulation and lobbying on public health matters (McCambridge et al., 2019; Mialon & McCambridge, 2018; Petticrew et al., 2020; Savell et al., 2016). The role of a cannabis for-profit, private industry requires very careful monitoring for their influence on public health policy and research. There is already evidence of inappropriate influence (Adams et al., 2021; Rotering & Apollonio, 2022; Subritzky et al., 2016). Self-evidently a government monopoly at the production and retail ends of the market would circumvent this problem of industry influence. In its absence, and with some segments of the market open to competition from for-profit providers, the effectiveness of regulation (such as product price, advertising, and sales restrictions) becomes paramount.

**Enforcement:** In the absence of government monopoly, enforcement of any regulations in the production and retail sales of cannabis becomes crucial. Unfortunately, the compliance and enforcement literature for what works for alcohol and tobacco is not strong. There is strong evidence of non-compliance and the effects of enforcement decay over time, suggesting significant investment in routine compliance checks, across all stores, is necessary (Wagenaar et al., 2005a). The ways in which compliance can be checked (through routine inspections, test purchases, mystery shoppers) have not been compared for their relative cost-effectiveness in detecting non-compliance. The penalties that can be applied (fines, public shaming, loss of license/permit) have also not been compared for their effectiveness in deterring retailers from breaches.



## Chapter 4: Pricing and taxation

Raising the price of alcohol and tobacco, either through taxes on the products or through other price-setting mechanisms, is expected to reduce consumption and therefore reduce harms and improve public health. Increasing excise taxes on alcoholic beverages is one of the WHO's 'best buys' for alcohol; and for tobacco the WHO best buy is "increase excise taxes and prices on tobacco products". This chapter considers the evidence, as derived from systematic reviews and meta-analyses, confirming the relationship between higher taxes and prices for alcohol and tobacco and reduced consumption and harm.

There are a range of tax and price controls that influence the price of the final sale of a product to consumers. Taxes are compulsory payments made by people to the government and can be imposed on products through excise tax (a tax on the manufacturing of alcohol or tobacco), general sales taxes which include alcohol or tobacco in their scope, specific taxes at the retail level on the active ingredients (e.g. ethanol content or volume), the beverage size or its value, a tax on specific product types (e.g. 'alcopops'<sup>16</sup> tax), or an import tax, applied to products being brought in from other countries. These various tax mechanisms are not mutually exclusive and may be used together.

Price controls can determine a legal threshold at which price products must be sold, with legal consequences for retailers selling under minimum prices. Common price controls in alcohol and tobacco include minimum sales or 'floor' prices and this can be calculated based on alcohol or tobacco content in the final product. A ban on product discounting is another form of price control that restricts enticements or product discounting. Examples are banning two for one sales or coupon discounts. The type of market within which products are manufactured and sold also influences final product price – with government monopolies for instance providing more certain opportunities for price control (see Chapter 3 market structure).

The literature often conflates prices and taxes, with the terms used interchangeably in many studies even though taxes may only represent a fraction of total purchase price (as other inputs, such as production or raw material or transport costs may have a larger impact on total product price (Wagenaar et al., 2010)). The information here refers to both prices and taxes unless specific information is provided on a particular type of tax or pricing policy lever. Where tax rates are raised, it is not inevitable that the entire amount is passed on to the consumer at the retail level (Rabinovich et al., 2012).

We found 60 systematic reviews that included analysis of alcohol or tobacco tax or pricing policies; 24 reviews were focussed only on alcohol;<sup>17</sup> and 31 reviews were focussed only tobacco.<sup>18</sup>

<sup>16</sup>Alcopops was the term given to ready-made, pre-mixed spirit-based beverages.

<sup>17</sup> (Anderson, 2011; Anderson, Chisholm, et al., 2009; Baldwin et al., 2022; Boniface et al., 2017; Elder et al., 2010; Fogarty, 2006; Gallet, 2007; Lachenmeier et al., 2011; Martinez-Loredo et al., 2021; Metzner & Kraus, 2008; Muhunthan et al., 2017; Nelson, 2014, 2015; Nelson & McNall, 2016, 2017; Patra et al., 2012; Rehm et al., 2022; Scott et al., 2017; Sharma et al., 2017; Siegfried & Parry, 2019; Sornpaisarn et al., 2013; Wagenaar et al., 2009; Wagenaar et al., 2010; Wilson et al., 2014)

<sup>18</sup> (Bader et al., 2011; Bafunno et al., 2020; Bafunno et al., 2019; Berman & Glasser, 2019; Brown et al., 2014a; Cantrell et al., 2020; Ciapponi et al., 2021; Contreary et al., 2015; Faber et al., 2017; Gallet & List, 2003; Golden

A further five included some consideration of both alcohol and tobacco price or tax policies.<sup>19</sup>

The reviews were varied with some just concerned with investigating the effect of taxation and pricing policies, and some considering them alongside a range of other interventions. This chapter reviews the evidence within these reviews particularly as it relates to:

- The extent to which prices/taxes impact consumption rates, including price responsiveness of different product types and possible substitution effects
- Differing effects of price and tax policies on consumption rates of different demographic or socioeconomic groups
- Evidence for effects of price/tax changes on harms from alcohol/tobacco use (both direct and indirect)
- Different types of tax and pricing policies
- The impact of price and tax on the black market and unrecorded consumption

#### 4.1 Pricing and taxation impact on total population consumption patterns

Overall, a number of reviews looked at price elasticity of demand and reported a strong negative correlation between higher prices/taxes and higher consumption and demand of both alcohol and tobacco i.e. at a general population level, increases in prices or taxes were linked to decreases in drinking or smoking (Sharma et al., 2017). The reverse was also true: lower prices/taxes were associated with higher consumption and demand. This finding was uncontested across the systematic reviews.

Meta-analyses on alcohol suggested that a ten per cent increase in the price of alcohol reduces consumption by approximately 5 per cent (Sharma et al., 2017). For instance, Wagenaar et al., (2009) in their analysis (n= 112 studies that contained 1003 estimates of effects of alcohol taxes and prices on alcohol sales and drinking behaviour) applied weightings to each estimated effect. They calculated the effect of tax/price on general alcohol consumption (i.e. based on all people who consume alcohol) to be -0.51 (Wagenaar et al., 2009). Gallet et al., (2007), reporting on the median price elasticity of all studies (from 1925 – 2002, n= 132), found the median reported elasticity of alcohol be -0.535. although there were greater effects in the long-run than the short-run. Therefore, policies that raise the price of alcohol were found to be an effective means of reducing drinking, a finding supported across other systematic reviews (Anderson, 2011; Elder et al., 2010; Fogarty, 2006; Sharma et al., 2017).

Analysis from reviews of tobacco studies also found that when prices rise overall consumption decreases. One meta-analysis by Gallet and List (2003) (analysing 86 studies) on general population-impacts of cigarette pricing on consumption found overall mean price elasticity for cigarettes was - 0.48 (i.e. a 10% price increase is associated with a 4.8% consumption decrease). However the standard deviation (0.43) was found to be large, as was the range of estimates (1.41 to 3.12), owing

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et al., 2016; Golechha, 2016; González-Roz et al., 2019; Guindon, 2014; Guindon et al., 2020; Guindon et al., 2015; Hill et al., 2014; Jawad et al., 2018; Krishnamoorthy et al., 2020; Lee et al., 2012; Lorenc et al., 2013; Main et al., 2008; Mannocci et al., 2019; Nazar et al., 2021; Reed et al., 2020; Sloan & Wang, 2008; Smith et al., 2013; Stoklosa et al., 2016; Thomas et al., 2008; Wilson et al., 2012; Yao et al., 2020).

<sup>19</sup> (Jain et al., 2020; Miracolo et al., 2021; Nystrand et al., 2020; Toumbourou et al., 2007; Wright et al., 2017).

to significant differences in price elasticities across studies. A more recent review of 23 studies using the Cigarette Purchase Task exploring 5 different demand indices (intensity of demand, elasticity of demand, maximum expenditure, price associate and the breakpoint – the point where price suppresses consumption) found medium to large effect sizes (elasticities) on consumption of price (González-Roz et al., 2019).

Reviews considering natural experiments of tax and price changes in alcohol (i.e. when a country or region has changed tax or pricing policy for alcohol) have similarly found that increasing the price of alcohol has resulted in decreased consumption and vice versa, albeit with some attribution issues where tax/price changes were accompanied by other alcohol policy interventions. Patra et al., (2012) (n=54 studies from 1987 to 2011) and Anderson et al., (2009) note that studies on a change in Finnish alcohol policy in 2004 found that a reduction in excise duties by 33% somewhat countered by a reduction in traveler's import allowances contributed to a 10% increase in alcohol consumption.

Income was noted to have a moderating effect on the impact of price rises across both tobacco and alcohol, as those with higher disposable incomes could more readily absorb price increases (Bafunno et al., 2020; Elder et al., 2010; Wagenaar et al., 2009). Those with lower incomes were on the whole found to be more responsive to tobacco pricing (Brown et al., 2014b) (discussed more in 4.2.2 below). It has been noted that the majority of econometric analyses rely heavily on data from the United States (Nelson & McNall, 2016). Reviews considering non-Western nations only have also found similar size of effect for alcohol, and that affluence can mute the size of effect of both substances, but tax and price are still effective tools to reduce consumption of alcohol (Sornpaisarn et al., 2013) and tobacco (Guindon et al., 2018; Nazar et al., 2021).

Other factors which had an impact on price elasticities were found to be:

- Product type and product substitution
- Off-premise versus on-premise purchases
- Demographic characteristics.

These are now considered in turn.

#### 4.1.1 Product types and product substitution

The size of price/tax effect has been shown to vary across different types of alcohol and tobacco products, with some products having a smaller effect size for price increases than for others. For alcohol, beer was found to be less elastic (i.e. people who drink beer are less responsive to price changes) than for wines and spirits across a number of different reviews, although all were statistically significant inverse relationships, as demonstrated in Sharma et al., (2017).

For different tobacco products, there were fewer price elasticity reviews (than for different alcohol product types). A meta-analysis conducted by Jawad et al., (2018) on price elasticity of demand for different types of non-cigarette tobacco products (rolling tobacco, e-cigarettes, cigars and bidis) found that price is negatively associated with demand for non-cigarette tobacco products. Drawing on 36 papers they found that a 10% price increase would reduce demand by: 8.3% for cigars (95% CI 2.9 to 13.8), 6.4% for roll your owns (95% CI 4.3 to 8.4), 5.7% for bidis (95% CI 4.3 to 7.1) and 2.1% for smokeless tobacco (95% CI -0.6 to 4.8). Jawad et al., note that the impact of price increases for non-cigarette tobacco products fall within the WHO estimated price elasticity of demand for

cigarettes in high income countries of  $-0.4^{20}$ , indicating that, as for cigarettes, price is an effective tool in reducing non-cigarette tobacco use. A review by Stoklosa et al., (2016) using pooled time-series data on e-cigarette sales from the EU found that a 10% increase in e-cigarette prices is associated with a drop in e-cigarette sales of 8.2% (although the effects are found to be larger in the long-run over the short-run).

Beyond different elasticities of demand for different alcohol and tobacco products, there is also evidence of product substitution in association with price changes. For alcohol, one review found that when prices are raised, consumers reduce their overall consumption and switch to cheaper beverages, with people who drink most heavily buying cheaper products within their preferred beverage category (Anderson, Chisholm, et al., 2009). Substitution to black-market or illicit products is also a concern but there was relatively little data on this in the reviews (a discussion on unrecorded consumption and the black market is given at the end of this chapter).

For tobacco and product substitution, a review by Krishnamoorthy et al, investigating the impact of price on tobacco use in the global south (South America, Africa and southeast Asia, using 13 studies) (2020) found that people were likely to switch brands to lower cost cigarettes or switch tobacco product (e.g. to roll your own from pre-manufactured cigarettes) in the face of price increases. This finding is supported by other systematic reviews, including Jawad et al., (2018) (36 studies), Ciapponie et al., (2021) (drawing from 49 studies) and Berman et al., (2019) (78 studies), with the latter two specifically looking at price as an influence for people switching from cigarettes to e-cigarettes. (E-cigarettes are dealt within greater detail in Chapter 6 – product types). Other reviews found that non-rechargeable e-cigarettes substitute for cigarettes among young people when the former are lower in price (Cantrell et al., 2020). However not all studies comparing pricing of e-cigarettes and cigarettes have shown similar effects (Yao et al., 2020), and the relationship is likely to be complicated by the user's frequency of use (Snider et al., 2017). One review (Berman & Glasser, 2019) found an experiment that appeared to show increased demand for very low nicotine products where prices for other nicotine products rose, although this was not unanimous across all of the experiments reviewed by the authors.

Given research that shows price can be a motivating factor for product use, some researchers have advocated for taxation and pricing policies to be used to discourage people from certain products and to nudge them towards lower harm products (Hatsukami et al., 2022) such as charging less tax on beverages with a lower alcohol content (Toumbourou et al., 2007), or as in the review above charging less tax on low nicotine products (Berman & Glasser, 2019). Such policies are already utilised by governments and in the past have included for instance a special 'alcopops tax' implemented in Germany, France and Switzerland when it was perceived that these beverages were encouraging alcohol use among young people (Metzner & Kraus, 2008).

However, the success of using tax/price as a standalone strategy is likely to be linked to motivational factors for product choice (i.e. price may not be the only determinant of use). For instance, from the alcohol literature, the reason why price elasticities varied across beverage types were argued to be due to sociocultural factors such as the national and cultural popularity of beverages, and some

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<sup>20</sup> Found in: National Cancer Institute and WHO, 2016 *NCI Tobacco Control Monograph Series 21 - The Economics of Tobacco and Tobacco Control*: [Monograph 21. The Economics of Tobacco and Tobacco Control \(cancer.gov\)](https://www.cancer.gov/monographs/21)

beverages like beer being treated as a staple food in some populations (Fogarty, 2006; Sharma et al., 2017) and reasons unrelated to price including availability, convenience and taste (Elder et al., 2010). A meta-regression by Fogarty (2006) using data from 64 studies conducted between 1923 and 1991 found that beverages with the largest market share in any country are less elastic than those that are “less preferred” and have less market share. As market share of different types of beverages changed so too did the price elasticity, which the author argues should be taken into consideration by governments seeking optimal tax rates for alcoholic beverages (Fogarty, 2006).

#### 4.1.2 Off-premise vs on-premise purchases

The location of purchase (whether on-premise or off-premise) matters for price/tax effects. Alcohol is almost always cheaper when purchased for off-premise consumption, since on-premise prices have to include the cost of labour serving the beverage and space for customers to socialise in, and off-premise retail sales, have a larger customer base and market power, use alcohol and a ‘loss leader’<sup>21</sup> and engage in discounting and promotions. In many European countries off-premise alcohol sales appears to be growing relative to on-premise sales (Rabinovich et al., 2009). Pricing strategies in off-premise outlets therefore have the potential for a significant effect on consumption (Callinan & MacLean, 2020).

Sharma et al. (2017), in their review of alcohol pricing impacts (drawing on data from over 200 studies from the UK, Canada and Australia) found that purchases of alcohol from off-premise sites (e.g. from supermarkets, liquor stores) were found to be more responsive to prices than purchases from on-premise sites, e.g. from bars and restaurants (no size of the effect was provided).

## 4.2 Price and tax impacts on different demographic groups/subpopulations

### 4.2.1 Underage and young adult consumption

Gleaning information on youth and ‘underage’ consumption in relation to price and tax is complicated by different legal ages between countries and the varied approach to who is considered as a young person. All reviews with a focus on young people are reported on here.

Evidence on the impact of prices on underage alcohol or tobacco use overall found that increased prices and taxation on both alcohol and tobacco reduced levels of consumption among young people. But young people appear to be less responsive to changes in alcohol prices than adults. The literature on alcohol found that while increased prices overall reduced drinking among young people, they appeared to be less price responsive than the general population (Gallet, 2007; Sharma et al., 2017). Evidence on the size of effect of price increases for young people was mixed. Elder’s analysis (2010) using data from 9 youth specific studies (from a review of 72 studies on price/tax) found six studies that consistently indicated higher prices or taxes associated with lower prevalence of drinking among young people (defined as those aged under 25 years), with the other three studies reporting mixed results. One systematic review on alcohol marketing influence on adolescent drinking behaviour found that alcohol discounts had a significant effect on alcohol consumption on underage (under 18s) consumption, with binge drinking reducing as prices increased (Scott et al., 2017).

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<sup>21</sup> ‘Loss leader’ refers to a product that a retailer is willing to lose money on in order to bring customers into the store.

Evidence on tobacco pricing was more uniform, but in contrast to alcohol studies suggests that young people are more sensitive to change than the general population and that increased taxes are an effective measure for reducing smoking among young people (aged under 18) and young adults (aged under 25) (Bader et al., 2011; Gallet & List, 2003; Thomas et al., 2008). Bader et al., for example found that people below the age of 19 were two to three times more price responsive than the general population (Bader et al., 2011). A Review by Brown et al., (2014a) on youth smoking found different price effects within groups of young people aged under 25 years based on their social economic status (SES), with low SES more responsive to price/tax increases than high SES young people. A meta-analysis by Gallet and List found that teenage girls tended to be less price sensitive to cigarettes than teenage boys (2003).

Studies concerned with price impacts on initiation were predominantly concerned with young people, however no systematic reviews were found that included data on alcohol initiation so these data pertain to smoking initiation only. The role that prices play as a deterrent of smoking initiation is not clear, with mixed results reported across systematic reviews. For instance a review drawing on data from the Global Adult Tobacco Survey found that increased price/tax does have a deterrent effect on smoking initiation (Bafunno et al., 2020), whereas a systematic review by Bader et al., (2011) reported that some studies found higher prices prevented smoking initiation, some studies found no correlation and others found that prices only impact initiation in some cases. A review by Guindon et al. (2014) (n=27) found that most studies in this area have methodological limitations, so that overall the existing studies do not provide strong evidence that tobacco prices or taxes affect smoking onset.

#### 4.2.2 Socioeconomic Status

As noted earlier, incomes were found in reviews to potentially have a moderating effect on price elasticities, with those on higher incomes more able to absorb price increases. Some reviews note that it is expected that the inverse of this is also true – that groups with less disposable income are more sensitive to changes in prices, although a review by Elder et al. (2010).did not find enough information to make a determination in regards to alcohol.

Reviews on tobacco, however, found that low SES adults were more responsive to increases in price/taxes of tobacco than high SES (Brown et al., 2014a, 2014b; Hill et al., 2014) although high SES adults were found to be more responsive than low SES when price increases were accompanied with smoke-free policies (Brown et al., 2014b). A review of tax/price modelling studies (n=9) by Contreary et al., (2015) found that although low income tobacco users cease smoking at higher rates than high income users after price increases, some continued to use tobacco products, and the extra expense from increased prices therefore represented a burden for those individuals, whereas those who ceased smoking benefited from reduced spending on tobacco.

A consideration for implementation of tax and pricing policies is distributional equity, in that higher prices of tobacco and alcohol may be regressive, impacting people on lower incomes more than those on higher incomes and contributing to increased poverty where increased costs does not prevent consumption (Elder et al., 2010). At the same time, where consumption is concentrated in low SES groups (as it is for smoking in many Western countries), tackling inequality in consumption is seen as critical to reducing health inequalities (Brown et al., 2014a; Hill et al., 2014). Elder et al., suggest that regressive taxes can be addressed through compensatory changes to other elements of the tax system to prevent overly burdensome financial penalties on low SES consumers of alcohol or tobacco (Elder et al., 2010).

### 4.3 Impact of price on harms (direct and third party)

#### 4.3.1 Impact of prices on harmful or heavy patterns of use

Reviews that investigated the price elasticity of demand amongst people who drink heavily found that it varied in magnitude across studies, but almost all reviews found that increases in prices reduced consumption among “heavy drinkers” (Elder et al., 2010; Gallet, 2007; Martinez-Loredo et al., 2021; Sharma et al., 2017; Wagenaar et al., 2009; Wagenaar et al., 2010). The dissenting evidence on price impacts on heavy drinking and patterns of binge drinking was found in reviews by Nelson only (Nelson, 2014, 2015). In terms of the size of the effect, Elder et al., (2010) found that the reported elasticities for the relationship between price and binge drinking were largely comparable to the general population (ranging from  $-0.29$  to  $-1.29$ ). Others have found lower elasticities for heavy drinking compared to moderate or light drinking. Three systematic reviews found that people who drink heavily are less responsive to price variations than the general population (Gallet, 2007; Wagenaar et al., 2009; Wagenaar et al., 2010). For instance, Wagenaar et al.’s (2009) meta-analysis of estimates from 10 studies found that the price elasticity of demand among people who drink heavily is  $-0.28$  (compared to general population estimates of  $-0.51$ ).

One challenge for this literature is the use of price elasticity of demand as a comparison measure between people who drink heavily and those who do not. If someone who is drinking 10 drinks a day reduces to eight drinks a day as a result of a price increase, that is an elasticity of  $-0.20$ , while if someone who is drinking two drinks a day reduces to one, that is an elasticity of  $-0.50$  -- much larger. This can explain why people who drink more heavily tend to have lower elasticities of demand; but the price lever still works. And from a public health point of view, the reduction from 10 drinks to eight drinks matters more for health than the reduction from two drinks to one drink (Sharma et al., 2017).

Reviews that considered real life case studies i.e. the impact of country-wide tax and price policies, also found that an increase in alcohol tax or price was associated with reduced high risk drinking (and alcohol-related harm) and a reduction in tax or price was associated with increased high risk drinking or harm (Boniface et al., 2017; Patra et al., 2012). For instance, an analysis of cross-sectional studies from the UK, Ireland and Australia found statistically significant associations between cheaper alcohol and heavier drinking (Boniface et al., 2017).

Other considerations also impacted price elasticity among people who drink heavily, including age, with Elder et al., (2010) finding that the range of effects for heavy and binge drinking among young people (aged between 16 and 21 years) were more variable and reported to be between  $-0.53$  and  $-3.54$ , and survey data on binge drinking among young people was mixed, with some studies finding some decreases in drinking following price rises and some finding no change (Elder et al., 2010). Another review noted the impact of gender suggesting lower correlation between hazardous drinking among women and price elasticity (Martinez-Loredo et al., 2021), whereas another review found that males who drank heavily were less influenced by price changes (Nelson, 2014).

Finally, the pricing levers on the type of alcohol and its current price to consumers likely matter to reduce heavy drinking. Sharma et al. (2017) found that increasing the price of cheap alcohol is likely to have a bigger impact on heavy drinking, especially those with low SES, rather than light drinking. Those who drink heavily tend to purchase cheaper alcohol (and below any minimum unit price – see 4.4.2).

#### 4.3.2 Impact of price and taxation on alcohol-related harms (direct and third party)

Evidence suggests that price/taxation policies can also reduce alcohol-related harm through its effect in reducing consumption. Reviews investigating the impact of price and tax changes on alcohol-related harms include a broad range of direct and third party harms including mortality and morbidity, violence, car crashes, rates of sexually-transmitted diseases (STDs) and risky sexual behaviour, and other drug use and crime. Overall, reviews found that increasing price/tax of alcohol reduced a range of harms to the person drinking and to third parties, although evidence varied depending on the type of harm being measured.

In their 2010 paper, Wagenaar et al., (drawing from 50 studies) analysed effect of prices on mortality and morbidity including violence, traffic crash fatalities, drunk driving, rates of sexually-transmitted diseases (STDs) and risky sexual behaviour, and other drug use and crime. Aggregate results show that beverage alcohol prices and taxes were significantly and inversely related to alcohol-related morbidity and mortality across all harms except suicide, with effect sizes largest for alcohol morbidity and mortality, followed by traffic crash outcomes (Wagenaar et al., 2010). Effects on crime, violence and STDs were smaller, although still statistically significant. According to their analysis, a doubling of alcohol taxes would be associated with a 35% reduction in alcohol-related mortality, an 11% reduction in traffic crash deaths, a 6% reduction in STDs, a 2% reduction in violence, and a 1.2% reduction in crime (Wagenaar et al., 2010).

A review by Elder et al. (2010) found significant correlation between variables in alcohol price (lesser so for alcohol taxes) and alcohol-related crashes but less correlation for all crash fatalities with price elasticities between -0.50 and -0.81. Studies they reviewed on non-motor-vehicle mortality outcomes found strong correlations between alcohol prices and death from liver cirrhosis, although estimated strength of this relationship varied substantially between studies. General rates of violence and STDs also found a correlation between prices and outcomes.

A review by Patra et al., (2012) (n=54 studies) found that when taxes on alcohol are increased, rates of alcohol-related problems - including traffic crashes, crime, violence, STDs, and alcohol-related mortality - decline, although impacts were not found for domestic violence.

Analysing country-level changes to tax and reported harms, Anderson et al., (2009) found that a decrease in the alcohol excise duty rate of 33% in Finland led to a 17 per cent increase in the number of alcohol-positive deaths per week, with the largest number of deaths occurring in people described as underprivileged (Anderson, Chisholm, et al., 2009). Another review looking at the before and after effects of alcohol supply reduction policies (Baldwin et al., 2022) found that after the introduction of 70% tax on premixed drinks in Australia (drinks found to be primarily consumed by young people), most studies found declines in hospital presentations of young people aged 12 to 17 for injuries and alcohol intoxication and poisonings (although results varied by jurisdiction with some studies/jurisdictions finding limited impact). As tax increases were accompanied by other alcohol policies including changes to liquor licensing, Baldwin et al. note that findings for their review are indicative only of a positive relationship between targeted alcohol tax and the health of children and adolescents (2022).

Analysing natural experiments in price/tax and alcohol consumption and harms in 9 different countries (studies n=45, mostly from Finland), Nelson and McNall (2016) overall found mixed results across different classifications of harms. For example, lower alcohol prices resulted in some short-term reductions in alcohol-related mortality and hospitalisations in Denmark, Hong Kong and



Sweden; produced mixed results for mortality in Iceland and the US; but had no pronounced effects in Finland and Russia. Effects of price and tax changes were found to be largely dependent on the particular circumstances of each country, and it was noted that local drinking culture and market saturation may be relevant in explaining a limited impact of drinking taxes/price reform in Nordic countries.

A review of studies from five different countries (Denmark, Finland, Hong Kong, Sweden and Switzerland) investigated impacts of major alcohol policy changes such as removal of quotas on tax-free imports by travellers and reduction in alcohol taxes (using 29 studies) (Nelson & McNall, 2017). In Switzerland, they found that a reduction in import duty on foreign spirits (that reduced prices for foreign spirits between 30-50%) had limited impact on alcohol consumption rates and cirrhosis, with both following a continued decline both before and after the policy introduction (noting that foreign spirits only accounted for 8-10% of total market sales). Comparing results across the five countries the authors found that policies introduced to reduce alcohol prices and increase availability did not show an impact on rates of binge drinking and drunkenness, and no differential changes among people who drank heavily were apparent. Overall, they found a lack of consistent results from which to draw robust development of alcohol-tax policy (Nelson & McNall, 2017). However, a review by Siegfried and Parry (2019) found that the studies by Nelson and McCall were all at high risk of bias given they “utilised data from the same database supplemented with discrete searches to evaluate the effects of price and taxation... and no assessment of study quality or integration thereof into the results”.

#### 4.4 Different types of tax/price levers

##### 4.4.1 Industry response to tax/price policies

The literature shows that industry response to, and particularly the ability to evade, different price/tax initiatives influences the effectiveness of such policies to increase product prices. In Western countries there is an assumption that taxes get passed on to the consumer, but the tobacco industry has been found to create different cost tiers in the face of increased tax, offsetting increased costs in premium products and introducing discount brands in order to maintain consumption rates (Golden et al., 2016; Krishnamoorthy et al., 2020). In emerging markets/non-Western nations, there is also evidence that some tax on production is absorbed by tobacco companies in order to get a foothold into the market (Krishnamoorthy et al., 2020; Lee et al., 2012).

Some systematic reviews included an investigation of how tobacco companies use price discounting as a marketing tool. These studies generally do not report on individual impacts of pricing on use/harms but do have some lessons for policy makers in the ways that companies in free markets respond to restrictions. For instance, Guindon et al. (2020) note that discounting of cigarettes was more prominent in low SES neighbourhoods in the US and in areas with higher proportions of African Americans – a point they note that is supported by evidence from tobacco industry documents detailing how manufacturers used race, class and geography to target vulnerable populations. They note: Our findings suggest that regulations that can limit industry price manipulation such as minimum, maximum, and uniform prices, and high specific excise taxes should be considered. There is emerging evidence that price-promotion restrictions and minimum-price laws can be useful approaches to reduce price disparities and lower tobacco consumption” (Guindon et al., 2020, p. 11).

Similar findings were made by Golden et al. (2016), who found that the tobacco industry utilised a range of tactics to keep prices low for consumers (thereby encouraging ongoing use), for instance through the use of price promotions and creation of different tiered products. Golden et al. found consumers tended to respond to increased prices by switching to lower priced products or discounted/cheaper brands and that young people and those from low SES backgrounds were more likely to use price coupons or respond to price promotions. At the same time, those substituting products due to cost were less likely to reduce smoking or attempt smoking cessation (Golden et al., 2016). Nearly one quarter of the articles reviewed (n=15) recommended combining pricing policies with taxes to prevent use of price minimising strategies.

To achieve public health outcomes from tax/pricing policies then, it is important for governments to pick the appropriate combinations of levers to limit the number of loopholes that may be used by industry to avoid passing on costs to consumers. One particular pricing policy, minimum unit pricing, is one such policy lever.

#### 4.4.2 Minimum Unit Price

Minimum Unit Price is used as a means to regulate alcohol prices in a number of countries including parts of Canada, Scotland and Russia, and can be configured in a number of different ways such as setting a minimum price for a unit of alcohol, litre of beverage, or by banning “below cost” sales of beverages (e.g. setting cost price at a particular rate that can consider excise or other taxes) (Chalmers et al., 2013). It has commonly been used by states/provinces in federal countries where the level of government (e.g., Scotland; Northern Territory in Australia) lacks the power to raise alcohol excise taxes.

Two systematic reviews considered the impact of Minimum Unit Pricing (MUP) policies of alcohol on consumption. Boniface, Scannell and Marlow (n= 33 studies) (2017), the most comprehensive review on MUP, found that it was highly probable that introducing Minimum Unit Pricing for alcohol reduces alcohol-related harms and alcohol consumption. Studies from Canada demonstrated that a 10 per cent increase in minimum prices were associated with significant reductions in alcohol consumption of 3.4-8.4 per cent as well as reductions in alcohol-attributable hospital admissions and in alcohol-related mortality (Boniface et al., 2017). Boniface et al. note that it was beyond the scope of their review to analyse the equity impacts of minimum unit pricing, but argue they found that this policy only affects the price of the cheapest drinks which are normally consumed by those who drink the heaviest, and so suggest that it is a pricing regime likely to narrow health inequalities (2017). A review by Sharma et al., (2017) found the same, agreeing that minimum unit price provided an effective policy option for reducing heavy drinking.

One of the concerns of minimum pricing regimes is that any increased revenue flows to the retailer where there is an absence of government monopolies, rather than the government. Thus, revenue to government that could be hypothecated is not maximised. The benefit for governments in the imposition of taxes is that they receive the revenue, whereas pricing policies deliver revenue to retailers. An argument for the imposition of so-called ‘sin taxes’ (additional taxes on harmful products) is that this revenue can then be used by governments to fund programs that prevent uptake of smoking or harmful alcohol use and to treat addiction and health problems relating to alcohol and tobacco use (Elder et al., 2010).

Sharma et al., (2017) found that while implementation of minimum unit pricing represents potential lost government revenue, they expected implementation of MUP in the UK to be revenue neutral

due to increases in sales tax revenue (the UK's Value Added Tax) applied to the new minimum unit price. In this way, they argue, tax and price policies can work together to prevent industries from circumventing new taxes, while also ensuring that governments benefit from commodity price increases (Sharma et al., 2017).

#### 4.5 Black market and unrecorded consumption – price/tax considerations

Price/tax regulations self-evidently cannot be employed in the black market. But prices in a legal market can shift purchases to the black market when the black market prices are cheaper. Setting appropriate prices so as to discourage black market purchases was a consideration often applied for alcohol in the early years of legalisation after prohibitions, and in contemporary times in low- and middle-income countries with a strong history of home production. Although it should be noted that in the latter evidence has found informal market prices can also rise when the price of taxed alcohol is raised (Okaru et al., 2019; Rehm et al., 2022).

One measure of a black market is what is referred to as “unrecorded consumption”. Unrecorded consumption relates to consumption of products that are not taxed and outside of the usual systems of government control. Unrecorded alcohol consumption relates to beverages unrecorded by any regulation and applies to homebrew, black-market purchases, cross-border imports or surrogate sources of alcohol (such as mouthwash). Thus, not all unrecorded alcohol is illegal. Unrecorded tobacco consumption includes untaxed and illegal products such as counterfeit cigarettes, illegal cross-border imports or homegrown tobacco.

One review was found on how alcohol taxation impacts unrecorded consumption rates (Rehm et al., 2022).<sup>22</sup> Rehm et al., investigated the argument that raising taxes results in increased unrecorded consumption with consumers switching to alternative (untaxed or illicit) sources of alcohol. They looked at evidence from four different geographical areas (Lithuania, Russia, Nordic countries, Kenya and Botswana). Evidence from the Nordic countries (most relevant to Switzerland) is that most unrecorded consumption comes from cross-border imports, and studies did not find a simple relationship between taxation and unrecorded consumption increases. Overall, unrecorded consumption in Nordic countries was found to be impacted by other factors including the availability of unrecorded alcohol products, countermeasures against unrecorded consumption and presence of large-scale producers of unrecorded alcohol.

Unrecorded alcohol consumption for western nations is estimated to represent 20 per cent of all alcohol consumption (Lachenmeier et al., 2011). Literature on the intersection of unrecorded alcohol and taxation (using data from all nations) notes that where a substantial illicit market for alcohol exists, taxation adjustments are needed to bring the illicit market under effective government control, e.g. by lowering taxation on specific products, alongside additional enforcement measures (Anderson, Chisholm, et al., 2009). While there is evidence from alcohol and tobacco showing that when prices increase, the extent of unrecorded consumption also increases (Krishnamoorthy et al., 2020; Miracolo et al., 2021), there are also studies showing that unrecorded alcohol consumption (a marker of the alcohol black market) did not automatically increase with increases in alcohol taxation (Rehm et al., 2022).

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<sup>22</sup> Although this paper is a literature review of case studies, narrative reviews and systematic reviews (not an SR itself) it is included here due to relevance.

There was relatively little information on unrecorded tobacco consumption within the systematic reviews. One review (Krishnamoorthy et al., 2020), analysed two studies from Uruguay (both with the same author) that found increased prices and taxes of cigarettes led to a rise in the manufacture of illegal cigarettes. A review by Miracolo et al., (2021) analysing a range of sin taxes and their effect on consumption in Latin America between 2000 and 2018 (n=34) found that after a cigarette excise tax was implemented in Brazil in 2012, overall population consumption decreased but illicit consumption grew from 16% of all tobacco use to 42.8% in 2016.

#### 4.6 Price/taxation - Implications for cannabis policy

**Price effects:** There is strong evidence from alcohol and tobacco that higher prices decrease population consumption and also decrease related harms (Sharma et al., 2017; Wagenaar et al., 2009). Meta-analysis has demonstrated that a 10% increase in the price of alcohol is expected to decrease overall consumption in the population by 5%, and some studies in tobacco demonstrate a similar range of effect (Gallet, 2007). Existing data on the elasticity of cannabis demand indicate that cannabis is also similar, with studies estimating elasticities of -0.418 (Halcoussis et al., 2017); -0.42 to -0.60 and -0.5 to -0.6 (Riley et al., 2020) (although acknowledging that cannabis elasticity studies have a more limited pool of data to draw from). It is therefore extremely likely that higher cannabis prices will contribute towards lower total population consumption and lower rates of harm than might be expected with lower market prices.

**Price effects for young people:** While increased price/tax was found to reduce overall consumption, price elasticities of alcohol and tobacco varied among different cohorts, with young people found to be less responsive to alcohol price increases than the general population although more so for tobacco, and people with heavy use also found to be less responsive, although still responsive (Elder et al., 2010; Scott et al., 2017). However, given that people who drink more heavily have a higher rate of consumption, even if price impacts are more moderate than for the general population, they will yield a larger magnitude of reductions in consumption for this group, and the associated health gains could therefore be significant (Sharma et al., 2017). Understanding how people with different patterns of cannabis use respond to different price increases will be critical to implementing appropriate cannabis policies.

**Off-premise vs on-premise elasticities:** People purchasing alcohol off-site have been found to be more price responsive than when purchasing alcohol on-site (Sharma et al., 2017) and off-site purchases of alcohol are growing and therefore have the potential for a significant effect on consumption (Callinan & MacLean, 2020). The same effects are likely to be found for cannabis.

**Different types of taxation/price systems:** Systematic reviews of alcohol and tobacco did not make a comparison of which tax/price systems are the most beneficial in terms of public health. Complicated tax regimes create the potential for industry loopholes. There are five main potential tax/price arrangements for cannabis:

- a sales tax based on THC content (that is products with higher THC content have a higher tax rate)
- a value added sales tax – as a fixed percentage of retail price, or of weight

- differential price by type of product (that is, additional taxes for more harmful forms or for certain forms to be discouraged)
- a minimum unit price (that is a floor price for any cannabis product)
- bans on price discounting and promotions

Determining the taxable amount based on THC content is complicated because of the presence of CBD – which mitigates some of the harmful effects of THC. One option is to consider tax rates based on the ratio of THC to CBD (rather than simply THC alone).

**Minimum Unit Pricing** also offers a potential model for setting base level prices of cannabis. The alcohol literature demonstrates that in conjunction with taxes, minimum unit pricing is effective at preventing industry cost cutting strategies and at raising the prices of the cheapest drinks, often consumed by those who drink most heavily, so offering an effective policy option for tackling heavy use (Boniface et al., 2017).

**Industry evasion:** The evidence from alcohol and tobacco shows that corporations will either try and find loopholes to avoid taxes (through the creation of new products or new tiers of products), or in some cases absorb taxes to retain market share. In addition to strategies such as minimum unit pricing, a ban on product discounting may also be effective in maintaining appropriate pricing levels. Bans on price discounting and promotions is especially important considering findings from tobacco literature that product discounting and coupons were used more readily by young people and those with lower socio-economic status (Golden et al., 2016; Guindon et al., 2020).

**Price effects, product substitution and nudge strategies:** Alcohol and tobacco research demonstrates that where tax or pricing policies (or other inputs) create differences in costs of products, substitution can occur (Ciapponi et al., 2021). Price signals for less harmful cannabis product types will be a potential ‘nudge’ strategy, as seen in individual studies of e-cigarettes (lower price) compared to cigarettes. The evidence from e-cigarettes suggests that flavoured products are likely to encourage consumption (and hence harms). Either banning flavours or placing an additional tax on flavoured cannabis product are regulatory options supported by evidence from tobacco control (Huang et al., 2017). (See also section 6.2.3).

**Price and the black market and unrecorded/illicit consumption:** Minimising black-market activity is often cited as one of the main drivers and benefits of cannabis policy liberalisation. At least in the short run, this therefore requires that the price and availability of cannabis be set at a level which is equal to or more accessible than the black market (i.e., similar prices, similar availability). The suggestion to implement lower prices of cannabis is in direct contrast to the public health arguments that have often been made for alcohol and tobacco – which aim to set the price as high as possible. While there is evidence from alcohol and tobacco showing that when prices increase, the extent of unrecorded consumption also increases (Krishnamoorthy et al., 2020; Miracolo et al., 2021), there are also studies showing that unrecorded alcohol consumption (a marker of the alcohol black market) did not automatically increase with increases in alcohol taxation (Rehm et al., 2022).

Price is not the only influencing factor on consumption rates (Pacek et al., 2019), with sociocultural factors, availability, convenience and taste also influencing price elasticities of alcoholic beverages and likely to also impact the price elasticity of cannabis products.

**Hypothecated taxes:** There is the option to ensure that revenue to government from taxation is hypothecated, that is the tax revenue is designated to be spent on cannabis prevention,

treatment and/or harm reduction. This is not an area that has been subject to empirical analysis but it has intuitive appeal.

**Medicinal cannabis:** Medicinal cannabis and its pricing and availability will bear on the effectiveness of recreational cannabis pricing strategies. Given that the boundary between medicinal use to improve one's state of mind and recreational use is very fuzzy, the level of tax on recreational cannabis needs to take into account the price and availability of medicinal cannabis (and consideration of a tax on medicinal cannabis).

## Chapter 5: Consumer information, product labelling and health warnings

The provision of accurate, helpful consumer information on products (product labelling) is a regulatory measure to improve public health outcomes that have been widely implemented for both alcohol and tobacco. In addition to product labelling, regulating product packaging to reduce attractiveness (through plain packaging and graphic warnings) has also been implemented, at least for tobacco. One of the five WHO best buys for tobacco control is to “implement plain/standardized packaging and/or large graphic health warnings on all tobacco packages”. This chapter reviews the evidence in relation to product warning labels, plain packaging, product labelling, and low-risk use guidelines.

Thirty-one systematic reviews were identified that explored the impact of packaging and labelling on subsequent substance use. Of these, the majority (n=23) examined tobacco products, seven examined alcohol and one (Purmehdi et al., 2017) looked at both alcohol and tobacco. Reviews were conducted between 2008 and 2021. This is an area of active research with four systematic reviews published in 2021 alone. The systematic reviews drew on naturalistic (in-field) as well as experimental (in laboratory or online) research designs. There was a focus on impacts for youth within the tobacco literature.

Most of the systematic reviews examined product warning labels, where one or more adverse health consequences to an individual or to others of consuming alcohol or tobacco is communicated on a label, which could be in text or an image (photographic or pictorial). There is also evidence about product labelling more generally, alongside specific strategies such as plain ‘packaging’. This chapter considers:

- Product labelling for healthier choices
- Warning labels and graphic images
- Plain (standardised) packaging
- Child-resistant and tamper-resistant packaging
- Safer-use (lower-risk) guidelines: consumer information.

### 5.1 Product labelling for healthier choices

Product labelling can be defined as a “nudge” strategy: “any aspect of the choice architecture that alters people’s behaviour in a predictable way without forbidding any options or significantly changing their economic incentives” (Bauer & Reisch, 2019).<sup>23</sup> These so-called “nudge” interventions generally involve changing some aspect of product or the physical environment that shapes behaviour often without people’s awareness. Here, the ways in which alcohol and tobacco are labelled can shape consumption behaviour and as such can form an important part of regulatory frameworks. In addition, research has shown that consumer information is a more acceptable nudge strategy than price nudges (Reynolds et al., 2019).

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<sup>23</sup> Note that the literature also refers to tactics by industry to alter the choice architecture in favour of unhealthy options, that is alcohol and tobacco industry tactics to encourage consumption. These are referred to as “dark nudges” and “sludges” (Petticrew et al., 2020).

One review paper on healthier choices, Bauer et al., (2019) reviewed 39 studies focussed on healthier food choices and identified the provision of information (for example food labelling and nutritional information on menus) as one of five important areas.<sup>24</sup> However, these reviewers concluded that mere provision of information is unlikely to have strong effects (in this case in relation to caloric information on food) but greater salience of positive health information (colours, positioning of labels) can increase the effect.

For alcohol, one form of product labelling is the use of 'standard drinks' labels, indicating the number of standard drinks within any one container/bottle (Kerr & Stockwell, 2012). The idea behind it is that the confusing variety of container sizes and beverage strengths make it difficult for the consumer to know how much they are drinking. Standard drinks labelling has been adopted in countries such as Australia, New Zealand, and the United Kingdom. A 'standard drink' varies between countries in terms of the number of milligrams of ethanol. For example, 8 grams for the British "standard unit"; 10 grams for the Australian "standard drink"; and 13.45 grams for the Canadian standard drink.

One review assessed the impact of standard drink labels (n=11 studies) (Wettlaufer, 2018). The review focused on studies assessing awareness of standard drinks, and the impact of standard drink labels on pouring behaviours, and consumption patterns. The review found that most people who drink in countries where standard drink labels have been introduced, are aware of the concept of a standard drink, and this awareness increased over time after such labels were introduced. Standard drink labels can help people estimate the number of standard drinks in their preferred beverage as well as pour a standard drink, however the size, position and vividness of the standard drink label influences the degree that someone can use the information. The review found there was no comprehensive evaluation studies that would enable the assessment of the impact of standard drink labels on alcohol consumption (Wettlaufer, 2018).

Labelling of tobacco as 'light' or 'mild' has been banned in more than 50 countries including the USA, Australia, Canada, Japan and the UK, given the view that such labels send the purportedly false message about reduced harm (Yong et al., 2011). In the case of alcohol however, the use of light, low strength alcohol labelling has arguably improved the ability of people to make healthier choices.

One systematic review focused on explicit label messages about low product strength (e.g. "low alcohol" "low tar") (n=26 studies) (Shemilt et al., 2017). Of the 26 studies included, there was one study on alcohol products and six on tobacco. All of these were non-randomised control studies, meaning they are of lower evidence quality. No conclusion could be drawn about the effect of product information labelling regarding 'low alcohol'. The single study to examine alcohol beverages (Bui et al., 2008) did not report on the impact of 'light'/'regular' labelling on drinking behaviour or intention. The study did find that participants did correctly identify that the beverage labelled as 'light' had less calories and carbohydrates than that labelled 'regular', indicating the label supported consumers' identification of a beverage with less calorie content.

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<sup>24</sup> The other areas were: use of salience and social norms (priming and social norms); changes in the default (making healthy options the default choice); changes to the physical environment (positioning, presentation, portion size, food variety); and incentives and planning (price changes, positive incentives).



For the six tobacco studies, two studies examined the impact of a ban on ‘mild/light’ labelling on cigarette packets; one reported non-significant results, the other found that pre-ban, consumption of ‘light’ cigarettes had a greater market share compared to after the ban (and an increase in the proportion of people who smoked consuming ‘regular’ cigarettes after the ban) (Shemilt et al., 2017). The authors conclude that “there is currently insufficient evidence from research available in the public domain to inform choices between alternative descriptors, or about the types or strengths of alcoholic beverage products to which they should be applied” (Shemilt et al., 2017).

## 5.2 Warning labels and graphic images

There is a vast literature examining the impact of placing warning labels on tobacco products; less so for alcohol. Systematic reviews typically examine the impact of warnings on awareness, knowledge, recognition, attitudes, and beliefs. And while impacts on behavioural outcomes (product selection, consumption etc.) are rarer (Francis et al., 2017), the increasing implementation of product warning labels has provided the opportunity to examine behavioural outcomes at the population level.

A number of reviews of the effectiveness of alcohol warning labels in terms of their ability to influence knowledge and in turn behaviour were undertaken in the late 2000s to inform government debate in Australia, Canada, and the European Commission (Wilkinson & Room, 2009). Overall, the evidence for alcohol warning label impacts is limited to experiences where warning labels are small and not prominent, and it is perhaps not surprising then that there is little evidence to indicate that these health warnings have had an impact on drinking behaviour.

The research evaluating experience with labelling as currently implemented internationally emphasises that the effectiveness of alcohol warning labels is dependent upon the content, format, and presentation of the messages. A recent systematic review with meta-analysis by Clarke and colleagues (2021) (based on 14 randomised control experimental studies, three about alcohol products) examined the impact of health warning labels (text and image) and product selection. Pooling the results from nine studies (non-alcoholic products included), participants were 26% less likely to select products that had a health warning label compared with the choice of a product with no health warning label. Pictorial labels deterred product selection more than text only labels, but this was not statistically significant (Clarke et al., 2021).

The literature on tobacco package warning labels offers a contrast to the alcohol warning label experience, both in terms of the different form labelling has taken, and the impacts. Evidence from tobacco suggests that health warnings that are large, rotating, pictorial, prominently displayed (and with specific text, size and formatting requirements) may be more effective than the existing typically text-based alcohol warnings.

Studies of tobacco warning labels were effective at reducing the number of cigarettes smoked daily by adults. In terms of warning placement and type, warnings are mostly effective when prominently displayed both on the front and back of the pack and strengthened by using pictures (Bafunno et al., 2019). A recent meta-analysis by Ünal & Metintaş (2021) examined the impact of product warning labels or anti-smoking TV ads and media campaigns on smoking prevalence rates (11 studies). The findings of these two interventions were often reported in combination, as both were considered as ‘information campaigns’ amongst a broader suite of tobacco control strategies. The authors found

these interventions decreased the smoking prevalence rate in adults by 13% in the longest follow-up period (Ünal & Metintaş, 2021).

Research suggests a number of factors increase the impact of warning labels, including vivid messages which provoke an emotional reaction, specific unambiguous warnings rather than general messages, and warnings that are attributed to a specific authoritative source (e.g. in the USA the Surgeon General) (Wilkinson & Room, 2009). Of those looking at pictorial labels, one review focused on the impact of graphic warning labels (n= 35 longitudinal studies) (Pang et al., 2021). Overall, the study found that the presence of graphic health warnings increased awareness of health harms of smoking over time and increased intention to quit.

### 5.3 Plain (standardised) packaging

Plain packaging, sometimes referred to as standardised packaging, of tobacco products has now been fully implemented in 15 countries after first being introduced in Australia in 2012 (Moodie et al., 2021). Plain packaging means everything about every package or container of a product is the same, irrespective of type or brand. No distinctive features, colours, brand images or logos can be used. Only the brand and product name can be displayed and in a standard colour and font style.

Six reviews were found that focused on assessing the impact of plain packaging<sup>25</sup>, with the most recent in 2021 a synthesis of two systematic reviews on the impact of introducing plain packaging in the UK (Moodie et al., 2021). From all reviews there is consistent evidence that cigarettes in plain packaging are judged to be less attractive than alternative (e.g. branded) tobacco packs (Hughes et al., 2016; Melendez-Torres et al., 2018; Moodie et al., 2021) including among young people (although two studies only) (Papanastasiou et al., 2019). The Moodie review found evidence that plain packaging reduced product appeal and acted as a deterrence for smoking initiation (Moodie et al., 2021).

Findings were mixed with respect to whether plain packaging were associated with increased perceptions of harm. There was some evidence that it increased attention to and the effectiveness of health warnings and increased the effectiveness of those warnings, with people reporting that the warning label made them want to quit smoking, although it should be noted no studies in the reviews directly explored cessation or relapse prevention (Moodie et al., 2021). The impacts on behaviour (rather than intention) of existing smokers are less clear. An observational study from Australia (in McNeill et al., 2017) suggests plain packaging may reduce smoking prevalence. Some people switched to cheaper cigarettes in association with the introduction of plain packaging (Moodie et al., 2021).

### 5.4 Child-resistant and tamper-resistant packaging

One review (eight studies) assessed the impact of child-resistant and tamper-resistant product packaging on health and behavioural outcomes (Jo et al., 2017). The authors sought to draw out implications for tobacco product packaging, and prevent poisonings due to tobacco product ingestion, particularly e-liquids and electronic cigarette cartridges. Products with child-resistant

<sup>25</sup> (Hughes et al., 2016; McNeill et al., 2017; Melendez-Torres et al., 2018; Moodie et al., 2021; Papanastasiou et al., 2019; Stead et al., 2013).

packaging (e.g. an opening mechanism requiring participants to push down and turn the cap) restricted product access compared to non-child-resistant packaging. Child-resistant packaging reduced child exposure to toxic products, and in some studies was linked to reductions in child mortality.

### 5.5 Safer use (low-risk) consumption guidelines

Another way of providing consumer information on low-risk consumption is through safe use guidelines or recommendations. For alcohol, the concept of a “standard drink” coupled with recommendations about the maximum daily or weekly number of standard drinks plus labels on alcohol beverages indicating the number of standard drinks<sup>26</sup>, has been a way to inform consumers and increase healthy choices.

The prevailing view is that there is no safe level of tobacco consumption (WHO, Tobacco Fact Sheet, 2021). Thus, there are no safe use guidelines for tobacco. For alcohol, the research showing any protective effects of low alcohol consumption have now largely been dismissed (Naimi et al., 2013; Roerecke & Rehm, 2014; Zhao et al., 2017). The absence of protective effects, however, does not then lead to the assumption that any consumption is harmful. The question becomes, what level of consumption is associated with minimal or no harm? Safe drinking guidelines, such as those developed in Canada, France, Australia, the United Kingdom and other countries, attempt to define a safer level of alcohol consumption in order to provide people with consumer information that will moderate their alcohol consumption. In general, the various national guidelines suggest that around 10 standard drinks per week, the inclusion of one or two alcohol-free days, no consumption in young people, and an absence of binge drinking is a safer pattern of consumption.

The potential for population health effects if safer drinking guidelines were followed is high (Stockwell et al., 2012). Sadly, compliance with guidelines appears rather low (Lovatt et al., 2015). We did not locate any systematic reviews of the effectiveness of drinking guidelines (usually measured in terms of awareness of the low-risk drinking guidelines rather than behaviour change or population level impacts in reducing alcohol consumption). However, a number of individual studies confirm that salience and awareness is low (see for example Bowring et al., 2012; Casswell, 2012; Harrison et al., 2011) and that there is no substantial or sustained effect on population-level alcohol consumption (Holmes et al., 2020). However, when the Australian guidelines reduced the maximum number of drinks on an occasion for men by one-half to be the same as the guideline for women, the responses on what was a safe level of drinking for their gender fell for men but not for women (Livingston, 2012).

### 5.6 Consumer information and product labelling – Implications for cannabis

**Product labels:** Consumer information about the product being purchased or consumed is important to increase awareness and enhance the likelihood of healthy choices. Alcohol includes standard drinks labelling and ethanol content; and cigarettes display the nicotine contents. There

<sup>26</sup> “Standard drinks” are also used in on-premise drinking venues to ensure that retailers dispense a standard drink (in theory, so that consumers can count their drinks).

is strong evidence that consumer/health information labels lead to changes in awareness and knowledge, but only moderate evidence that such labels lead to changes in alcohol drinking or tobacco smoking behaviours. This is in the context of high levels of public knowledge of different alcohol strengths (e.g. beer vs wine vs spirits). For cannabis, the public may be significantly less well-informed about THC levels. Current labelling requirements in legal cannabis markets include THC and often also CBD potency in milligrams, percentages and/or ratios. However, recent research has shown poor consumer comprehension of THC amounts (Leos-Toro et al., 2020). This study showed that ‘traffic light’ labelling or ‘recommended doses’ were more effective in communicating THC levels.

In addition, there is no standard way to communicate THC amount. As noted by Hammond et al., “What little research exists suggests that current regulatory practices of labelling THC levels on packages may be ineffective due to consumer difficulties understanding numbers (e.g., mg vs. percentage), and the different ways THC levels are communicated across product categories” (Hammond, 2021). This suggests that the consumer information labelling for cannabis products requires much thought, and traffic light labelling in addition to THC content and/or THC-CBD ratios combined are likely to be more effective. This should also be seen in the context of the alcohol and tobacco evidence which shows that consumer information labelling is only moderately effective in changing behaviour.

**Health warning labels:** Evidence for potential behaviour change comes mostly from the experience with tobacco warning labels; the key to their success appears to be the use of large, prominent, graphic warnings. Warning labels on cannabis products may reduce cannabis consumption (and hence harms) moderately, and will be more effective depending on their size, shape, colours and placement. In a US study comparing the current required cannabis warning labels (small font and a composite health risk statement) with an experimental enhanced warning label (varying textual and pictorial components), the authors found improved recall accuracy amongst young people (Kim et al., 2022). Mandating health warning labels for cannabis is more effective than voluntary cannabis warning labels (Goodman et al., 2022). For other experimental work on cannabis warning labels see: (Mutti-Packer et al., 2018; Winstock et al., 2021).

**Plain packaging:** The evidence for plain packaging comes from tobacco control, with consistent evidence that plain packaging of cigarettes reduced product appeal and deterred people from initiation to smoking. Plain packaging also increased intentions to quit smoking. There is not, however strong evidence for behavioural impacts (i.e. reduced tobacco consumption). We note that the major impediments to tobacco plain packaging have been industry legal action in the context of existing free trade agreements. For cannabis, there are no free trade agreements, and as such plain packaging could be introduced without industry interference.

**Child-resistant and tamper-resistant packaging:** in relation to tobacco, and notably e-liquids and e-cigarette cartridges, one review has shown that child resistant packaging reduced child exposure to nicotine. In Canada, all cannabis-containing edibles are required to have tamper-proof and child-resistant packaging.

**Safer use (low risk) guidelines:** Low-risk alcohol consumption guidelines do not have strong evidence of effectiveness in preventing high risk consumption or reducing the harms amongst those consuming at high risk levels. At the same time, they do no harm and are not a costly

intervention. Despite there being no strong evidence from meta-analyses or systematic reviews of alcohol guidelines to indicate population-level effects, the development and promulgation of safer cannabis use guidelines may provide relevant consumer information that will increase the likelihood of lower risk behaviours. Lower-risk cannabis use guidelines have been published (Fischer et al., 2022). These guidelines were developed based on extensive review of the literature of cannabis and health harms. The guidelines provide 12 recommendations, alongside three general principles, the first of which is: “People who use cannabis need to know that there is no universally safe level of cannabis use; thus, the only reliable way to avoid any risk for harm from using cannabis is to abstain from its use” (Fischer et al., 2022).

## Chapter 6: Regulating product types and product modification

There are many different forms of alcohol, largely defined by strength or ethanol content. Regulations differ depending on the product type (for example different taxation regimes for low strength alcohol versus high strength alcohol). Similarly, nicotine comes in different forms, such as snus, electronic delivery devices and so on. This chapter is concerned with systematic review evidence of the relationship between product type and/or product modification and public health outcomes, including prevalence of consumption, high-risk consumption and harm to third parties.

For alcohol, we tend to take for granted that there is a huge variety of products (both across and within the broad categories of beer, wine, spirits, potentially numbering in the 100s). In addition, the ethanol content within alcoholic beverages varies greatly, with beers at around 3% to 10% alcohol by volume (ABV), wine between approximately 12% and 20% ABV, and spirits between 30% and 80% ABV broadly speaking. Low and reduced alcohol products have emerged on the market as an alternative to “full-strength” beverages, and the WHO’s global alcohol strategy has encouraged the alcohol industry to reduce alcohol content in beverages as a means of reducing alcohol-related harm.

While cigarette smoking is the dominant form of tobacco use in many countries, there are a range of other tobacco products available including waterpipes, chewing tobacco and snuff. Over the past 20 years there has been an emergence of significant new tobacco products through the introduction of vaporisers and e-cigarettes. There are also product modifications such as smokeless tobacco (snus), and governments have been discussing the potential for reducing the amount of nicotine in cigarettes and enacted some bans on tobacco flavouring. These types of products vary markedly in terms of their preparation, method of use and toxicity (Hajat et al., 2021).

Given the sheer volume of literature assessing medical outcomes and health impacts of different product types we have attempted to provide an overview of relevant literature on harms and focus our review on literature that is more relevant for the regulation of cannabis, covering the following areas:

- Regulating the psychoactive ingredients
- Regulating product types, particularly:
  - Smokeless tobacco (snus)
  - Electronic nicotine delivery systems
  - Flavoured tobacco products
- Factors influencing selection of product type.

Overall, more than 25 systematic reviews were found of relevance to the above areas. The consideration of product types in this chapter was influenced by the available literature with the e-cigarette literature very large, and for other products lacking (for instance there was only one systematic review found for low alcohol beverages and none for snuff or chewing tobacco). Key concerns of the literature on different product types include how alternative products may contribute to increasing harms or harm reduction, their use among young people, and the role that less harmful products may play in encouraging (smoking) cessation.

## 6.1 Regulating the psychoactive ingredients

### 6.1.1 Regulating ethanol content in alcohol

Regulating the amount of the psychoactive ingredient is one approach to reducing harms. The psychoactive ingredient in alcohol is ethanol which is also the main source of harm. The harms from alcohol consumption are well documented and are short-term and long-term in nature. The psychoactive effects of ethanol impact cognition and psychomotor coordination and can have physiological and psychological effects (Babor et al., 2010). Ethanol is a carcinogen that can, with excessive or prolonged use, cause a range of injuries and disease and death. Intoxication is a key risk factor for adverse consequences of drinking and sustained heavy use of alcohol can cause dependence (Babor et al., 2010).

Alcoholic products are regulated based on their ethanol content: restrictions apply to differing levels of ethanol content in some countries (e.g., In the USA ethanol content impacts where products can be sold, in parts of Australia there are restrictions on the sale of higher alcohol content beverages on-premises such as ban of shots of spirits after midnight). Additionally taxes are often based on ethanol content resulting in higher prices for higher potency products which then creates an incentive for manufacturers to reduce the average ethanol concentration in their products (Rehm et al., 2019) (see Chapter 4 on tax and pricing for further information). Other policy levers discussed in this report may also apply differently to types of beverages with high ethanol content, for instance through bans on advertising of only those beverages with high ethanol content.

One approach is to regulate the ethanol content, and/or encourage low-ethanol content alcohol as the preferred beverage. One scoping review of reduced ethanol content in beverages (Anderson et al., 2021) (including 70 studies) cited only one study examining reduced ethanol content of alcoholic beverages as a means to reduce harmful use of alcohol. That study found too little evidence to draw conclusions. Most of the studies found by Anderson et al. (2021) on low and reduced alcoholic beverages focussed on sales numbers and preferences. Eight publications indicated that taste, prior experiences, brand, health and wellbeing issues, price differentials, and overall decreases in the social stigma associated with drinking alcohol-free beverages were drivers of the purchase and consumption of low- and no-alcohol beers and wines (Anderson et al., 2021).

Alcohol is primarily consumed as a beverage although it can be present in food, for instance in chocolate liqueurs. No systematic reviews or even primary research reports were found that considered the regulation of chocolate liqueurs or other foodstuffs containing alcohol. From a brief review of country and jurisdictional regulations, it appears that liqueurs are regulated based both on ethanol content and proportion of ethanol to the product by weight (e.g. Western Australian regulations require liqueurs to be sold as separate pieces each weighing no more than 15.6g, with ethanol containing no more than 5.1g of liquid and not exceeding 5% concentration).

### 6.1.2 Regulating nicotine content

For tobacco, the active ingredient is nicotine. Nicotine can cause dependency, one of the harms arising from consumption. (We note that there are harms from use of tobacco that are unconnected to nicotine and deal with this later in the chapter). The burden of disease and death from smoking cigarettes and tobacco are extensive and also well documented, with smoking estimated to kill 8 million people each year, including through direct use and passive smoking (World Health Organization, 2022).

Article 9 of the WHO Framework Convention on Tobacco Control (the Tobacco Framework Convention) provides for the regulation of the contents of tobacco products, noting that signatories will adopt and implement effective guidelines for testing and measuring the contents and emissions of tobacco products, and for the regulation of these contents and emissions. While the accompanying guidelines to Article 9 are partial (published in 2017) they provide recommendations for regulatory authorities (without specifying nicotine levels, or emissions).

Regulating nicotine to reduce the level in cigarettes (so called Very Low Nicotine Cigarettes, VLNC) has been discussed by the WHO (in their 2015 Global Nicotine Reduction Strategy), and the United States Food and Drugs Administration (FDA) have explored the idea of a low nicotine product standard for cigarettes that would set a maximum allowable nicotine level. The intention of capping nicotine levels and introducing VLNC is to reduce the addictiveness of tobacco products to minimal or non-addictive levels, suggested by US studies to be <0.4mg nicotine/tobacco (conventional cigarettes contain approximately 10 to 15 mg/nicotine) (Hatsukami et al., 2022). Despite the reduction in nicotine, research on VLNC has found them to be as carcinogenic as higher nicotine cigarettes, so harm-reduction effects are largely dependent on reduced initiation and use, and increased cessation (Berman & Glasser, 2019).

While some of the literature on VLNCs has focussed on their utility as a product to help people cease smoking, a clear question emerges from the research on whether or not people will continue to use a product with the psychoactive substance removed, or just find alternative products with the desired amount of nicotine. Two high quality systematic reviews were retrieved that examined the evidence on VLNCs (predominantly from lab trials, human experiments and surveys) (Berman & Glasser, 2019; Hatsukami et al., 2022). Berman et al.(2019) (citing 78 papers) focussed on the impact of very low nicotine cigarettes (VLNCs) on use and cessation. Overall studies indicated that VLNCs were associated with a decline in the number of cigarettes per day (except for those smoking menthol cigarettes). However, during trials, those who were assigned to only smoke VLNCs were more likely to report alternate nicotine product use than others assigned e-cigarettes or regular cigarettes, and they also had a higher drop-out rate and non-compliance. The authors noted that VLNCs were “subjectively disliked by current smokers” (Berman & Glasser, 2019). In the studies reviewed by Berman et al., demand for regular cigarettes and e-cigarettes was also found to be higher than VLNCs suggesting that people would not choose alternative, lower-nicotine options if other products were available (Berman & Glasser, 2019). However, price was found to be an influencing factor, with some experiments finding higher demand for VLNCs where prices for other nicotine products rose (Berman & Glasser, 2019).

In a comprehensive review of the state of evidence synthesis for tobacco endgame policies, Puljević et al.(2022) reviewed 49 syntheses, which covered eight tobacco control policies (with the overall goal of ending tobacco use). The strongest evidence came from mandating very low nicotine content cigarettes (“All evidence syntheses on this topic concluded that the policy is likely to result in a notable reduction in cigarette smoking”). While taxation was found to have significant effects on health outcomes and smoking prevalence, across the synthesised reviews there was caution about the ability of this measure alone to end tobacco use (given the required size of the price increases, concerns about increasing inequality, and political feasibility) (Puljević et al., 2022).



A review of survey data found that smokers informed about the low nicotine product standard (that would require all cigarettes in the US to have reduced nicotine levels of <0.4mg/nicotine), reported significantly increased interest in purchasing normal cigarettes illegally (Hatsukami et al., 2022). The feasibility and acceptability of VLNC would require ensuring the availability of alternative products, and strong policies against illegal markets to mitigate any unintended consequences (Hatsukami et al., 2022). The Hatsukami review also considered whether implementing VLNCs should be done gradually or immediately, drawing on results from one clinical trial. People who smoked and were assigned products with gradually reduced nicotine levels were more likely to compensate by smoking more cigarettes, whereas the group provided with <0.4mg VLNCs immediately were more likely to smoke less and cease smoking, but as per the studies above they were also the most likely to drop out of studies (Hatsukami et al., 2022).

## 6.2 Product type

Cigarette smoke contains more than 7,000 chemicals including at least 69 known carcinogens, exposure to which overtime can result in a range of cancers (Committee on the Public Health Implications of Raising the Minimum Age for Purchasing Tobacco Products, 2015). The different types of tobacco, plus the design of cigarettes (such as filters and length) influence the levels of toxic and carcinogenic chemicals in the combustion emissions of burned tobacco (Centers for Disease Control and Prevention (US), 2010). A number of systematic reviews confirm that a range of non-combustible products avoid some of the harms of cigarettes and other combustible products, while still containing the active ingredient (nicotine). However, systematic reviews that evaluated the public health outcomes of the regulation of product types were lacking.

### 6.2.1 Smokeless tobacco (snus)

Smokeless tobacco (snus) are oral products which are usually place behind the upper lip either loose or in portioned sachets and are primarily used in Sweden and Norway. As the use of snus avoids smoking they are associated with lower health harms than cigarettes, particularly the avoidance of associated respiratory illnesses, and therefore have potential to provide net health benefits (to the population) as an alternative (Foulds et al., 2003; Hajat et al., 2021; Lee, 2007). A systematic review by Colilla for example (Colilla, 2010) concluded that “epidemiologic studies have not shown strong evidence of elevated tobacco-related disease risks with ST [smokeless tobacco] use”.

### 6.2.2 Electronic Nicotine Delivery Systems (ENDS)

ENDS are battery-powered devices used to smoke or “vape” a flavoured solution which usually contains nicotine. For the purposes of this report, the term is used here to cover both vaporises (containing refillable pods) and e-cigarettes. As ENDS are not burning tobacco leaves, they do not have the thousands of chemicals present in cigarette smoke and are therefore a less harmful means of consuming nicotine than cigarettes (Kim et al., 2021; Rahman et al., 2015).

The majority of literature on e-cigarettes is concerned with their harmfulness relative to cigarettes or their effectiveness as quitting agents. The reviews (systematic and meta-analytic) support the view that for individuals who currently smoke, e-cigarettes are less harmful and a lower risk alternative to cigarettes (Corona et al., 2020; Drovandi et al., 2020; Erku et al., 2020; Farsalinos & Polosa, 2014; Goniewicz et al., 2020).

While ENDS are a demonstrably less harmful means of consuming nicotine than smoking tobacco, there are some emergent health concerns around the use of ENDS, for instance systematic reviews and meta-analysis have found indicative results suggesting there may be links between e-cigarette use and oral cancers (Amato et al., 2020); bronchitis and asthma (Liu et al., 2018) and potential pathway to chronic pulmonary disease (Bravo-Gutiérrez et al., 2021; Skotsimara et al., 2019). There is some concern also that cutting agents used in e-liquids, particularly vitamin E have been responsible for some lung injuries (Cecchini et al., 2020). However, the long-term effects of ENDS use are largely unknown and the evidence is mixed with a lack of RCTs preventing more concrete findings. There is a need for well-conducted studies with longer follow-up periods to assess health effects (Amato et al., 2020; Rahman et al., 2015).

Given the lower risk profile of ENDS compared to cigarettes, a major public health concern is how much they act as a gateway to smoking cigarettes (Rahman et al., 2015). There are more than 20 systematic reviews on the relationship between e-cigarettes and smoking behaviour (whether as a cessation aid, harm reduction aid, or as new initiation to nicotine) however, there is no consensus about the balance of harm reducing effects of ENDS versus new initiates to nicotine, and potential emerging harms from ENDS in themselves. Some argue that e-cigarettes are a useful tool for smoking reduction and cessation and others support the position that they encourage uptake of cigarette smoking (Rahman et al., 2015). In analysing the available literature, a review of reviews by Kim et al.(2021) (n=20 reviews), argue for caution, noting methodological limitations across many systematic reviews, and call for additional high-quality studies to be undertaken in order to determine the role of e-cigarettes in initiation or cessation. In addition, the industry's role in e-cigarette research has been subject to research, finding that conflicts of interest deserve greater attention in evaluating the scientific evidence (Hendlin et al., 2019; Martinez et al., 2018; Pisinger et al., 2019).

Since ENDS first appeared on the market around 2008, policymakers have introduced various regulations for them modelled on tobacco control policies. A particular point of concern around ENDS is their use by adolescents following observations in some countries that e-cigarette use and vaping is becoming increasingly common among young people (Ciapponi et al., 2021; Fadus et al., 2019). Very few of the regulations on ENDS have been evaluated for effectiveness on youth smoking rates or their impact on behaviour (Glasser et al., 2017; O'Connell & Kephart, 2022). As already noted, it is not clear how much cross over there is from ENDS to traditional cigarettes, this includes by young people. Systematic reviews on studies measuring combustible tobacco uptake by young adult users of e-cigarettes suggest some young people may move on to using combustible tobacco who might not have otherwise but firm conclusions cannot be drawn due to limitations of the studies (Glasser et al., 2019). However, given the concerns over the use of ENDS by young people, it has been suggested that profiling users and usage patterns of e-cigarettes is a first step in deciding appropriate public health programs and regulatory responses (Rahman et al., 2015).

In a scoping review of local and state regulations addressing ENDS (drawing on 93 studies), O'Connell and Kephart (2022) found a range of regulatory measures were being employed, including product classification, smoke-free policies, tax, age restrictions, flavour bans, advertising and packaging. They concluded that the regulatory impacts "mimic tobacco control efforts" with few evaluations of effectiveness in preventing youth consumption. Product classification has some bearing on which existing regulatory frameworks may be used for regulating ENDS. The US has reclassified ENDS as a tobacco product bringing it in under existing tobacco legislation whereas the UK has chosen to

define ENDS as a medicinal product “which requires companies to undergo licensing procedures, caps nicotine content and highly regulates manufacturing and sales” (O’Connell & Kephart, 2022). The UK model has had cost implications for producers, meaning it is expected that all except the largest e-cigarette companies will be driven out of the market. Thirteen other countries impose special taxes on e-cigarettes and/or e-cigarette liquids (O’Connell & Kephart, 2022).

### 6.2.3 Flavoured nicotine products

Flavourings for tobacco products exist both for products consumed electronically and smoked through flavoured cigarettes or waterpipes. Five systematic reviews were found that just looked at flavoured tobacco products and regulations<sup>27</sup>. A main concern of research on flavoured nicotine products, and particularly ENDS is how much they contribute to uptake and ongoing use, particularly among young people.

Looking firstly at traditional smoked cigarettes, the use of flavouring in cigarettes (outside of menthol) has been banned in many countries including the United States and Australia in order to reduce their appeal to children (Erinoso et al., 2021). A systematic review (40 studies) of Canadian restrictions that banned the sale of all flavoured cigarettes (except menthol), little cigars, cigarillos and blunt wraps that weighed under 1.4g found that prevalence of flavoured tobacco use among Canadian high school students remained high after the ban (Huang et al., 2017). They argued that this was because the ban did not include all categories of tobacco products (pipe tobacco and smokeless tobacco were exempt), and that the tobacco industry reformulated flavoured cigarillos to circumvent the bill by increasing the product weight.

The majority of people who use ENDS consume flavoured ENDS and reviews overall found that flavours and the range of flavours offered, are an important factor in the appeal, increasing use and ongoing use of e-cigarettes and other types of ENDS, particularly among young people (Feirman et al., 2016; Huang et al., 2017; Kowitt et al., 2017; Zare et al., 2018). Flavours such as fruits and desserts were found to be among the most popular for young people, although still popular with adults (Notley et al., 2021; Rogers et al., 2022; Zare et al., 2018). Flavoured tobacco is also seen to be more appealing and less harmful by both tobacco and non-tobacco users across all age brackets (Huang et al., 2017; Zare et al., 2018). Two reviews found evidence to suggest that young people generally prefer initiating and continuing e-cigarette use with flavoured over non-flavoured products (Notley et al., 2021; Zare et al., 2018). There was no definitive research that found a link between the use of flavoured e-liquids in ENDS and the subsequent uptake of tobacco smoking (Notley et al., 2021). One systematic review of the use of e-liquid flavours by young people (Notley et al., 2021) (58 studies) argued that the quality of evidence was extremely low with most studies relying on cross-sectional survey designs for information on flavour use and preference (Notley et al., 2021).

As of March 31, 2021, 336 jurisdictions in the United States (states and local counties and municipalities) had passed flavour restriction policies that include flavoured e-cigarettes and some of which also restrict the sale of menthol tobacco products (Rogers et al., 2022). FDA rules as of November 2018 also ban e-cigarette products that are appealing to youth, such as those with names of products similar to childhood confectionary such as bubble gum or cotton candy (Fadus et al., 2019). Two systematic reviews (O’Connell & Kephart, 2022; Rogers et al., 2022) considered the

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<sup>27</sup> (Feirman et al., 2016; Huang et al., 2017; Kowitt et al., 2017; Notley et al., 2021; Rogers et al., 2022)

effectiveness and impact of the US flavour bans. O'Connell et al. (2022) found evidence from New York City that suggested sales of e-cigarette and vaping flavoured tobacco products decreased after the introduction of the ban. Evidence from Massachusetts showed a significant decrease in availability of flavoured tobacco products following implementation of product restriction legislation and indicated that there was a decrease in use of flavoured products in the short-term (although the authors note the evidence here was limited) (O'Connell & Kephart, 2022). In both areas, O'Connell et al., (2022) noted that the bans relied on retailer compliance and an enforcement body to ensure full implementation

Rogers et al. (2022) were more critical of the sales evidence finding that studies demonstrated significant short-term reductions in availability and sales following policy implementation, but that several longer-term studies found continued availability of flavoured products. They also found that tobacco industry and retailers exploited policy loopholes to continue to sell flavoured tobacco, for example by labelling products 'purple' instead of 'grape', or through creation of new flavour profiles (Rogers et al., 2022). The same review found other studies using sales data showed reduced flavoured tobacco sales but increased non-flavoured products (suggesting substitution) and evidence that a ban on menthol and flavoured tobacco products resulted in increased cross-border and alternative-source purchases by tobacco users (Rogers et al., 2022). Rogers et al. ultimately found issues in implementing flavoured tobacco regulation occurred where different levels of government were responsible for different parts of the regulation. Local and state bodies had created regulation that varied in strength, clarity and comprehensiveness and they did not have the enforcement resources that a national body would have had.

### 6.3 Factors influencing selection of product type

Examining the research on factors influencing the selection of product types is useful because it may suggest structural or regulatory measures which could be employed to encourage moderate use or encourage switching to less harmful products. Systematic reviews were predominantly concerned with ENDS use and the reasons why people might choose ENDS over other nicotine products.

Overall, there were a range of practical and psychosocial factors found to influence the use of ENDS, and the use of ENDS over cigarettes. Practical considerations included price, flavour, perceptions of e-cigarettes as less harmful, the desire to avoid smokefree policies and as a tool for nicotine cessation (Ciapponi et al., 2021; Fadus et al., 2019; Glasser et al., 2019; Zare et al., 2018).

Ciapponi et al. (2021) (49 studies) conducted a rapid systematic review to assess how and to what extent a switch from conventional cigarettes to electronic nicotine delivery systems (ENDS) occurs. They found that price had a major impact on decision making. Fourteen economic studies all suggested a negative relationship between consumption and price increases of e-cigarettes and conventional cigarettes. Demand for e-cigarettes increases when price of conventional cigarettes increases. The study also found that people switched to ENDS as a method of reducing and stopping use (Ciapponi et al., 2021). Given price is a consideration among consumers in choosing nicotine products, it has been suggested that differential taxation is applied to all nicotine products based on their relative risk (not just the nicotine content) (Hatsukami et al., 2022).

Nicotine strength was another practical consideration found to influence e-cigarette product selection in Zare et al. (2018) (n=66) with new or non-smokers found to prefer no or low-nicotine

products whereas people who currently smoked preferred higher nicotine products. E-cigarette use history and gender also impacted choice with women and inexperienced e-cigarette users having a preference for disposable e-cigarettes. In addition to price and product type, a range of personal and psychosocial factors were found in reviews to influence the uptake and use of e-cigarettes included exposure to advertising, influence of peers, friends, family, and social norms (Amin et al., 2020; Pacek et al., 2019).

Young people and adolescents were found to be particularly motivated by psychosocial factors in the uptake or use of e-cigarettes (Amin et al., 2020; Fadus et al., 2019; Han & Son, 2022). For instance, one review found peer influences to be amongst the most common reasons for e-cigarette experimentation among high school and college students, and other uptake reasons were related to exposure to advertising and social media campaigns and the perception that e-cigarettes are “cool” (Fadus et al., 2019). Other influences of e-cigarette use among young people were found to include perceptions of e-cigarettes as less risky or harmful than cigarettes, where social norms suggested e-cigarette use is socially acceptable or where use was associated with social enhancement (gaining of friends, respect and popularity) (Fadus et al., 2019). A review by Han & Son (2022) noted that adolescence is a period of identity establishment, and e-cigarettes may be a tool to shape image and peer-relations.

Social norms clearly play a role in product preferences. Parental disapproval of underage drinking was found by one review to only have a very limited impact on social norms (2018) and overall, the review concluded that “we have found no evidence as to whether or not purposeful changes in collective social norms that disfavour the harmful use of alcohol are effective at the population level” (Anderson et al., 2018). In a potentially corroborating review of studies of neighbourhood social and collective effects, Jackson et al., (2014) found that adolescent alcohol consumption was not significantly associated with neighbourhood attitudes to drinking, social capital and collective efficacy. It seems there is little evidence from alcohol research to transfer to changing collective social norms around particular product types.

#### 6.4 Product types and product modifications – Implications for cannabis

**Regulating the psychoactive ingredient:** In attempting to apply the lessons from alcohol and tobacco to cannabis, it is important to recognise the unique characteristics and different harm profiles for each substance. The psychoactive ingredient in alcohol is the main source of harm from the product, while much of the harm from cigarettes and other smoked tobacco products does not come directly from nicotine, the main psychoactive ingredient, but from the route of administration (smoking) and the carcinogens found in different tobacco products.

For cannabis the psychoactive profile is more complex and there are differences in types and degrees of potential harm between different potencies, cannabinoid composition, and modes of use (as well as consumption patterns) (Room, 2018). Cannabis contains hundreds of phytocannabinoids; tetrahydrocannabinol (THC) and cannabidiol (CBD) are both psychoactive, but THC is the one most often linked to public health risks such as addiction, cognitive harm and psychomotor impairment (Bidwell et al., 2021; Solowij et al., 2019).

Setting appropriate limits in potency for cannabis products will also be a critical consideration, not just for THC but also the balance of THC and CBD. Research is somewhat in its infancy regarding CBD to THC ratios, but suggests that CBD ameliorates some of the more negative short-term side effects of THC use such as paranoia, anxiety, nausea and cognitive impairment, especially in cannabis with high CBD to THC content (Drennan et al., 2021; Manthey, 2019). Recent research finding that low CBD to THC ratios can increase intoxication effects compared to THC alone (Solowij et al., 2019) indicates further research is necessary to determine ideal ratios of THC, and THC to CBD for public health considerations.

In US states where cannabis is legal, the regulations for THC content are specified as maximum THC levels per serving (varying by state, but between 5mg and 10mg for combustibles, higher for edibles) (Gourdet et al., 2017). Noting the complexity of specifying a standard dose, a recommendation for a 5mg THC content has been proposed (Freeman & Lorenzetti, 2020).

The evidence in relation to capping the level of nicotine may also have lessons for cannabis. The evidence from VLNCs suggests that consumers who are dependent on nicotine seek out nicotine from alternative products (from the legal or black market). If the caps on the THC levels in cannabis are so extreme as to nullify the effects of the product, the same behaviours are likely to occur. However, at least some people will be encouraged to take up products with lower psychoactive properties where there are significant differences in price. A sliding scale of taxation/price could therefore potentially nudge people towards less harmful products (both in terms of appropriate levels of psychoactive properties and in terms of type of administration).

**Regulating product types:** Another consideration in the regulation of cannabis products is in the different routes of administration and different types of products. There are a large variety of forms of cannabis (dried herb, concentrates/tinctures, oils, edibles, and drinks) and routes of administration (smoked, vaped, swallowed/eaten, dapping, inhalation etc) (Blake & Nahtigal, 2019; Goodman et al., 2020). Each of these forms and routes of administration are likely to be associated with differing harm profiles (given an equivalent amount of THC), but again, research is still in its infancy.

A number of cannabis researchers, especially from the US, have been documenting the proliferation of cannabis products and modifications (Goodman et al., 2020) with some concern. The prevailing assumption is that a greater range and number of cannabis products and types is associated with increased likelihood of cannabis uptake or continuation – which would suggest limiting the range of product types available. We did not locate any alcohol or tobacco systematic reviews that could confirm this.

From a regulatory point of view, the lesson for cannabis regulators is to increase the availability of lower-harm forms of cannabis products, for example through taxation levers (and hence price) for instance through lower taxes on ENDS cannabis products over higher harm products e.g. pre-rolled joints or raw product. Again, appropriate taxation and pricing levels will need to be driven by health guidance on appropriate levels of THC/CBD content, and relative harm of the type of product.

As per ENDS use, vaping of cannabis is purported to offer a method of consumption with fewer harms than smoking, although with the same discussion around whether or not the availability of

vaping encourages or acts as a gateway to smoking cannabis (Budney et al., 2015). Edible cannabis products offer another means of administration with lower harm impacts than smoking, although again, regulating the levels of psychoactive substances in edible products as well as capping the amount of cannabis/THC in a product is a critical consideration. Emerging research on legal cannabis markets has documented cases of acute psychological distress and severe vomiting from the ingestion of high-potency cannabis edibles leading to hospitalisation and in rare cases death (Matheson & Le Foll, 2020). This has led some researchers to call for a ban on edibles until proper regulatory frameworks (potency levels, labelling and enforcement mechanisms among retailers) can be implemented (Matheson & Le Foll, 2020).

**Flavoured cannabis products:** The evidence from the tobacco literature demonstrates that flavoured products are potentially more attractive to a younger cohort and have been partially blamed for uptake of ENDS among young people. Flavoured smoked tobacco has already been banned in many countries for this reason along with banning names similar to childhood confectionary. Given the evidence on the link between flavours and use of tobacco products in children, a ban on flavoured cannabis products and names/brands marketed to children could also be applied. Given the evidence from the US that retailers may try and subvert such bans (for instance rebranding as purple), a large scope and clear guidance will likely be necessary alongside appropriate enforcement mechanisms.

## Chapter 7: Regulating advertising and promotion

Regulating the extent of advertising, including regulating the allowable days/time, amount, visual images as well as regulating promotions (such as banning two-for-one promotions) is seen as a key regulatory measure to reduce alcohol and tobacco consumption. In line with this, one of the three WHO ‘best buys’ for alcohol is: “enact and enforce bans or comprehensive restrictions on exposure to alcohol advertising”. For tobacco, the WHO ‘best buy’ is a comprehensive ban on advertising (“enact and enforce comprehensive bans on tobacco advertising, promotion and sponsorship”). This chapter examines the evidence for the public health impacts of restricting advertising.

As defined by Lovato, Watts and Stead (Lovato et al., 2011), advertising can be defined as: “the use of media to create positive product imagery or positive product associations or to connect the product with desirable personal traits, activities or outcomes. Promotion, also called marketing, can be defined as the mix of all activities that are designed to increase sales”.

There is strong evidence that exposure to advertising/promotion is associated with alcohol and tobacco consumption, increased consumption and/or intention to use alcohol or tobacco products. The type of promotion appears to matter little with systematic reviews finding this relationship regardless of advertising being on billboards, television, print, radio, on-line, point-of-sale, and/or sponsorship.

This chapter starts with a brief review of the literature on evidence of the impact of advertising and consumption on different groups and patterns of use (aggregate consumption, heavy use patterns and young people). We then review evidence for the following:

- Effectiveness of partial advertising bans
- Effectiveness of full advertising bans
- Regulating internet-based advertising and social media marketing
- Statutory versus voluntary codes of advertising.

### 7.1 Relationship between advertising and consumption

#### 7.1.1 Aggregate consumption rates and advertising exposure

There is strong evidence that exposure to advertising/promotions is associated with alcohol and tobacco consumption, increased consumption and/or intention to use alcohol or tobacco products. Many systematic reviews have demonstrated this.<sup>28</sup> For example, in a large review of 52 studies, Capella et al. (2011) found exposure to cigarette advertising was a significant predictor of smoking initiation and continuation, although with relatively small effects. Similarly for alcohol, several systematic reviews have demonstrated that exposure to advertising and promotion may increase alcohol use (Noel et al., 2020; Stautz et al., 2016), including initiation of alcohol use (Smith &

<sup>28</sup> (Anderson, de Bruijn, et al., 2009; Bryden et al., 2012; Buchanan et al., 2018; Capella et al., 2011; Cerdá et al., 2010; Donaldson et al., 2022; Finan et al., 2020; Gupta et al., 2016; Jernigan et al., 2017; Lovato et al., 2003; Lovato et al., 2011; Nunez-Smith et al., 2010; Sargent & Babor, 2020; Scott et al., 2017; Smith & Foxcroft, 2009; Stautz et al., 2016; Wellman et al., 2006)



Foxcroft, 2009). One meta-analysis of the advertising elasticity for beer by Gallet et al. (2007) found that for every 10% increase in advertising expenditure, the expenditure on beer increased by 0.2%.

The relationship between advertising and higher consumption was found across different sites, including promotions at the point of sale (Paynter & Edwards, 2009; Robertson et al., 2016; Robertson et al., 2015). Point-of-sale promotions include advertising, exterior and interior signage and location of products in preferred positions on display. The association between advertising exposure and consumption also held for advertising at events such as sporting events (Brown, 2016; Finan et al., 2020) and through traditional and online advertising and promotions via social media (Curtis et al., 2018; Donaldson et al., 2022; Gupta et al., 2016; Noel et al., 2020). Despite the wealth of research showing an association between greater advertising exposure and higher consumption patterns, the studies which are reviewed are primarily of cross-sectional associations, so the causal direction of an association is not tested. Even for longitudinal studies, it is possible that someone may have a predisposing interest which means they notice and remember the advertising.

### 7.1.2 Heavy/harmful use and advertising exposure

There is some evidence from studies that exposure to advertising is associated with heavier patterns of alcohol consumption, with a review by Smith and Foxcroft (2009) finding consistent patterns of association over a range of types of advertising including TV programmes and music videos. Findings on associations between heavy drinking patterns and advertising exposure were particularly prevalent in studies on adolescents and young adults (Finan et al., 2020; Jernigan et al., 2017; Scott et al., 2017). One review cited a longitudinal study from the US that found adolescents and young adults more likely to binge drink if exposed to alcohol advertisements containing a 'party' theme (Jernigan et al., 2017).

Alcohol sports sponsorship has also been identified as potentially increasing drinking amongst school-aged children and has been associated with increased hazardous drinking amongst adults (Brown, 2016). Reviews that found increased consumption rates and risky drinking rates among adults were generally associated with sponsorship agreements that included free/discounted alcohol to athletes, and where sports clubs with licensed venues received alcohol sponsorship (Brown, 2016).

For those people who had previously experienced heavy consumption and had chosen to reduce or quit their tobacco use, advertising can impact on those intentions. In one systematic review Robertson et al. (2015) found that point-of-sale advertisements can have an effect on those trying to cease smoking, with studies demonstrating a link between such advertising and an increased risk of impulse purchasing and urges to purchase tobacco products.

### 7.1.3 Impact on overall consumption rates of young people

The impact of advertising on young people has been subject to considerable analysis, with 12 systematic reviews identified on this topic.<sup>29</sup> All reviews show an association between advertising and young people's alcohol or tobacco consumption, although the strength of association varied.

<sup>29</sup> (Anderson, Chisholm, et al., 2009; Anderson, de Bruijn, et al., 2009; Buchanan et al., 2018; Finan et al., 2020; Jernigan et al., 2017; Lovato et al., 2003; Lovato et al., 2011; Sargent & Babor, 2020; Scott et al., 2017; Smith & Foxcroft, 2009; Wellman et al., 2006) and a further five considered young people as a separate population in

From the alcohol literature, reviews that looked at young people specifically tended to find that exposure to advertising and promotion increased the likelihood of intended and actual consumption of alcohol (Buchanan et al., 2018; Gupta et al., 2016; Scott et al., 2017) as well as heavier consumption (Anderson, de Bruijn, et al., 2009; Bryden et al., 2012; Jernigan et al., 2017).

There was some suggestion in the literature that social media may be more influential on adolescent alcohol use than traditional media exposure due to the potential influence of networks (friends, families etc) sharing information and product content which blurs the boundary between marketing and online peer activities (Buchanan et al., 2018; Noel et al., 2020) (social media is considered in more detail in section 7.3 below). In a review of 15 studies, Gupta et al. (2016) found there was a significant association between exposure to internet-based alcohol content (inclusive of alcohol brand marketing and other internet content that displayed alcohol) and subsequent alcohol use amongst 12- to 25-year-old people. Similarly, Curtis et al. (2018) reviewed 19 studies exploring young people's engagement in alcohol-related social media (e.g., friends' posts showing alcohol) and subsequent alcohol use and alcohol-related problems and found a significant relationship.

Point-of-sale advertisements were found to have some limited/unclear effects on the consumption of alcohol by young people although with stronger results for tobacco. One review found limited positive association between exterior advertising near schools and adolescent drinking (Bryden et al., 2012). On the other hand one meta-analysis found that exposure to point-of-sale advertising of tobacco for children and young people (aged between 9 and 17 years) was associated with a 1.6 times higher chance of having tried smoking and a 1.3 times higher chance of being susceptible to future smoking (Robertson et al., 2016).

Reviews of the impact of tobacco advertising on young people's consumption found exposure to cigarette advertising was significantly associated with positive attitudes towards smoking, initiation and continuation of tobacco use (Lovato et al., 2003; Lovato et al., 2011; Wellman et al., 2006). Many reviews have also explored the impact of e-cigarette advertisement on subsequent e-cigarette use. Amin et al. (2020) reviewed 43 studies exploring advertising of e-cigarettes, social interactions, and social norms and found that exposure to advertising was consistently associated with increased intentions to use e-cigarettes. Similarly, a review by Collins et al. (2019) found there was some evidence to suggest e-cigarette advertising could increase trial of e-cigarettes, but not cigarette consumption. A review by Han & Son (2022) however, reviewing 14 studies on media found that exposure to e-marketing was found to be a risk factor for e-cigarette use. One meta-analysis found that exposure to different types of e-cigarettes were found to lower the perceived harm of smoking among children (Vasiljevic et al., 2018).

## 7.2 Effectiveness of advertising bans

Given the overwhelming evidence on exposure to any kind of advertising/promotion and increased consumption or intention to consume, banning advertising is an obvious solution. There have been a number of reviews examining the impact of either partial (i.e., some types of media, such as point-of-sale or television) or full (all types of media) bans on advertising. Tobacco literature often

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the review, alongside adults (Brown, 2016; Bryden et al., 2012; Paynter & Edwards, 2009; Robertson et al., 2016; Siegfried et al., 2014).

considered evidence on partial and full bans. Limited real-world examples exist for full bans for alcohol advertising (outside of those nations where consumption is also banned), so most of the alcohol reviews drew data from countries with partial bans. To compensate for the lack of literature on full alcohol bans we have included two studies on the effects of full alcohol advertising bans in Norway.

### 7.2.1 Partial advertising bans

Evidence suggests that the impact of partial bans on consumption patterns of alcohol and tobacco are limited. Partial bans can apply to certain products (e.g. spirits only), or to certain hours of television, to specific types of media (e.g. print media ban only) and to the location of advertising (e.g. billboard bans within a certain radius of schools) but then still allow other types of advertising to occur (e.g. point-of-sale, online or sports sponsorship). There was very little consideration in the literature of how different types of partial bans may have different effects on consumption patterns, and reviews drew on studies with varying types of bans. Much of the literature on partial advertising bans used studies prior to the advent of social media and smart phones.

Three tobacco reviews considered the impact of partial bans on consumption.<sup>30</sup> Quentin et al. (2007) undertook an analysis of econometric time series data from the USA and 22 other OECD countries. Of 24 studies reviewed, 15 were on TV and radio cigarette ad bans in the US (enacted in 1971), the review overall found mixed results – five of the US studies found the ban significantly decreased aggregate consumption, seven found non-significant results, with the other three finding no or increased aggregate consumption. Although the authors noted substantial issues with econometric analyses (e.g., many of the studies quantified intensity of the ban using expenditure on advertising), the studies analysed together did show a tendency towards small, negative reductions in aggregate consumption (Quentin et al., 2007). As most of the evidence was drawn from partial bans, the authors further suggest that complete advertising bans may have more substantial impacts.

Capella et al. (2008) undertook meta-analysis of the entire published cigarette advertising ban research (n=27 studies). Like other authors they found that research on cigarette advertising bans was “plagued with methodological difficulties” but overall found the majority of research suggests partial or limited bans generally have no or little effect on cigarette consumption often because of substitution to non-banned media. In an omnibus review of multiple tobacco control mechanisms, Wilson et al. (2012) reviewed five studies measuring the before/after impact of tobacco advertising bans. These studies included a mixture of bans on sponsorships, billboard, print, radio, and broadcast media. Where studies did demonstrate declines in smoking, they noted that attribution issues and lack of control groups limited the inferences that could be made. Comprehensiveness of ban, level of enforcement and level of industry shifting to other marketing initiatives appeared to impact on results in studies reviewed. Overall, they found insufficient evidence that partial bans impacted tobacco consumption (Wilson et al., 2012).<sup>31</sup>

Attempts to measure the effect sizes of advertising bans on alcohol consumption have produced varying estimates. As noted by Sargent and Babor (2020), alcohol advertising restrictions in most countries are ‘piecemeal’ applying only to certain beverages (e.g. spirits), or certain hours of

<sup>30</sup> (Capella et al., 2008; Quentin et al., 2007; Wilson et al., 2012)

<sup>31</sup> Price and taxation had the strongest impact on consumption (Wilson et al., 2012).

television or specific media, meaning that reviews on alcohol advertisements consider only the impacts of partial alcohol advertising bans on consumption. In an umbrella review of various alcohol control measures, Siegfried and Parry (2019) found uncertain evidence of the impact of bans on consumption. Drawing from two other systematic reviews on alcohol advertising bans (Siegfried et al., 2014; Stautz et al., 2016) they found that evidence suggested any beneficial effects of advertising bans are likely to only be in the short term. Nelson et al. (2010) in their study of advertising bans in 17 OECD countries between 1975-2002 also found that (any) alcohol advertising bans do not decrease market demand for alcohol. They also criticised studies finding a relationship between advertising bans and alcohol consumption, arguing that they do not appropriately consider local contexts and are therefore biased (Nelson, 2010).

Some reviews also argue there has been relatively little work produced in measuring the effects of advertising bans on alcohol consumption in adolescents (Jernigan et al., 2017), and that low quality evidence inhibits the ability to draw a direct link between consumption and advertising bans (Smith & Foxcroft, 2009). Two reviews considered alcohol advertising bans on youth in detail. Siegfried and colleagues (2014) included clinical trials, RCTs and before and after interrupted time series studies (ITS). One ITS study assessed by Siegfried et al. measured the change on consumption after the lifting of a total ban on all forms of advertising to a partial ban on spirits advertising only. They found that following this change, beer and wine sales increased but spirits sales decreased significantly, although the quality of this study was rated very low due to risk of high bias. Siegfried et al. (2014) overall found the evidence on advertising bans to be very low quality (Siegfried et al., 2014). Similarly, a review by Stockings et al., considering a range of interventions for decreasing adolescent alcohol consumption, also found insufficient evidence for the effect of bans on young people's alcohol consumption (Stockings et al., 2016).

On the other hand, Saffer and Dave (2002) have produced a range of work finding positive associations between advertising bans and reduced alcohol consumption levels. In their 2002 study using pooled time series data from 20 countries over 26 years, they found results that indicated advertising bans decrease alcohol consumption and that the effects of bans may increase as the number of bans increases. Saffer estimated for instance that one ban on beer and wine or spirits would reduce consumption by 5%, and one more ban on all alcohol advertising in one type of media would reduce consumption by 8% (Saffer & Dave, 2002). Other work by Saffer on youth drinking behaviours estimated that a complete ban on alcohol advertising could reduce monthly levels of adolescent drinking by 24% and young binge drinking by 42% (Saffer & Dave, 2006). A later review of econometric studies of alcohol bans on consumption by Saffer (2020) suggested that older studies were "suspect" by current econometric standards but that some new studies that address issues of endogeneity have found small effects of advertising bans on consumption, especially for young adults.

### 7.2.2 Full advertising bans

The extent of evidence on the effect of full advertising bans on alcohol and tobacco was limited, and the findings mixed, although four reviews suggested that full tobacco bans would likely be more effective than partial bans (Blecher, 2008; Capella et al., 2008; Feirman et al., 2017; Quentin et al., 2007). A systematic review of 40 studies exploring the impact on tobacco consumption of a variety of tobacco control measures ( $n = 2$  on advertising regulations) used computational models to estimate the effects of full advertising bans on smoking rates (Feirman et al., 2017). One of their reviewed studies found a national complete ban on advertising could produce a 5.3% reduction in

smoking after 5-years, and a 6.1% reduction over 40-years. The second study similarly predicted that banning tobacco advertising for 25 years could prevent 60,000 tobacco-related deaths (both based in the US). Although these results are promising, the impacts of pricing and taxation changes were more substantial compared to advertising restrictions. Another review found that comprehensive tobacco advertising bans result in a significant reduction in consumption (estimated to be 6.7% per capita), with limited bans having no significant impact on consumption in developed nations (Blecher, 2008).

While the Capella et al. (2008) meta-analysis found little evidence on the impact of partial bans on cigarette consumption they suggested that stage of ‘product life cycle’<sup>32</sup> is important with advertising bans more likely to have a “significant negative impact” on consumption if introduced in the introductory stages of the product life cycle (i.e. before product is established) and that bans in later stages of product cycle have no effect when markets are already mature.

Norway is one of the few non-Muslim nations to implement a complete advertising ban which has been in place since 1975 for all beverages with an alcohol content above 2.5%. As there were no systematic reviews analysing Norwegian data, we draw on the singular study here (Rossow, 2021a, 2021b). Under a full alcohol advertising ban introduced in 1975, recorded alcohol sales between 1960 and 2006 reduced by 7%. Rossow did note however that the study pertained to the impact of traditional marketing and given the extent of digital platforms she hypothesised that if a fully enforced ban on marketing happened today the effects could be larger than that observed in Norway post-1975. (Issues in regulating online marketing and social media is discussed in 7.3 of this chapter below). As noted by Rossow (2021b): “Bans and comprehensive restrictions on alcohol advertising, sponsorship and promotion are recommended as effective measures to curb alcohol consumption and harm. However, direct evidence to support this recommendation is still meagre; the studies are few and the findings are mixed. It seems likely that the effectiveness of a ban on marketing depends on its comprehensiveness and that a complete ban offers the best protection from marketing impact”.

While the evidence on the relationship between advertisement bans and consumption is weak, the relationship between exposure to advertising and consumption of both alcohol and tobacco is strong (Anderson, Chisholm, et al., 2009).<sup>33</sup> Particularly where partial bans are implemented, companies are able to redirect their advertising to other platforms meaning that people are still exposed to marketing messages which can affect their consumption (World Health Organization, 2022). As Booth et al. (2008) note, where there is an underlying common mechanism – here exposure to advertising – prevention should be applied across all possible sites, events, types, and situations where any product advertising may occur. “This takes account of the fact that promotion is never static, even in established markets, as new cohorts of young people, with new media preferences, become targets for marketing activity as they mature.” (Booth et al., 2008).

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<sup>32</sup> Described as a popular marketing term referring to four major stages from market introduction to sales decline.

<sup>33</sup> Anderson et al., report on a meta-analysis of 322 estimated advertising expenditure elasticities showed a positive effect on alcohol consumption.

Another argument for a full advertising ban comes from applying the precautionary principle (Babor et al., 2010). Given that when the Bradford Hill Criteria for causation<sup>34</sup> are applied (confirming a causal link between advertising exposure and consumption) (Sargent & Babor, 2020) the application of the precautionary principle – banning all advertising – is justified.

### 7.3 Regulation of online and social media marketing and promotions

The WHO notes that the emergence of social media has transformed advertising and promotion, with digital platforms able to collect and sell information on users which then feeds into complex algorithms used to create targeted advertising content (World Health Organization, 2022). At the same time the advent of smart phones has increased accessibility of content, with people now able to easily and rapidly view and share promotional and advertising content and messages, and access sites of online sales (Freeman, 2012).

While most countries have some form of regulation for alcohol and tobacco marketing in traditional media, almost half of countries have no regulations in place for online and social media marketing (World Health Organization, 2022). Even where bans of online and social media promotion might exist, implementing regulation is complicated given that promotional content might be via social media influencers and paid content creators (where it is not clear content is paid), and user-generated content with the latter almost wholly unregulated. Therefore alcohol, cigarette and e-cigarette companies are still able to promote their products on social media platforms (Donaldson et al., 2022), for instance through users sharing posts about products (O'Connell & Kephart, 2022) and tech industries have so far been mostly successful at pushing for a regulation-free zone (Room & O'Brien, 2021).

Systematic reviews have analysed the extent and impact of marketing via social media and have been mostly concerned with alcohol, tobacco and e-cigarette promotions, and the use of social media marketing targeted at young people. One review on alcohol for instance found that online alcohol marketing has grown over the past two decades and is now prevalent across social media, for instance with many popular alcohol brands having YouTube channels with hundreds of thousands of followers, and posts on Facebook and Instagram designed to elicit interaction and emotional responses (Noel et al., 2020). We located no reviews examining the effectiveness of social media regulations.

Seven reviews were found that contained analysis of the extent of social media marketing for tobacco or e-cigarettes.<sup>35</sup> Overall the reviews found that tobacco advertising was readily available. For instance a review by Freeman (2012) found multiple studies that demonstrated tobacco imagery was prolific and easily accessible on YouTube and a review by Donaldson et al. (2022) found tobacco promotion across social platforms including Twitter, Facebook, Instagram, and YouTube, and that

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<sup>34</sup> Bradford Hill causality of criteria are: (a) strength of association, (b) consistency, (c) specificity of association, (d) temporality, (e) biological gradient, (f) biological plausibility, (g) coherence, (h) experimental evidence, and (i) analogy.

<sup>35</sup> (Collins et al., 2019; Donaldson et al., 2022; Fadus et al., 2019; Freeman, 2012; Grilo et al., 2021; Lee et al., 2020; O'Connell & Kephart, 2022).

tobacco-brand generated content featuring topics like product design, flavours and promotions were regularly discussed on these platforms.

Within the literature there are concerns that corporations are taking advantage of the lax regulatory environment to promote products directly to children and young people, and that age-gating technologies are ineffective (Noel et al., 2020). Grilo et al., (2021) found adolescents and young adults were more likely to be exposed to e-cigarette and ‘heated tobacco products’ advertisements from digital sources than adults aged 26 and over. Donaldson et al., (2022) cited studies which found over half of adolescent participants reported past 30-day exposure to tobacco content on social media and that those levels of exposure were associated with tobacco-related attitudes and behaviours.

The role of social media advertising of e-cigarette and vape products to young people has emerged as a particular area of concern with one review finding e-cigarette information widely available across social media channels (Collins et al., 2019). Two reviews suggested there was evidence social media campaigns were partly responsible for a rapid rise in the use of e-cigarettes and vapes by young people (Fadus et al., 2019; O’Connell & Kephart, 2022) (albeit without either review including details of the methods or results of the cited studies).

Three reviews included detailed analysis of the leading e-cigarette brand JUUL which had publicity accounts across Twitter, Instagram and YouTube as well as affiliate marketers producing content on behalf of JUUL on Instagram and YouTube (Fadus et al., 2019; Lee et al., 2020; O’Connell & Kephart, 2022). These studies found that a majority of JUUL’s social media followers were under 21 and that their content was highly targeted towards young people, for example analysis of JUUL’s Twitter account estimated that 81% of its followers were aged 13 to 20 years (Lee et al., 2020). Following the release of such studies and a crackdown by the FDA, JUUL deactivated most of their social media accounts, and eBay removed online sales listings for JUUL, although it appears vendors continued to post their products just without advertising the brand name (Fadus et al., 2019; Lee et al., 2020).

### 7.3.1 Options for the regulation of social media and online promotional activities

Overviews of existing legislation aimed at curbing online and social media alcohol and tobacco promotions only received cursory mentions in systematic reviews and there were no reviews that attempted to assess the relative impact of such measures.

The review by Freeman (2012) found a number of practical issues with implementing more rigorous alcohol and tobacco advertising bans on social media including:

- Cross-border/jurisdictional issues with sites easily able to switch their domains to other countries to avoid domestic policies
- Problems on prohibiting user-generated content as it conflicts with freedom of speech provisions that many countries have
- Problems with implementing any regulation e.g. in screening all tobacco content and assessing if it constitutes commercial advertising or not

Freeman (2012) suggested that governments should work with popular social networking sites to implement voluntary bans to eliminate tobacco advertising, noting that a number of sites already have advertising policies; for example at the time of Freeman’s study Facebook prohibited tobacco products from advertising – although this policy only applies to click through advertisements and not

fan pages or groups. The World Health Organization report (2022) on reducing harm from cross-border alcohol marketing notes case examples where countries are trialling various social media regulations for alcohol advertising. Potentially existing domestic statutory and voluntary codes already exist in law that may be better utilised to enforce limitations to advertising via social media (World Health Organization, 2022). These are now explored below.

#### 7.4 Statutory versus voluntary codes of advertising

Advertising restrictions can either be statutory and monitored through a governmental regulatory agency or voluntary and be monitored through industry self-regulation. Statutory advertising regulations tend to cover broadcast hours, and the content and placement of advertisements. Voluntary codes, developed by the industry or by industry associations, tend to cover guidelines regarding the content of advertising and guidelines regarding exposure to vulnerable populations.<sup>36</sup>

We identified a number of systematic reviews concerned with examining the ability of voluntary codes to effectively regulate advertising. Noel et al., (2017) explored industry compliance with voluntary guidelines through a review of 96 publications. The authors found that alcohol advertising consistently violated the guidelines within self-regulation codes, containing themes that were considered harmful to young people. All the studies reviewed detected harmful content, and the 57 studies that looked at exposure demonstrated young people had a high awareness of alcohol advertising (Noel et al., 2017). Anderson, Chisholm, et al. (2009) also reported on the effectiveness of self-regulation, including that self-regulation does not prevent harmful marketing tactics. Another review by Knai et al. (2015) explored the evidence for the content of alcohol self-regulation codes, as opposed to the codes themselves. Across the reviews, it is fair to conclude that industry self-regulation of alcohol advertising does not show evidence of efficacy, in terms of compliance with the guidelines.

In a systematic review of 17 studies concerned with the arguments used by industry to maintain self-regulation, Savell and colleagues (2016) found that the alcohol industry used three main points to promote the continued use of voluntary codes (and self-regulation): emphasizing industry responsibility and the effectiveness of self-regulation, questioning the effectiveness of statutory regulation, and focusing on consumers' individual responsibility. The eagerness for industry to continue with voluntary codes and self-regulation suggests that this approach to suppressing inappropriate advertising is likely failing. Given the identified weaknesses in self-regulation, a later review by Noel et al., (2020) suggested that governments implement marketing regulation under the precautionary principle as self-regulated marketing codes are "likely ineffective at protecting populations vulnerable to alcohol-related harm".

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<sup>36</sup> The AVMSD (the European guidelines for alcohol advertising), for example, include "shall not create the impression that the consumption of alcohol contributes towards social or sexual success" and "may not be specifically aimed at minors" (European Centre for Monitoring Alcohol Marketing (EUCAM)).



## 7.5 Restrictions on advertising – Implications for cannabis

The extent of advertising restrictions – whether a full ban on cannabis advertising or a partial ban, is linked to market structure. We assume that if a government monopoly were chosen, there would likely be a full advertising ban. With a privatised market (with for-profit and/or not-for-profit retailers), the regulations around advertising become important.

The evidence on the association between exposure to advertising/ promotion of alcohol and tobacco and increased consumption and/or intentions to consume alcohol or tobacco products is strong (Capella et al., 2011; Paynter & Edwards, 2009; Robertson et al., 2016). These impacts are felt across all locations of promotion including traditional media, point-of-sale, sporting events and social media. It is a reasonable assumption that cannabis advertising will be associated with the same or similar positive intentions to consume cannabis and greater uptake of cannabis consumption. Young people have been found to be particularly vulnerable to the impact of tobacco and e-cigarette advertising (Amin et al., 2020; Lovato et al., 2003; Lovato et al., 2011; Wellman et al., 2006).

Evidence from tobacco studies and from a study on Norwegian alcohol advertising bans suggest that total advertising bans would be more effective than partial bans (although evidence is still largely indicative). Restrictions on point-of-sale advertisements are needed to prevent impulse purchases (Robertson et al., 2016). Ensuring that total bans include appropriate regulation to moderate online and social media promotions will be critical.

The meta-analysis by Capella et al., (2008) suggests that advertising bans initiated at the introductory stages of the product life cycle are likely to yield a significant impact. This suggests that cannabis advertising bans should be implemented at the outset, before the product lifecycle matures. This is in line with the argument that it is better to introduce stricter regulation at the start, leaving the opportunity for future loosening of regulations, rather than attempting to retroactively apply restrictions once industry, and industry influence has been established (McCambridge et al., 2019; Savell et al., 2016).

The area of online and social media advertising is fraught and has demonstrated the power of for-profit industry to maximise the use of social media channels in their advertising (Donaldson et al., 2022; Freeman, 2012; Grilo et al., 2021). Multiple marketing violations by current cannabis businesses, particularly in-store promotions and content posted online (Carlini et al., 2022), suggest that appropriate regulatory mechanisms will also need strong compliance infrastructure to be effective.

A final consideration is for the use of taxes to curb the marketing budgets of corporations. As noted in a report by Anderson-Luxford et al., (2021), marketing is often a deductible business expense for tax purposes. Prohibiting this as a tax deduction has been suggested by the US Surgeon General as a means to reduce advertising budgets and marketing expenditure (Anderson-Luxford et al, 2021).

## Chapter 8: Regulation of retail sales

The retail sales of alcohol and tobacco are highly regulated. For tobacco and alcohol, regulations cover off-premise sales (that is the selling of tobacco or packaged alcohol) and for alcohol, retail regulations also cover on-premise sales (alcohol consumed within the venue). Regulation is commonly applied through licensing laws<sup>37</sup> which specify the various requirements for the retail sale of these products. Restrictions on retail sales are all aimed at regulating the physical availability of the products. One of the three WHO best buys for alcohol is to “enact and enforce restrictions on the physical availability of retailed alcohol (via reduced hours of sale)”.<sup>38</sup> This chapter reviews the evidence from systematic reviews of retail regulation.

The retail sale of alcohol (and in some cases tobacco) is commonly regulated through a permit or licensing system. This is often administered at a local/regional level, especially in federated nations. Licenses or permits can apply to all types of alcohol, or be differentiated by alcohol type (spirits versus beer and wine), and be differentiated by whether the license or permit covers off-premise sales, or on-premise consumption or both. Products may be restricted to specialist stores only (i.e. that only sell alcohol, tobacco or electronic cigarettes such as ‘vape stores’). One scoping review of US state policies to restrict e-cigarette sales by introducing retail licences found that the introduction of retail licenses reduced past 30-day e-cigarette use among adolescents (O’Connell & Kephart, 2022). No evaluation data were presented on an additional measure to restrict e-cigarette sales to ‘adult only’ stores (O’Connell & Kephart, 2022).

Where products are allowed to be sold in more generalist stores like supermarkets, there may be restrictions on product placement such as alcohol being restricted to certain aisles in the supermarket to discourage impulse purchases and reduce alcohol sales (Foster, 2017). Bans of products within a certain distance of a school are also in place, for instance New York does not allow sales of tobacco within 1000 feet of schools (Ribisl et al., 2017). These various examples demonstrate the complexity of retail regulations: where stores are located may be important; where products are placed within stores may be important; and where sales are restricted through limiting the number of licenses/permits may be important. Perhaps surprisingly, we did not locate any systematic reviews or meta-analysis examining the broad impact or effectiveness of differing licensing or permit systems. There are, however, many reviews examining the conditions within licenses/permits, including the location of licenses/permits granted (outlet density), trading hours, sales to minors and so on.

Thirty-two systematic reviews were identified concerned with retail sales regulations for alcohol and tobacco. Twenty-one of these reviews were focused on alcohol only, 10 were focused on tobacco, and one was focused on alcohol, tobacco, and illicit drugs. These reviews covered various interventions including:

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<sup>37</sup> We use the term ‘licensing’ throughout this chapter to capture the regulatory systems for retail sales, while recognising that a formal licensing or permit scheme is not the only method of administering and enacting the regulations. Other than licensing or permit schemes, retail premises can be regulated through registration and reporting requirements as well as accreditation and certification programs.

<sup>38</sup> The five WHO best buys for tobacco do not include retail sales restrictions.

- Limiting outlet density
- Restricting trading hours and days of the week
- Regulating online sales
- Banning sales to minors
- Regulating the drinking environments and mandating responsible server training
- Enacting alcohol server liability laws
- Applying rations or quantity purchase limits
- Enforcing these various retail restrictions and regulations.

In what follows we review the evidence according to each of these key aspects of retail regulation.

## 8.1 Outlet Density

Outlet density is typically a measure of the number of retail outlets per area or head of population. Regulating the alcohol or tobacco outlet density works through increasing the amount of time it may take for someone to purchase alcohol or tobacco and hence reduce consumption. For alcohol, lower outlet density is also associated with lower alcohol-related harms, such as injury and violence. We identified nine systematic reviews examining the relationship between outlet density and alcohol consumption and harm and one systematic review examining the association between tobacco retail density and consumption. The majority of these reviews found higher outlet density was associated with an increase in alcohol consumption (Campbell et al., 2009; Popova et al., 2009; Sherk et al., 2018; Taylor et al., 2018) and related harms (Campbell et al., 2009; Popova et al., 2009). For example, in a review of 44 studies of alcohol outlet density, Popova et al. (2009) found the majority of studies showed a reduction in alcohol consumption or harms associated with lower outlet density.

A minority of reviews drew more cautious conclusions (Bryden et al., 2012; Gmel et al., 2016; Wilson et al., 2014). These reviews noted that while there is strong evidence outlet density is associated with consumption at the aggregate level, more research is needed to refine the relationship between outlet density and harmful consumption for different outlet types (such as bars compared to retail shops) (Gmel et al., 2016). The single tobacco review of 40 studies found higher outlet density to be associated with higher smoking prevalence, greater tobacco use, and higher smoking initiation (Valiente et al., 2021).

Although much of the outlet density literature was focused on the whole population, three reviews focussed specifically on the impacts on young people (Finan et al., 2019; Marsh et al., 2021; Nuyts et al., 2021). Despite concerns about methodological quality leading to some caution (Nuyts et al., 2021) Finan et al.'s (2019) meta-analysis of 11 studies on tobacco outlet density around homes and schools and young people's smoking behaviours, found a significant association between higher tobacco outlet density around the home and smoking behaviours in young people (OR=1.08), but not for higher tobacco outlet density around schools. Marsh et al. (2021) supported these findings; their review of 35 studies confirmed the positive association between tobacco outlet density near homes and young peoples' tobacco consumption. These reviewers highlighted the importance of regulations of outlets in residential areas.

## 8.2 Trading Hours and Days

Ten reviews examined restrictions on trading hours and restrictions on days of the week sales. Eight of these concluded that increasing the days of the week or the hours of sale can lead to increased

alcohol consumption (Middleton et al., 2010; Popova et al., 2009; Sherk et al., 2018) and an increase in alcohol-related harms (Hahn et al., 2010; Middleton et al., 2010; Popova et al., 2009; Sanchez-Ramirez & Voaklander, 2018; Wilkinson et al., 2016). For example, in a review of 26 studies, Sanchez-Ramirez and Voaklander (2018) found that restricting hours of sale is effective harm reduction; restricted hours of sales can reduce injuries, hospital presentations, homicides, and crime, and even more so when hours are restricted by at least two hours (Hahn et al., 2010). Two reviews reported less conclusive conclusions; the first of these was focussed on drawing lessons for low and middle income countries (Siegfried & Parry, 2019) and the second was a specific review of intimate partner violence (Hahn et al., 2010; Siegfried & Parry, 2019; Wilson et al., 2014). There were no systematic reviews of the impacts of tobacco trading hour restrictions.<sup>39</sup>

Another way in which alcohol trading hours may be restricted, for some patrons, is through the application of so-called “lockout” policies. A ‘lockout’, or a ‘one-way door’ policy is a regulation applied to licensed venues (in night-time entertainment districts) that restricts entry into a venue after a designated time despite the venue remaining open to patrons who are already inside. Patrons may exit the venue; however, re-entry past the lockout time is refused. The objective of the regulation is to reduce alcohol-related injuries and violence which predominantly occur outside and around licensed venues by modifying the night-time entertainment area. Lockouts have been implemented in Scotland (Glasgow), New Zealand and Australia. Lockouts have often been introduced alongside a range of other interventions, including trading hours restrictions, increased policing, and increased surveillance. As a result, it is difficult to evaluate the effectiveness of the lockouts alone.

We located one systematic review of lockouts (Nepal et al., 2018). With five studies included, all of which had design limitations, the results were mixed. On the positive side, two studies showed a decline in assaults and one study showed reductions occurred only inside licensed premises. However two studies showed an increase in assaults; and three studies showed no association between lockouts as an intervention and rates of assaults and/or injuries. The reviewers conclude that “there is not good evidence that lockouts prevent alcohol-related harm” (Nepal et al., 2018).

Studies that have tried to separate the effect of a lockout policy compared to restrictions on trading hours suggest it is the trading hour aspect that is driving reductions in violence and not the lockout. It appears that the specific effect of lockouts as a regulatory tool are not more effective than restricted trading hours, managing outlet density, and employing price restrictions (Taylor et al., 2018). In one review covering 21 studies of restricted alcohol trading hours, the authors note that “Several of the Australian studies involved the combination of a change in closing hours with a lockout requirement earlier in the evening. We have included studies of the combined effects of lockouts and changes in closing hours, but not studies of the effect of a lockout alone” (Wilkinson et al., 2016). This review found that restrictions on late-night trading hours had a significant effect in reducing rates of violence; and longer trading hours increased alcohol-related harm. “The evidence of effectiveness is strong enough to consider restrictions on late-trading hours for bars and pubs as a key approach to reducing late-night violence in Australia” (Wilkinson et al., 2016).

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<sup>39</sup> Interestingly, there appears to be very limited research on trading hour restrictions for tobacco, possibly because trading hour restrictions are uncommon. Cigarettes can be sold in 24-hour convenience shops, most supermarkets, tobacconists, and through vending machines. The lack of evaluative research reflects that this dimension of availability has not been much proposed or used as a tobacco control measure.

The logical extension of restrictions on trading hours and days of the week sales is a total ban on retail alcohol sales. There are a number of countries that either fully or partially (allowed for foreigners) ban alcohol sales; examples include Afghanistan, Saudi Arabia, some province/states in India, United Arab Emirates, Sudan and Afghanistan. We did not locate any meta-analysis or systematic reviews of the effectiveness of alcohol sales bans. Babor et al., (2010) concluded that the effectiveness of sales bans would be high (absent any recent systematic reviews) but they also noted “substantial adverse side-effects from black market, which is expensive to suppress” (p. 264).

In relation to the COVID pandemic, we note that a number of jurisdictions introduced temporary bans on the sale of alcohol in association with other COVID-related restrictions (De Jong et al., 2020; Matzopoulos et al., 2020; Moultrie et al., 2021). To our knowledge, no systematic review has been conducted on the health policy impacts of bans on alcohol sales, but developments on this topic would be interesting to follow.

### 8.3 Online sales

Only one review was identified which examined online sales of alcohol (Colbert et al., 2021). However, it summarised the presence/absence and characteristics of various interventions specifically governing online alcohol sale and delivery (such as trading hours, quantity limits, sales to minors and responsible server training) as well as evidence of retailer compliance with such policies, rather than the association of such interventions with consumption rates or public health outcomes. The reviewers found a majority of jurisdictions had relaxed alcohol home delivery regulations, and that compliance with age restrictions was low (Colbert et al., 2021). The area of online sales (and alcohol home delivery) has emerged as an important site for new regulatory measures in the retail sales of alcohol and deserves closer attention (Reynolds & Wilkinson, 2020; World Health Organization, 2022).

### 8.4 Sales to minors and minimum legal drinking age laws

The sale of alcohol and tobacco to children is banned in most countries of the world. The age at which purchase of alcohol or tobacco is allowed varies, but for alcohol it largely ranges from 18 to 21 years and for tobacco from 16 to 18 years of age. Given the lower consumption rates of alcohol and tobacco in people under-age compared to adults, one can assume that this policy is effective (restricted access is associated with reduced consumption) (Baldwin et al., 2022; Jones et al., 2011; Nuyts et al., 2018; Siegfried & Parry, 2019; Stead & Lancaster, 2002, 2005; Stockings et al., 2016).

Poor retail compliance with sales to minor laws - as measured through the use of test purchases in violation of the law<sup>40</sup> - has been widely reported (Fichtenberg & Glantz, 2002b; Nuyts et al., 2018; Richardson et al., 2009; Stead & Lancaster, 2002, 2005). One systematic review found enforcement efforts, such as the use of warnings and fines for non-compliant tobacco retailers did reduce the proportion of retailers who were willing to sell tobacco to minors, but did not demonstrate a clear

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<sup>40</sup> Sometimes referred to as “mystery shoppers”, or as “undercover test purchases” or as “controlled purchase operations”.

effect on the behaviours of those young people already smoking nor their perceptions of how easily they can buy cigarettes (Stead & Lancaster, 2002, 2005)<sup>41</sup> (See also section 8.7).

One empirical approach to testing the effect of bans on sales to minors is to take advantage of natural experiments – when a country or region changes the age at which one is allowed to purchase alcohol or tobacco. One study (Baldwin et al., 2022) systematically reviewed 13 studies evaluating the impact of changes in minimum drinking age laws. Studies from Australia and New Zealand, as reviewed by Baldwin (2022), predominated because in both countries there has been a lowering of the minimum drinking age from 20 or 21 years to 18 years of age. The findings, however, are mixed. First, the impacts of lowering the minimum drinking age laws on traffic crash injuries were largely not statistically significant (that is lowering the minimum drinking age did not increase traffic crash injuries).<sup>42</sup> On other alcohol-related harms, study findings were mixed with a lower minimum legal drinking age associated with increases in mortality and hospitalisations in some studies, but not in others.<sup>43</sup> (Baldwin et al., 2022). A smaller body of literature on other outcomes indicated there may be some increases in fatalities for children and adolescents when the minimum age drinking laws are decreased, including accidental drownings, falls and strangulation (Baldwin et al., 2022).

Despite the lack of high-quality evidence to draw strong conclusions on minimum drinking age laws, most reviewers conclude that an older minimum legal drinking age is likely associated with reduced alcohol-related harms (such as hospital admissions for acute alcohol intoxication, alcohol-related motor vehicle accidents, and mortality) (Stockings et al., 2016).

## 8.5 Regulating drinking environments, responsible server training, and alcohol server liability

Drinking environments (such as licensed venues) can have attributes that increase harmful alcohol consumption (and attributes that decrease harmful alcohol consumption). Aside from the regulations governing these venues (such as trading hours, sales to minors), there are other environmental factors shown to impact on harms. In a systematic review of 34 studies (across nine countries), Hughes et al., (2011) found that a permissive environment, cheap alcohol availability, poor cleanliness, crowding, loud music, a focus on dancing and poor staff practice can contribute to increased alcohol-related harm. (See also Jones et al., 2011). Despite these two reviews, there is surprisingly few meta-analytic reviews of specific strategies to reduce harms in drinking environments. One example is serving alcoholic drinks in plastic glassware, rather than in glass vessels (to reduce risk of injuries). Another example is police patrols carrying spare shoes (flip flops) for women who may be intoxicated and be walking barefoot (again to reduce the risk of injuries).

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<sup>41</sup> One reason for this may be that the undercover test purchasers were readily able to be detected by the retailer, and the undercover agents did not sufficiently mimic the look and behaviour of youth, as found in this systematic review (Lee et al., 2016) of the protocols used for undercover test purchases.

<sup>42</sup> Note: non-significant up to three years after the policy change to lower the drinking age, but one study found increased traffic crash injuries from 4 years post-policy change (ie traffic crash risk may be a lagged indicator).

<sup>43</sup> In New Zealand the number of assaults and crime increased immediately after the decrease in minimum drinking age laws, but this effect had balanced out at a later six-year review.

Mandatory staff training in the ‘responsible service of alcohol’ (for example not serving alcohol to those already intoxicated) has become commonplace (Stockwell, 2001). However, three different systematic reviews of the effectiveness of responsible service of alcohol training in reducing harmful alcohol consumption all concluded that it has limited effectiveness (Jones et al., 2011; Ker & Chinnock, 2006; Stockings et al., 2016). As aptly concluded by Stockwell et al., (2001): “...skills deficits in the serving of alcohol are not a significant problem compared with the motivational issue for a commercial operation of abiding by laws that are rarely enforced and which are perceived as risking the goodwill of their best customers”.

Making the retailer responsible for alcohol-related harm (‘server liability’) is another potential regulatory measure. This applies particularly to on-premise alcohol consumption, and is found in countries with a strong history of liability laws and which are prone to litigation (primarily the USA). Two reviews examined ‘dram shop’<sup>44</sup> server liability. Rammohan (2011) systematically reviewed 11 studies examining the relationship between dram shop liability and alcohol-related harms including: all motor vehicle crashes; alcohol fuelled motor vehicle crashes; alcohol related motor vehicle deaths; alcohol consumption and other harms. The reviewers found that these retailer liability laws were associated with reductions in all outcomes, particularly alcohol related motor vehicle deaths, where there was a median reduction of 6.4% with the presence of dram shop liability laws.

## 8.6 Rations or quantity purchase limits

Another potential retail regulatory tool is to set limits on the amount of alcohol (or tobacco) that can be purchased. Population-based rationing and quantity limits have occurred historically, but they are uncommon these days,<sup>45</sup> unless targeted at an individual. No systematic reviews of rations or quantity purchase limits were located. We do, however, note that historical programs of rationing the amount of alcohol that could be purchased were arguably effective in reducing total population consumption of alcohol and reducing alcohol-related mortality (Room, 2012). As described by Room, these permit-based schemes in Sweden (1916-1955), Ontario (1927-1962) and Finland (1943-1957) all featured a form of individual permit and monitoring system whereby all alcohol purchases (days of the week and amount) were recorded. In association with these permits (or rations) also came the ability to refuse a permit or ban someone from being allowed to use rations to purchase alcohol. As Room notes, there was little evaluation of these various schemes but notably in Sweden, the cessation of the permit system (known as the Bratt system), was associated with a 25% increase in alcohol consumption in the following two years.

## 8.7 Enforcement of retail regulations

All of the above regulations (eg trading hour restrictions, sales to minors, responsible service regulations) rely on effective implementation. There is ample research evidence of alcohol and

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<sup>44</sup> ‘Dram shop’ is a peculiarly American term to mean an on-premise licensed establishment (a bar or tavern). Historically, it was a shop where spirits were sold by the dram, a small unit of liquid, hence the name.

<sup>45</sup> Restrictions associated with COVID-19 regulations has seen the introduction, in some countries, of rations or limits placed on the amount of alcohol allowed to be purchased at any one time (Colbert et al., 2021; Keric & Stafford, 2021; Neufeld et al., 2020). There is no evaluation to date and isolating the effects of quantity purchase limits from the myriad of other COVID-19-related impacts would be difficult.

tobacco retailer non-compliance (for example, Berg et al., 2021; Gosselt et al., 2007; Milam et al., 2021). This then speaks to the ability of regulators to monitor and enforce the regulations. The majority of the systematic reviews of retail regulations conclude with calls for greater enforcement. Indeed, the common conclusion is that retail restrictions are less effective because they are not enforced (Martineau et al., 2013). This presents a significant problem disentangling the efficacy of a regulation from its enforcement.<sup>46</sup>

Enforcement requires detection of breaches in the regulations (for example see above, section 8.7 on undercover test purchases), which in turn require investment in enforcement processes. Once breaches are detected, the penalties provided can include warnings, fines, public shaming (e.g., lists of venues that have breached the regulations) and sales curtailment. Ultimately, the removal of a permit (or license) to sell alcohol or tobacco is also available to regulators.

Strong empirical evaluations of the effectiveness of detecting breaches and the effectiveness of different penalties or consequences is lacking. No systematic reviews of enforcement (either detection of breaches or penalties) were located. One strong individual study of enforcement efforts for retail alcohol sales was sourced (Wagenaar et al., 2005a; Wagenaar et al., 2005b). Enforcement checks (for sales to minors) resulted in immediate improvement in regulatory compliance (a 17% decline in alcohol sales to minors), however this effect had decayed entirely for off-premise alcohol purchases three months later and had reduced to an 8% decline for on-premise alcohol purchases. The enforcement effects only occurred for those premises subject to checking (there was no generalisability across retailers). This study suggests that consistent and regular compliance checks, across all stores, is required.

In one systematic review on tobacco (which included 60 different studies, of which 20 were concerned with retail restrictions), there was a single reported study of enforcement (tobacco sales to minors) which found reductions in the number of retail violations after enforcement, compared to before (Richardson et al., 2009). In a meta-analysis of eight studies of sale of cigarettes to minors, there was no evidence that increased compliance was associated with decreased prevalence of youth smoking (Fichtenberg & Glantz, 2002b). However, another review concluded that routine inspections involving test purchases was an effective enforcement strategy (DiFranza, 2012). In relation to the effectiveness of enforcement strategies in relation to smoke-free bans, one review (26 studies) concluded that the evidence is weak that enforcement strategies increase compliance with smoke-free policies (Wynne et al., 2018). Strong empirical findings are hampered for a number of reasons: the restrictions themselves vary; compliance appears difficult to assess; there is limited data comparing different enforcement measures; and the outcomes rarely extend beyond an assessment of future compliance to public health outcomes.

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<sup>46</sup> In clinical research, a clear distinction is made between 'efficacy' (whether an intervention works under trial conditions) and 'effectiveness' (whether an intervention works in real life with all its attendant complexity and compliance issues). Such an efficacy-effectiveness distinction is lacking in alcohol and tobacco policy research, because controlled trials are rare.



## 8.8 Retail sales and distribution – Implications for cannabis

**Outlet density:** Research shows that when there are more alcohol and tobacco outlets in a given area, overall consumption and harms increase (Finan et al., 2019; Popova et al., 2009; Sherk et al., 2018; Valiente et al., 2021). The research on young people smoking and tobacco outlet density reinforces that regulating outlet density may prevent underage consumption (especially outlet density in residential areas). Regulating cannabis store outlet density is supported by this research from alcohol and tobacco. Furthermore, research has shown that a greater density of medical cannabis stores has been associated with increased cannabis use and presentations in hospitals due to cannabis-related problems (Berg et al., 2018). Medical cannabis stores are also more likely to be placed in areas with relatively low socio-economic status (Berg et al., 2018). Density limits – including limits on retail outlets and caps on dispensaries – have been implemented in Canada to offset the harms associated with the increased availability of cannabis (Silver et al., 2020). Buffer zones have also been implemented in Canada, where the state requires a minimum distance between cannabis retail outlets; between cannabis stores and schools, day-cares, and community centres; and between cannabis stores and alcohol and tobacco retailers (Caulkins & Kilborn, 2019).

**Trading hours and days restrictions:** The evidence from alcohol points to a strong correlation between longer sales times and greater days of week and higher consumption and alcohol-related harms (for example Hahn et al., 2010; Middleton et al., 2010; Popova et al., 2009; Sanchez-Ramirez & Voaklander, 2018; Sherk et al., 2018; Wilkinson et al., 2016). Limiting the days of the week for cannabis sales, and the trading hours for cannabis sales is likely to be an effective regulatory measure based on the alcohol literature (Haden & Emerson, 2014). We note that cannabis retail stores in Canada are often open until the evening, perhaps in order to compete with the illegal market (which operates 24/7).

**Online sales:** There are no systematic reviews of the effectiveness of online sales regulation for alcohol and tobacco, and as such, no empirical evidence to transfer across to cannabis. Whether legal online sales of cannabis are allowed or not could be informed by the general principles surrounding availability and access – for alcohol and tobacco where availability and access is high, consumption is high, and where consumption is high, harms are high. There is one recently published study describing internet “age gates” (online barriers where people under the age of 18 cannot access the website of cannabis dispensaries) (Madson, 2022).

**Specialist stores only:** There are no systematic reviews investigating the impact of trading from specialist stores on consumption of alcohol or tobacco, although they have certainly been instigated as a method of reducing access, particularly by people under the age of 18. Accessibility is linked to consumption and harms, and so instigation of specialist retailers may be informed by general principles surrounding availability and access. We note that restricting cannabis sales to specialist outlets only is a model used in the Netherlands and parts of the US, and an initiative suggested by some as having relevance for cannabis (Transform Drug Policy Foundation, 2022).

**Sales to minors:** Rates of alcohol and tobacco consumption amongst people under the age of 18 are lower than those over the age of 18. Whether this is driven by the ban on sales to minors, or is a simple age-effect is not able to be precisely determined but there is little disagreement that a ban on sales to minors is a sensible policy. For alcohol, there is limited empirical evidence for a difference between 18 years of age and 21 years of age as the legal age for purchase and/or consumption, but when the legal age is lowered, alcohol-related harms appear to be higher (Baldwin et al., 2022; Stockings et al., 2016).

**Responsible service training, alcohol server liability:** Responsible server training for alcohol does not have a strong evidence-base. This does not suggest that training service staff is harmful. It seems sensible to ensure that staff working in cannabis retail outlets are trained in the potential harms of cannabis, and in detecting problematic cannabis use. However there is no evidence from the alcohol literature to suggest that this will have a positive impact on public health outcomes. Research on alcohol server liability has shown that liability laws are associated with reductions in driving-related alcohol harms (Rammohan et al., 2011), in the context of on-premise alcohol consumption. Liability laws that hold the retailer to account for any harms arising from on-site cannabis consumption may be effective in reducing cannabis-related road crashes where alcohol is involved (see section 9.6 re cannabis and driving).

**Rations or quantity purchase limits:** While there are no systematic reviews of the public health effects of alcohol quantity purchase limits, historical experience of rationing systems (e.g., Bratt system, Sweden) suggests that when such limits are removed, total alcohol consumption increases (Room, 2012). Given that the rationing schemes arose following alcohol prohibition (the parallel with cannabis) this suggests that rations or purchase quantity limits may reduce levels of total population consumption.

**Enforcement of retail regulations:** There is limited evidence to inform enforcement regimes: either in terms of methods for detecting non-compliance with retail regulations, or assessment of the effectiveness of different penalties. There is evidence from both alcohol and tobacco literature that enforcement effects decay over time, suggesting significant investment in routine compliance checks, across all stores, is necessary.

## Chapter 9: Drink-Driving Countermeasures

One of the harms from alcohol is road traffic crashes caused by intoxicated drivers. The harms accrue to both drivers under the influence and to others (passengers and/or bystanders). The introduction of laws against driving under the influence of alcohol has been associated with significant declines in road traffic crashes – including both fatalities and injuries.

A total of 22 systematic reviews on drink-driving interventions were retrieved<sup>47</sup>. One literature review of high relevance was also included for consideration (Aston & Liguori, 2013). The literature investigated a range of interventions for reducing drink-driving including those that encouraged people not to drink and then drive a vehicle through Blood Alcohol Concentration (BAC) measures (including education, testing and the level at which BAC is set), mass media and designated driver programs. The reviews also covered a range of enforcement strategies (drink-driving checkpoints and random breath tests) and programs aimed at reducing drink-driving recidivism including investigating ignition interlocks, remedial programs, and license suspension.

Outside of differentiated BAC levels based on age, none of the studies segmented their results for young people. Where impacts were recorded it was at the general population level and for total reduction in drink-driving occasions, alcohol-related injuries, mortality from road accidents and drink-driving recidivism.

A meta-analysis by Waagenaar et al., (1995) using studies from 1960 to 1991 (n=125) found that all interventions assessed<sup>48</sup> were associated with reductions in drink-driving and traffic crashes, although studies were often poor quality and failed to include basic data for meta-analysis. One review using more recent data (from 1982 to 2015) also compared multiple drink-driving interventions but found strongest evidence for establishing or lowering BAC limits for drivers and drink-driving checkpoints, and weakest evidence for mass media campaigns (Esser et al., 2016). Esser et al., (2016) also note that there was limited evidence on the effectiveness of designated driver programs. Esser et al.'s findings are substantiated by the other reviews, although with the addition that there appears to be a high degree of evidence for drink-driving checkpoints and random breath tests in reducing drink-driving, and for ignition interlocks in reducing drink-driving at least in the short-term among people with criminal convictions for drink-driving. Reviews considering license suspension were split with one review suggesting there may be some impacts in the short-term, but only in some jurisdictions (McArthur & Kraus, 1999) and another suggesting license suspension had strong evidence (Elder et al., 2011).

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<sup>47</sup> (Buckley et al., 2016; Ditter et al., 2005; Elder et al., 2004; Elder et al., 2011; Erke et al., 2009; Esser et al., 2016; Fell & Scherer, 2017; Fisa et al., 2022; Goss et al., 2008; Ker & Chinnock, 2008; McArthur & Kraus, 1999; Miller et al., 2015; Morrison et al., 2003; Peek-Asa, 1999; Shults et al., 2009; Siegfried & Parry, 2019; Tay, 2005; Tippetts et al., 2005; Wagenaar et al., 1995; Wells-Parker et al., 1995; Willis et al., 2004; Yadav & Kobayashi, 2015).

<sup>48</sup> Administrative license suspension, breath tests, mandatory jail sentences, mandatory community services, mandatory license suspension, limits on plea bargaining, mandatory fines, selective enforcement patrols, regular police patrols and sobriety checkpoints.

## 9.1 Blood alcohol concentration limits

Setting an appropriate BAC level (0.00; 0.05; 0.08 or other) to limit impairment and therefore the likelihood of road crashes has been key to drink-driving policy. Four reviews assessed BAC limits. Two systematic reviews considered BAC limits among a range of strategies to address alcohol-related harm and suggested that the evidence supporting low or reduced BAC was strong (Esser et al., 2016; Morrison et al., 2003). One meta-analysis investigated the number of drink-drivers in fatal crashes after the introduction of a BAC limit of .08 g/dl in the US from 1982 to 2000, and assessed the impact of this change against other key safety laws and economic conditions (Tippetts et al., 2005). The number of drink-drivers in fatal crashes declined in 16 of 19 District of Columbia jurisdictions after the introduction of the 0.08 BAC limit, with nine of these found to be statistically significant. More pronounced effect sizes were found in states where 0.08 BAC was supported by license suspension/ revocation laws and drink-driving checkpoints (Tippetts et al., 2005). One meta-analysis of studies on lowering BAC limits found reducing the BAC limit from 0.08 to 0.05 g/dl would result in an 11.2% decline in fatal alcohol-related crashes (resulting in 1,790 saved lives in the US per year) (Fell & Scherer, 2017). One additional review also found that further reducing the legal BAC could be beneficial, as there was still an 18% higher risk of accident at 0.04 g/dl, compared to 0.00 g/dl (Fell & Voas, 2009).

In Sweden when the BAC legal limit was lowered to 0.02 g/dl there was a 10% decrease in fatal car accidents (Fell & Voas, 2009). Some countries have adopted lower limits for young people, such as 'zero tolerance' (i.e., a 0.00 g/dl for people under 21) or lower limits such as 0.02 g/dl (Fell & Voas, 2009). Studies of lower BAC limits for young people were all found to result in significant decreases in car accidents compared to when young people were under the same BAC legal limits as the general population (Fell & Voas, 2009).

One literature review assessed programs designed to train people to estimate their BAC more accurately and assess their own impairment (Aston & Liguori, 2013). There was limited success in training those experiencing alcohol addiction but some success among people who drink moderately (Aston & Liguori, 2013). It is not clear how such training might occur outside of a lab setting, although the reviewers argue that this provides some support for increased education and information for the general public on signs of impairment.

## 9.2 Mass media (drink-driving campaigns)

Three systematic reviews directly investigated the influence of mass media on drink-driving with some mixed findings. A review by Elder et al., (2004) (drawing on nine papers) noted that most mass media campaigns are either focussed on persuading individuals to take personal steps to avoid drink-driving, or to prevent others from drink-driving. Among the reviewed studies, they found that under certain conditions "well-executed mass media campaigns can contribute to a reduction in AID [alcohol involved driving] and alcohol-related crashes" (Elder et al., 2004). Another systematic review and meta-analysis by Tay et al. (2005) (n=11) found that mass media campaigns significantly reduced drink-driving and alcohol-related crashes.

However, a larger systematic review by Yadav and Kbayashi (2015) (n=19) found that the different study methodologies were so diverse that they were unable to draw any conclusions on the impact

of mass media campaigns in reducing risk of alcohol-related injuries or crashes. Studies that evaluated the impact of mass media independent of other interventions, showed reduction in alcohol-related driving injuries more consistently than when mass media was combined with enforcement activities. The pooled analysis undertaken by Yadav and Kobayashi (2015) did not find evidence that media campaigns reduced the risk of alcohol-related fatalities. One other systematic review assessing alcohol industry initiatives to address drink-driving found that mass media campaigns undertaken by industry commonly included distribution of leaflets, giveaways and fliers and so acted as a form of marketing and brand exposure (Esser et al., 2016). As such, Esser et al., (2016) found that alcohol industry involvement in information or media around drink-driving can have a negative impact, with the “vast majority of the alcohol industry’s actions” not reflecting public-health based recommendations (Esser et al., 2016).

### 9.3 Designated driver programs

Designated driver programs encourage patrons to abstain from alcohol by providing incentives for drivers (e.g. through free club entry and free non-alcoholic beverages) or by providing alternate modes of transport home such as taxis through ‘safe ride’ programs.

One systematic review investigated various designated driver incentive programs (Ditter et al., 2005) which all indicated some self-reported decreases in the number of people travelling with a drink-driver or increases in the number of designated drivers being used by patrons per night. The authors concluded: “It is apparent that consistent, concerted promotional efforts are needed to obtain and maintain small increases in the number of self-reported designated drivers” (Ditter et al., 2005). A second study looked at public health strategies based on media campaigns that encourage people to intervene and prevent someone else from driving while impaired (Buckley et al., 2016). Findings from this study were inconclusive. Neither of these systematic reviews assessed the impact of the programs on alcohol-related motor vehicle injuries. One Cochrane review on server settings for minimising harm (Ker & Chinnock, 2008) noted that an individual study of a drink-driving service reported a 15 per cent reduction in injury road crashes in the experimental area but the authors argued that there was insufficient evidence to draw any overall conclusions.

### 9.4 Law enforcement: drink-driving checkpoints and random breath testing

The most common law enforcement interventions described in the literature were drink-driving/sobriety checkpoints whereby a stationary checkpoint is set up on a road to check for impaired drivers, and random breath testing whereby police can stop drivers anywhere at any time to check for blood alcohol levels.

Evidence from a meta-analysis of drink-driving checkpoints suggested that presence of checkpoints are consistently found to reduce crashes with the largest reductions in crashes found within the first three to six months after introduction of a checkpoint program (Erke et al., 2009). The meta-analysis found a 14-17% mean reduction in crashes involving alcohol after the introduction of drink-driving checkpoints, with those studies using a control group finding smaller reductions in crashes (Erke et al., 2009). Erke et al., note that there are some differences between how checkpoints work in each country, for instance some may only stop or test drivers suspected of driving impaired. Most effective checkpoints (measured by crash reduction) were found to be those that tested all drivers

who were stopped (not just those potentially acting impaired) tested a high number of total drivers, and that were highly visible to drivers (Erke et al., 2009).

A Cochrane review by Goss et al. (2008) investigated the impact of increased random breath testing via police patrols for preventing alcohol impaired driving. While studies generally found reductions in traffic crashes and fatalities following implementation of police patrols, study quality and reporting were often poor. However, a recent overview of systematic reviews on all traffic crashes found evidence that both random breath testing and drink-driving/sobriety checkpoints were effective in reducing alcohol-related crashes (Fisa et al., 2022). One systematic review by Peek-Asa (1999) on the effects of random alcohol screening (used in the Fisa et al., review) found the same, but also that evidence suggested random breath tests may be more effective at reducing car crash fatalities and injuries than sobriety checkpoints.

### **9.5 Interventions aimed at people convicted of drink-driving offences**

One systematic review compared all interventions aimed at reducing recidivism of people convicted of drink-driving offences (Miller et al., 2015). Drawing from 40 studies, the reviewers found that the most common interventions included ignition interlocks, education, victim impact panels, intensive supervision programs and drink-driving courts.

Ignition interlocks are devices that require drivers to undertake a breath test in order for the car to start. They are installed on vehicles of people found guilty of drink-driving offences and sometimes offered as an alternative to license suspension. A systematic review by Elder et al. (2011) updated an earlier Cochrane review on ignition interlocks by Willis et al. (2004). Based on 15 studies, the reviewers found that installation of ignition locks was consistently associated with large reduction in re-arrest rates for alcohol-impaired driving, but following removal, arrest rates reverted to similar levels. Limited evidence from a few studies suggests that alcohol-related accidents also decrease while interlocks are installed in vehicles (Elder et al., 2011). The review by Miller et al. (2015) found similar results – interlock ignitions only worked as long as the device was installed in the vehicle and that the people concerned did not drive other vehicles.

An older systematic review by Wells-Parker et al., (1995) provided a meta-analysis for remedial interventions (e.g., treatment or education) for people convicted of drink-driving. The reviewers identified that remedial programs were associated with a 7-9% reduction in recidivism and alcohol-related accidents, compared to treatment as usual (e.g., license suspension or a fine).

A review by McArthur et al. (1999) evaluated the effect of ‘administrative per se’ laws (i.e., when a license can be suspended for drink-driving, when no other offences have occurred) on recidivism rates for people charged with drink-driving offences. The reviewers concluded that administrative per se laws appear to reduce recidivism in some jurisdictions but not others, however the studies were not easily comparable, and the methodological issues made it difficult for the reviewers to draw firm conclusions. When there was an observed effect on recidivism, this appeared to be most apparent in the year following license suspension (McArthur & Kraus, 1999). The review by Elder et al., (2011) on the other hand suggested that license suspension provides the strongest and most consistent evidence of effectiveness in reducing drink-driving recidivism but there is evidence that many people continue to drive unlicensed (and as noted above people with interlock devices can drive different vehicles).

Miller et al. (2015) also note that there are relatively few high-quality evaluations for other drink-driving interventions, but that the existing results support the use of intensive supervision and education in programs for people who are convicted of drink-driving offences. They also suggest that multi-component programs, i.e. those utilising a range of interventions, may work best.

## 9.6 Drink-drive countermeasures – Implications for cannabis

**Driving under the influence:** Drink-drive countermeasures have been regarded as a highly successful public health measure that has reduced alcohol-related harm – both for people consuming alcohol and for third parties.

Drink-driving countermeasures that have demonstrated effectiveness are those which legally specify a blood alcohol limit for drivers and enforce that limit through checkpoints and/or random breath tests (Esser et al., 2016; Morrison et al., 2003). Legal consequences for exceeding BAC levels (i.e. license suspension) have mixed evidence for effects on road traffic crash reductions (McArthur & Kraus, 1999). Remedial programs, which aim to provide treatment and education to people who have been convicted for drink-driving, appear to be effective at reducing recidivism rates (Miller et al., 2015).

In terms of communicating the risks of driving under the influence, mass media campaigns have not been shown to be highly effective for alcohol but may play a role in reducing the likelihood of driving under the influence. For cannabis, as a stand-alone tool, it is unlikely to be effective (and given the absence of strong evidence of cannabis-impaired driving, the factual basis for any such campaign could be questioned).

Research on cannabis and driving is still emerging, with some evidence that cannabis does impair driving, although modestly (Alvarez et al., 2021; Sevigny, 2021). The key to the success of the drink-drive countermeasures has been the ability to specify a legal limit of alcohol in a driver's blood that is associated with impairment and increases the risk of a road accident. The BAC standard (at between 0.05 and 0.08), known as *per se* laws<sup>49</sup>, developed over many years of research (both in driver simulations and on-road tests) to establish the most appropriate level at which driving is impaired. Such a program for cannabis, establishing the appropriate level of cannabis in a person's blood that is likely to impair driving performance is the key to moving forward with *per se* laws as a cannabis-driving countermeasure.

There is no strong evidence yet that a specific range THC concentration is strongly correlated with impairment (Arnell et al., 2021) and detection methods remain a pressing research priority. In Canada, however, sobriety/impairment tests have been implemented alongside a *per se* THC threshold for driving of  $\leq 2$  ng/mL and  $\leq 5$  ng/mL, despite considerable uncertainty (Peng et al., 2020; Windle et al., 2021). While this research agenda emerges (and we recommend a systematic review of all cannabis-related driving research), a parsimonious cannabis regulation would be to

<sup>49</sup> There are three different types of regulations applicable here: *per-se* laws specify a legal limit of blood concentration of a substance (and the *per-se* refers to the assumption that anyone driving above the limit is *per-se* impaired). The second option is effect-based or impairment-based driving laws which specify that police must detect impairment in driving (eg through on-road performance or roadside impairment tests). The third option is zero-tolerance, that is no cannabis may be detected in a driver.

avoid specifying a legal limit given the unknown evidence for any such limit, and provide strong advice to not drive after consuming cannabis (the “wait” policy).<sup>50</sup> One review of medicinal cannabis and driving found the driving impairments from cannabis tended to be most prominent in the two hours after reaching the ‘subjective high’, then gradually decrease in the subsequent four hours (Neavyn et al., 2014). An eight hour wait time was therefore suggested as a ‘conservative’ recommendation. However, some studies found some impairment over the 24-hours post-consumption (Neavyn et al., 2014).

There is strong evidence that the combination of alcohol and cannabis is associated with higher crash risk (Neavyn et al., 2014). Enforcing drink-driving laws (through random breath testing) is likely therefore to have an effect on driving-related crashes involving cannabis and alcohol.

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<sup>50</sup> The conservative policy option is to introduce zero limits – that is to regulate that no cannabis in blood concentrations is allowable under the law (no detectable presence of cannabis is permitted). This has been adopted in some countries (such as Australia) with significant legal and ethical criticisms and is not justified from an evidentiary point of view.



## Chapter 10: Regulating allowable places for consumption

The consumption of tobacco is banned in workplaces, educational institutions, public places and other venues (such as restaurants). These smoke-free regulations aim to protect third parties from the harms of second-hand smoke. “Eliminating exposure to second-hand tobacco smoke in all indoor workplaces, public places, public transport” is one of the five WHO best buys for tobacco control. The goal of these bans is to reduce second hand-smoke as exposure to second-hand smoke has been associated with various health outcomes, including increased rates of asthma and heart disease (Himathongkam et al., 2013). In addition, smoking bans aim to reduce opportunities to smoke and smoking prevalence. Alcohol consumption is also banned in prescribed places, sometimes as a temporary measure (e.g. alcohol-free zones in public parks on New Year’s Eve). This chapter summarises the evidence from systematic reviews about the effectiveness of these place-based consumption bans in reducing harmful consumption and reducing the harms to third parties.

We located 30 systematic reviews of smoke-free policies.<sup>51</sup> The reviews covered a range of venues where smoking has been restricted or banned, including workplaces/universities; prisons; and in cars when children are present. More commonly however, the systematic reviews do not differentiate specific venues, and provide analysis of comprehensive bans of smoking in public venues.

The reviews examined a range of outcomes from smoke-free policies, including:

- Health outcomes, such as acute myocardial infarction rates (Gao et al., 2019), asthma (Hauri et al., 2011), and respiratory diseases (Rado et al., 2021)
- Tobacco consumption behaviours e.g., (Bennett et al., 2017; Callinan et al., 2010)
- Childhood health outcomes (Wang et al., 2015)
- Perinatal health outcomes (Been et al., 2014; Faber et al., 2017)
- Young people’s smoking behaviours (Freedman et al., 2012; Heris et al., 2020).

### 10.1 Smoke-free policies and population health outcomes

Across the reviews, the most frequently recommended intervention was ‘comprehensive’ smoking bans (Bafunno et al., 2019; Faber et al., 2017; Gao et al., 2019; Hauri et al., 2011; Mackay et al., 2011; Rado et al., 2021; Tan & Glantz, 2012). Although the definition varies, it appears this tends to refer to smoking bans at multiple public venues (generally indoor spaces) such as public transport, schools/universities, workplaces, and restaurants/bars. Comprehensive smoke-free policies have been associated with improved population-level health-related outcomes. For example, in a systematic review and meta-analysis of 17 studies of smoke-free legislation, Gao (2019) reported smoking bans were associated with a statistically significant 8% reduction in population acute myocardial infarction mortality rates, and found that more comprehensive laws appear to have stronger results. In a systematic review of 24 studies of European tobacco control strategies, Bafunno et al., (2019) identified that national comprehensive smoking bans were associated with

<sup>51</sup> It is interesting that there have been no systematic reviews on (temporary) alcohol consumption bans in public places. This is a common regulatory option, particularly in association with public spaces and/or big events (like New Year’s Eve). For an example of such research from Switzerland, see (Demant & Landolt, 2013).

improved health outcomes at the population level, with one study finding smoke-free legislation was associated with a 1.6% reduction in population-wide onset of lung disease. Other health outcomes identified in systematic reviews included population prevalence reductions in acute coronary events (Mackay et al., 2011) and population reductions in ischaemic heart disease (Hauri et al., 2011). Of the reviews that reported on multiple types of public venue smoke-free policies, all stated that more comprehensive bans (i.e., bans at more venues) were associated with improved population prevalence health outcomes (Bafunno et al., 2019; Faber et al., 2017; Gao et al., 2019; Hauri et al., 2011; Mackay et al., 2011; Rado et al., 2021; Tan & Glantz, 2012).

Smoke-free workplaces have been found to be associated with improved workforce health outcomes. Tompa et al., (2016) found moderate evidence that smoke-free workplaces were associated with reduced respiratory symptoms for employees. However, in a systematic review of 14 studies, Rashiden et al., (2020) found that although workplace smoke-free policies were associated with reductions in second hand-smoke exposure, employees were still exposed. This may indicate issues with enforcement or implementation of these policies in some cases.

## 10.2 Smoking behaviours

Aside from population-based health outcomes from reduced exposure to second-hand smoke, smoke-free policies also impact on smoking behaviours of those who smoke. In a systematic review of 50 studies on smoke-free legislation, Callinan et al., (2010) found that of the studies that examined smoking prevalence (n = 15) following the introduction of smoke-free legislation, all found either a reduction or no change in smoking prevalence. Furthermore, of the studies that examined tobacco consumption (n = 13), all but one found a reduction in consumption associated with smoke-free policies. Finally, the studies that examined smoking cessation (n = 7) found either no change or some increases in cessation rates associated with a smoking ban (Callinan et al., 2010). Another systematic review of 19 studies (n = 11 examined smoke-free policies) found that comprehensive smoke-free policies were associated with reduced consumption at school and work, but no overall population reductions in consumption (Main et al., 2008).

There is considerable evidence that smoke-free workplaces can reduce smoking behaviours (Callinan et al., 2010; Fichtenberg & Glantz, 2002a; Lin et al., 2013; Tompa et al., 2016). In a review of 26 studies assessing workplace tobacco smoking bans, Fichtenberg et al., (2002a) found complete bans at work were associated with significant reductions in smoking prevalence and number of cigarettes smoked per day. Similarly, Lin et al., (2013) reviewed 18 studies of smoke-free workplaces and other sites and found significant reductions in smoking prevalence and second-hand smoke exposure. In an omnibus review of 50 studies, Callinan et al., (2010) found significant reductions in workplace second hand-smoke exposure, particularly for hospitality workers, following smoke-free policies which included workplace bans.<sup>52</sup>

<sup>52</sup> There are other workplace policies, such as alcohol and drug testing that can impact on consumption behaviour. Systematic reviews of this area include: (Cashman et al., 2009; Els et al., 2020; Osilla et al., 2012; Pidd & Roche, 2014). Although some reviews identified a potential deterrent effect from random testing, this does not appear to be a long-term effect (Cashman et al., 2009; Els et al., 2020). In relation to workplace injuries, there appears to be slightly stronger evidence for reductions associated with drug/alcohol testing, however there remain methodological issues with many of the studies (Cashman et al., 2009; Pidd & Roche, 2014). One review of 57 studies evaluated workplace interventions targeted at individual people who smoke,

Bans on smoking in schools/university settings have also been shown to impact on smoking behaviour. We located two systematic reviews looking at smoking bans at schools and universities, which demonstrated strong acceptance of smoke-free policies as well as reductions in smoking behaviours (Bennett et al., 2017; Lupton & Townsend, 2015). In a review of 11 cross-sectional and longitudinal studies, Bennett et al., (2017) found that university smoking bans had mixed results on smoking behaviour in the cross-sectional studies. However, in the longitudinal studies there were reductions in both smoking behaviour and pro-smoking attitudes, suggesting a more long-term effect of these restrictions. Smoke-free policies also appear to be supported by both university students and staff. Lupton (2015) reviewed 19 studies of university students' and staff's perceptions of smoke-free policies and found 58% of students and 68% of staff supported the policies. Two of the included studies assessed smoking behaviours and both found significant reductions in prevalence of smoking in the one to three years following the introduction of the smoke-free policies (Lupton & Townsend, 2015).

Research from smoking bans in prisons found that they may reduce smoking behaviours in the short-term, but this does not appear to have long-term efficacy (de Andrade & Kinner, 2017; Kennedy et al., 2015). Furthermore, issues with enforcement and implementation may inhibit the effect of the bans in carceral settings (de Andrade & Kinner, 2017; Kennedy et al., 2015).

Smoke-free policies can also impact on young people's smoking initiation. Two systematic reviews were identified that examined smoke-free policies association with initiation of smoking for young people (Freedman et al., 2012; Heris et al., 2020). In a systematic review of 27 studies, Freedman et al. (2012) found smoke-free policies reduced the number of young people who initiated smoking tobacco. In a systematic review exploring factors associated with smoking behaviours amongst Indigenous young people, Heris et al., (2020) found smoke-free spaces (including in the home) were a protective factor for risk of smoking.

A final omnibus systematic review was identified that explored qualitative studies on young people and the impacts of tobacco control policies, including smoke-free legislation. Papanastasiou et al., (2019) reviewed multiple studies which explored young people and smoke-free legislation. The reviewers identified that smoke-free policies may serve to change the perceptions of smoking amongst young people and encourage young people to want to quit smoking if it is more difficult to smoke in public places such as bars and restaurants. Furthermore, the reviewers suggest that comprehensive smoke-free policies may act to prevent young people who socially smoke from transitioning to more regular smoking.

Turning to health equity, Brown (2014a) reviewed one study that found smoke-free legislation was associated with reductions in smoking prevalence for 14–18-year-olds and high SES young people, but not associated with any change in smoking prevalence for low SES young people, which may indicate an increase in health inequities.

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and workplace environment policies aiming to reduce/prevent smoking (Cahill & Lancaster, 2014). Group behaviour therapy, individual counselling and cessation medications were found to be effective in the workplace to help employees stop smoking. However, self-help methods, support from friends, family and workmates, relapse prevention programmes, environmental cues, or comprehensive programmes targeted at high-risk behaviours were not found to be effective at helping people stop smoking. Workplace incentives showed mixed results on cessation behaviours.

### 10.3 Childhood health outcomes

Children's exposure to second-hand smoke is associated with negative health outcomes, including asthma (Wang et al., 2015). Two systematic reviews have evaluated the impact of comprehensive smoke-free policies on children's health outcomes, generally finding significant improvements. Been et al., (2014) found smoke-free policies were associated with significant reductions in childhood asthma presentations at hospitals, whilst Faber et al., (2017) found reductions in both asthma and respiratory tract infection hospital attendances for children.

The evidence of smoke-bans on child health equity is mixed. In a systematic review of 38 studies (n = 12 on smoke-free policies), Brown (2014a) found smoke-free legislation tended to either have more of an effect on higher SES groups or equal effect by SES when looking at children's exposure to second-hand-smoke. This appeared to be related to the source of second-hand smoke exposure for children, in particular, whether their main source was in the home or in public places (Brown et al., 2014a). In contrast, a systematic review of eight studies, Nanninga et al., (2019) found smoke-free policies do not appear to lead to 'inequality widening' by SES, suggesting this may be an effective policy from a health equity perspective.

Although there had been some suggestion that public smoking bans may encourage smoking within the home, a meta-analysis of 15 studies found most studies showed exposure to smoke in the home for children decreased after smoking bans, with only two studies showing an increase (Nanninga et al., 2018).

We did not locate any systematic reviews that specifically evaluated smoking bans in cars when children are present. However, individual studies have demonstrated that smoking while driving can lead to unsafe levels of respirable suspended particles, even if windows remain open (e.g. Rees & Connolly, 2006). As a result, it has been suggested that smoking while driving with children present should be banned.

Two systematic reviews identified impacts of smoke-free policies on perinatal outcomes (Been et al., 2014; Faber et al., 2017). Both systematic reviews found smoke-free policies were associated with reductions in preterm birth, however there were mixed findings on birthweight and perinatal mortality outcomes (Been et al., 2014; Faber et al., 2017).

### 10.4 Strategies to make smoke-free policies more effective

Two reviews considered strategies to make smoke-free policies more effective (Wynne et al., 2018; Zhou et al., 2016). Wynne et al., (2018) suggested signage, enforcement officers, penalties, and increasing awareness may assist with increasing the effectiveness of smoke-free policies. Zhou et al., (2016) suggested ensuring convenient designated smoking areas may assist with compliance.

It is worth noting one additional review assessed the quality of studies evaluating the economic impacts of smoke-free policies in the hospitality industry (Scollo et al., 2003). Of the 97 studies examined, Scollo et al., found that all those that concluded a negative impact of smoking bans on the economy were funded by the tobacco industry, and 94% of the tobacco industry funded studies reported a negative impact. Compared to the studies that were not supported by the tobacco industry, tobacco-funded studies were also significantly more likely to not be peer reviewed (Scollo

et al., 2003).

## 10.5 Regulating allowable places of consumption – Implications for cannabis

**Smoke-free policies:** Smoke free policies for tobacco (given the health harms of both smoking and exposure to second-hand smoke) has been a highly effective public health measure for both decreasing tobacco consumption and protecting the health of third parties (Callinan et al., 2010; Faber et al., 2017).

Comprehensive smoking bans have been associated with reductions in smoking behaviours, including smoking prevalence and quantity of cigarettes smoked (Callinan et al., 2010). In addition, there have been considerable positive health outcomes from comprehensive smoke-free policies, such as reduced heart and lung disease (Faber et al., 2017). Comprehensive smoking bans have also been associated with reduced respiratory infections, asthma, and second-hand smoke exposure for children, as well as reduced smoking initiation in young people (Been et al., 2014; Freedman et al., 2012).

While evidence supports smoke-free policies at specific venues such as workplaces and universities, most reviews noted that the more comprehensive the bans, the better the outcomes (Bafunno et al., 2019; Faber et al., 2017; Gao et al., 2019; Hauri et al., 2011; Mackay et al., 2011; Rado et al., 2021; Tan & Glantz, 2012). Prison smoke-free policies appear to be less effective, possibly due to enforcement and implementation (de Andrade & Kinner, 2017; Kennedy et al., 2015). One review of workplace smoke-free policies also suggested there may be issues with implementation in some cases (Rashiden et al., 2020).

One review identified that more widespread use of cannabis may be a barrier to tobacco smoking cessation, due to the mixing of cannabis and tobacco (Papanastasiou et al., 2019). Therefore, restrictions on public consumption of cannabis may also assist with reducing tobacco smoking.

The implementation of the Framework Convention on Tobacco Control with its ban on public consumption of tobacco could be simply extended to cover cannabis (Steinberg et al., 2019). In Canada, most provinces ban cannabis consumption where tobacco consumption is prohibited (Shanahan & Cyrenne, 2021). The face-validity of regulations banning cannabis smoking in public places relies on evidence of harms from second-hand cannabis smoke. Some people mix their cannabis with tobacco when smoking, and in those cases, the second-hand tobacco smoke is well-known to be toxic to third parties (Carreras et al., 2019). There is also evidence of second-hand cannabis smoke toxicity (independent of tobacco) (Chatkin et al., 2019; Holitzki et al., 2017). The research on whether there are second-hand harms from vaping cannabis is nascent (Cone et al., 2015; Wilson, 2016)

Although it has been suggested that public smoke-free policies could increase smoking in the home (with children present), this has not eventuated with tobacco (Nanninga et al., 2018). Whilst it is unclear whether the same would apply for cannabis, ensuring public venues are free from second-hand cannabis smoke, particularly when children are present, should remain a priority.

Further considerations may be whether other non-inhalation forms of cannabis consumption is allowable in public (such as edibles). It may require considering the intention of the policies – is it

to reduce consumption (as is one of the intentions of tobacco smoking bans) or to reduce the harms associated with second hand-smoke exposure? If the intention is to reduce consumption, placing bans on consuming other forms of cannabis may be considered. However, if the primary goal is to prevent harms to third parties, then evidence of such harms would be required to justify such a policy.

## **PART 3 CONCLUSIONS**

## Chapter 11: Synthesis

### 11.1 What works best: alcohol and tobacco?

Taking a bird's eye view across both alcohol and tobacco, and assessing the evidence for effective regulations, the most effective measure for both alcohol and tobacco with the strongest level of empirical support is price/taxation measures. In all cases, higher prices to the consumer discourage consumption. For tobacco, the implementation of smoke-free legislation has had significant positive public health effects and ranks second in terms of evidence of reduced consumption and harm to others. For alcohol, the second most effective regulation in reducing harms is drink-driving legislation and notably breath testing of drivers. The third-ranked most effective regulation for both alcohol and for tobacco is curtailment (or banning) of advertising. The empirical evidence shows a strong relationship between higher consumption (of both alcohol and tobacco) in association with exposure to advertising (across all forms).

At this point, the two substances diverge: there is strong evidence for retail sales restrictions for alcohol, notably lower outlet density, reduced hours and days of week sales (such evidence is not so readily available for tobacco). Health warnings (including graphic displays on packaging) for tobacco have shown impacts on awareness, initiation and intentions (health warnings for alcohol to date have not shown significant effectiveness in reducing consumption). Minimum purchasing age research is complicated to interpret but has strong face validity (people under 18 years of age consume less alcohol and tobacco than those aged over 18 years of age). Government monopoly of the market has some empirical support at the retail and production level but evidence at the wholesale/manufacturer level is overall lacking, despite most experts arguing that a government monopoly across both manufacture and retail is the least harmful approach. Quantity purchase limits (alcohol only) has historical support from one country (Sweden) but otherwise limited evidence from our current times. Mandatory server training has little empirical support to date. Limiting the allowable level of the psychoactive ingredient (ethanol and nicotine) has not been shown to be an effective regulatory strategy, but this may be because it has not been implemented. Lower-harm products (such as e-cigarettes) remain controversial within the context of tobacco control. Finally, there is strong evidence for the ways in which a for-profit industry influences the regulatory approach: indeed, perhaps the most important finding across all this work is that mechanisms to control industry and limit policy influence are paramount to successful alcohol and tobacco control.

These 'bird's eye' conclusions are supported by 'policy index' research (Moxham-Hall & Ritter, 2017). Policy indexes aim to scale regulatory alcohol or tobacco policies for their effectiveness in order to compare different jurisdictions' approaches to alcohol regulation. Five different alcohol policy indexes have been developed, which cover between 10 and 29 different policy measures. Pricing and taxation policies were consistently rated as highly effective, in the scales that included these policies (Brand et al., 2007; Karlsson & Österberg, 2007; Naimi et al., 2014). Drink-driving restrictions including legal blood alcohol concentration limits and random breath testing were also consistently rated moderate to high in effectiveness across the indices (Brand et al., 2007; Karlsson & Österberg, 2001, 2007; Korcha et al., 2018; Naimi et al., 2014). Policies that regulated the distribution of alcohol were also rated moderate to highly effective across the scales, specifically government monopolies, outlet density, and hours of sale restrictions. For tobacco, a tobacco control scale ranked the following regulations in order of effectiveness: tobacco pricing, smoke-free workplaces and other



smoke-free public sites, public information campaigns, bans on advertising and promotion, large and direct health warning labels, and individual treatment for smoking cessation (Feliu et al., 2020; Joossens & Raw, 2006).

While the above ‘bird’s eye’ view summarises the effectiveness of individual measures, in reality measures are not introduced individually, and what is of most interest is the relative effectiveness when regulatory measures are mixed together. This is a challenging research task because there are no standardised outcome measures, and study designs and study quality vary greatly (with many reviews having low quality ratings for individual studies) (Martineau et al., 2013). One alternative research approach to assessing relative effectiveness of a mix of regulations is to use policy simulation modelling. Policy simulation modelling combines multiple different regulatory levers to predict the health outcomes (and sometimes the cost-benefits) of a mix of regulatory levers. In one such policy simulation model for tobacco control, the authors included six policy levers: taxation, youth prevention, smoke-free policies, mass media campaigns, marketing/advertising restrictions, and product regulation (Feirman et al., 2017). The modelling results demonstrated both the independent and combined effects of these interventions on decreasing projected future smoking prevalence. The pricing/taxation effects were the most robust. Another tobacco control model, SimSmoke (Levy et al., 2006; Levy et al., 2002) includes taxation, smoke-free legislation, marketing bans, health warnings, media and educational campaigns, cessation treatment, and youth access restrictions. Across all applications of the model, taxation (price controls) produces the greatest effect on smoking prevalence; see for example the cross-country European application (Levy et al., 2014). The equivalent in the alcohol domain is the Sheffield Alcohol Policy Model (Brennan et al., 2016; Brennan et al., 2015) which covers price, availability, and advertising controls. The Sheffield model has mainly been used to date to model the effects of minimum unit price of alcohol.

The above summary of regulation measures and their relative effectiveness is largely with reference to total population consumption and does not provide analysis for specific population groups or types of harm. We summarise this next.

## 11.2 Young people, high risk consumption and harmful use, and third party harms

As detailed in Chapter 1 (section 1.4), the Federal Office of Public Health specified four areas of particular interest: preventing underage use; preventing high risk consumption; reducing harms amongst those consuming alcohol and/or tobacco at high risk levels; and protecting third parties.

### 11.2.1 Preventing underage use

Preventing underage use of alcohol and tobacco is primarily achieved through regulations which prohibit sales of alcohol or tobacco to minors (and through mass media and schools-based education programs – both of which are out of scope for this review as they are not structural regulatory measures).<sup>53</sup> Prohibiting sales to minors needs to be matched with compliance checking and an enforcement regime. Methods for assessing compliance with regulations regarding sales to minors include test purchases (see section 8.4) but research evidence about differential effectiveness of penalties is lacking. There are no systematic reviews in this area. One strong individual study (see section 8.7) found that enforcement checks for sales to minors resulted in immediate improvement

<sup>53</sup> We also note that the evidence demonstrating effectiveness for both of these is somewhat slim.

in regulatory compliance, however this effect had decayed entirely for off-premise alcohol purchases three months later (Wagenaar et al., 2005a; Wagenaar et al., 2005b).

While prohibiting sales to minors is an obvious regulatory lever, other regulatory approaches discussed across this report have also been shown to reduce youth consumption. Stockings et al. (2016) reviewed measures to prevent or reduce youth consumption of alcohol and tobacco. They found that pricing measures were the most successful measure to reduce alcohol use and harms in young people. For tobacco, Stockings et al. (2016) found good evidence of pricing measures in reducing problematic use in youth but inconclusive evidence about preventing use overall (see also Mannocci et al., 2019). The reviewers also found strong evidence for the effectiveness of public consumption bans for tobacco but insufficient evidence for alcohol. For the various measures concerned with availability or sales restrictions, young people's alcohol or tobacco use was not shown to be affected by these control measures.

As discussed in section 7.1.3, young people's exposure to alcohol advertising and promotion increased the likelihood of intended and actual consumption of alcohol (Buchanan et al., 2018; Gupta et al., 2016; Scott et al., 2017) as well as heavier consumption (Anderson, de Bruijn, et al., 2009; Bryden et al., 2012; Jernigan et al., 2017). Despite the strong evidence of the relationship between advertising exposure and consumption, the parallel evidence of the effectiveness of advertising bans (whether full or partial) is less strong. Stockings et al. (2016) found insufficient evidence in their systematic review for banning or regulating alcohol advertising; but strong evidence for banning or regulating tobacco advertising to reduce youth tobacco consumption.

There was some suggestion in the literature that social media may be more influential on adolescent alcohol use than traditional media exposure due to the potential influence of networks (friends, families etc) sharing information, and product content which blurs the boundary between marketing and online peer activities (Buchanan et al., 2018; Noel et al., 2020). This suggests that to successfully prevent underage consumption (of either alcohol or tobacco), strong regulation of social media platforms will be required.

The availability of flavoured electronic cigarettes and vapes, and the range of flavours offered have been found to increase their appeal and use among young people (Feirman et al., 2016; Huang et al., 2017; Kowitt et al., 2017; Zare et al., 2018) (see chapter 6.2.3). In response, flavoured ENDS products have been banned in many different countries and jurisdictions. There is some limited evidence from these areas of short-term success in reducing use of flavoured products in the total population where such bans were accompanied by enforcement and retailer compliance (O'Connell & Kephart, 2022; Rogers et al., 2022).

### 11.2.2 Preventing high-risk consumption and harms

The literature on the effectiveness of regulatory measures to address heavy drinking, or heavy episodic drinking, is instructive for considering which measures may reduce harmful or dependent cannabis consumption.

Market structures that include government monopoly appear to be associated with lower alcohol-related harms, including alcohol-related hospitalizations, psychosis, injuries and accidents, and liver cirrhosis (Ramstedt, 2002; Stockwell et al., 2018). As detailed in Chapter 4 (section 4.3.1) higher prices tend to reduce heavy drinking (and those who experience harms from their alcohol). People

who drink more heavily may have lower elasticity of demand, but the quantity reductions in alcohol consumption with increased prices for someone who is drinking heavily represent positive health impacts. At a population level, higher prices are associated with reductions in mortality and morbidity including violence, traffic accident fatalities, drink-driving, rates of sexually-transmitted diseases (STDs) and risky sexual behaviour, other drug use and crime (Wagenaar et al., 2010). Another consideration from the alcohol literature is the research on 'cheap' forms of alcohol. Cheap alcohol is consumed at higher quantities amongst those who are alcohol dependent. Regulations around minimum unit price attempt to deal with the cheaper forms of alcohol, and hence have the potential to impact on dependent use (Boniface et al., 2017). While not every review found conclusive results (Nelson & McNall, 2017), the price effects on harmful consumption have been shown across many reviews, and the relationship between price and harm is well-established.

For alcohol, regulating outlet density is associated with a reduction in violence and injury (Campbell et al., 2009; Popova et al., 2009) (see section 8.1). In addition, restricting alcohol trading hours is effective harm reduction: restricted hours of sales can reduce injuries, hospital presentations, homicides, and crime (Hahn et al., 2010; Sanchez-Ramirez & Voaklander, 2018).

Some forms of nicotine consumption are more harmful than others – notably it depends on the route of administration, and the presence of co-occurring chemicals and other substances. The harms from the many chemicals associated with cigarettes (and tobacco) can be mitigated by consuming nicotine through snus, vaping or other electronic nicotine delivery systems. These are all demonstrably less harmful than smoking (see section 6.2). As such ENDS represent an excellent harm reduction strategy for tobacco that could be readily applied to cannabis, albeit a contested one (some argue that ENDS act as a gateway to cigarette use but there is no conclusive evidence to support this).

Exposure to tobacco or alcohol advertising is associated with heavier patterns of consumption (Finan et al., 2020; Scott et al., 2017; Smith & Foxcroft, 2009), and restricting and/or banning advertising has strong face validity. In their systematic review, Robertson et al., (2015) found that point-of-sale advertisements can affect those trying to cease smoking, with studies demonstrating a link between exposure to such advertising and an increase in impulse purchasing and urges to purchase tobacco products. While screening and brief interventions, and treatment for alcohol or nicotine dependence were outside the scope of this report, we note the extensive literature on the effectiveness of both screening and treatment to reduce harmful levels of consumption in those who are experiencing problems (for example Brose, 2015; Moyer et al., 2002; Phimarn et al., 2022; Prochaska et al., 2004; Rigotti et al., 2022; Stockings et al., 2016; Zakiyah et al., 2021). There have also been a number of non-treatment interventions focussed on individuals with alcohol use disorder, such as 'banned drinker registries' (Room, 2012). As this review is focussed on the structural regulatory level, individualised control measures, such as 'banned drinker registries' were outside our scope.

Drinking environments (such as licensed venues) can have attributes that increase harmful alcohol consumption and attributes that decrease harmful alcohol consumption. Aside from the regulations governing these venues (see chapter 8 retail regulations), there are other environmental factors shown to impact. In a systematic review of 34 studies (across 9 countries), Hughes et al., (2011) found that a permissive environment, cheap alcohol availability, poor cleanliness, crowding, loud music, a focus on dancing and poor staff practice can contribute to increased alcohol-related harm

(see also Jones et al., 2011). Despite these two reviews, there is surprisingly little meta-analytic reviews of specific strategies to reduce harms in drinking environments.

### 11.2.3 Protection of third parties

The final population of interest is the general population who may experience harms from other people's alcohol and/or tobacco consumption. For alcohol this includes violence, injury, and road accidents; for tobacco this includes exposure to second-hand smoke.

Drink-driving countermeasures and smoke-free places have been the two key interventions to address protection of third parties from harm. In addition, reduced density of drinking outlets have also been shown to reduce violence associated with drinking areas.

One key feature of tobacco policy is the success of the 'harm to others' framing. Second-hand smoking harms opened up an avenue for policy reform that introduced smoke-free workplaces, smoke-free recreational settings and the like, premised on protecting the 'innocent' population members from the ill-effects of second-hand tobacco smoke. This gave significant impetus to the lowering of smoking rates across western nations.

While cannabis smoked with tobacco will produce the same harm to third parties, there is limited evidence to date about cannabis smoke alone. Third party harms from vaping are unknown (and for edibles it is also unknown). Careful mapping of harms to others from cannabis consumption is required in order that regulations that prohibit consumption in prescribed places is driven by a strong evidence-base.

As we note (see Chapter 10), part of the rationale for prohibiting tobacco consumption in public places has been that it encourages cessation amongst people who smoke (that is, its goal extends beyond solely protecting third parties). If the goal is to minimise cannabis consumption at a population level, then banning consumption in public places not only reduces consumption, it also sends social norms signals about the acceptability of cannabis consumption.

## 11.3 Vulnerable populations and equity considerations

Some population groups are more susceptible to higher consumption and/or greater harms from alcohol and tobacco, including people of low socio-economic status, sexual and gender minorities (LGBTIQ+), and ethnic and racial minorities. Most regulatory policy levers fail to account for differential impacts on vulnerable populations. Cannabis regulation provides the opportunity to address this from the start of a regulatory regime. Given the evidence that ethnic and other minorities have greater exposure to and risk from alcohol and tobacco (for example, Baskerville et al., 2017; Grier & Kumanyika, 2008) there is no reason to think this will be different for legalised cannabis.

Equity from a regulatory perspective includes whether regulations have significantly more positive effects on marginalised or deprived populations; whether regulations increase health equity (that is improve health status of those more marginalised/deprived); whether regulations increase economic equity (that is address poverty considerations); and whether regulations increase social (and justice) equity (that is address social conditions). We can see some tensions here: take the example of taxation policy (see Chapter 4) - while higher prices may improve health equity (due to

their larger impact on poorer populations), they may at the same time increase economic inequity (poorer people least able to afford higher prices).

Equity is an important consideration for all health policies (Lal et al., 2018). For cannabis regulations, a review of the equity considerations associated with each regulatory measure would represent best practice in health policy design. There are three separate questions related to equity considerations: Does cannabis legalisation resolve existing inequities created through prohibition? Do new cannabis regulations create new inequities and/or perpetuate existing ones? Can new cannabis regulations redress past inequities? None of these questions have straightforward answers (Kilmer et al., 2021).

Focussing on the ways in which different regulations may increase or decrease equity, we note that alcohol and tobacco control policies have been very slow to embrace an equity lens. This is despite the well-known fact that low socio-economic groups carry a greater burden of alcohol and tobacco use and harms (Grilo et al., 2021). A number of reviews consider alcohol and tobacco regulations from an equity perspective (Brown et al., 2014b; Hill et al., 2014; Jain et al., 2020; Lorenc et al., 2013; Main et al., 2008; Nanninga et al., 2019; Thomas et al., 2008). In each case, they find trade-offs: some regulations increase health equity, others have no effect, and in some cases regulations decrease equity (in the case of distributional or economic equity).

There is strong evidence of alcohol and tobacco industry marketing to racial minorities and in poorer neighbourhoods (Grier & Kumanyika, 2008). Retailer non-compliance with marketing regulations was significantly associated with racial/ethnic neighbourhood composition (Higgins et al., 2019). These findings mirror another systematic review which found significant disparities in tobacco marketing by tobacco retailers for neighbourhoods with more Black residents (Lee et al., 2015). For cannabis regulation, this suggests attention to both the location of retail outlets, and strong enforcement of regulations in poorer neighbourhoods. There is already evidence of equity-related issues with reference to cannabis retail locations (Firth et al., 2020; Firth et al., 2022; Rhee et al., 2022; Unger et al., 2020). Researchers have shown that neighbourhoods with cannabis retailers (both licensed and unlicensed) had higher proportions of Hispanics, African Americans, and residents living below the poverty level {Firth, 2022 #420; Unger, 2020 #421}. This suggests careful attention to equity in cannabis licensing that does not set up a regulatory system that further perpetuates inequity. It also links to regulating outlet density, and special attention to outlet density in poorer neighbourhoods (see section 8.1 on outlet density).

Cannabis regulations can be designed to specifically address past inequity. In such an attempt, some US states have introduced so-called “equity licences”, that is licenses to sell cannabis are provided to those who had previously participated in the black market and were from poorer neighbourhoods. For example in 2018, California’s Cannabis Equity Act was signed into law, which funds local jurisdictions to develop programs that reduce barriers to licensure, and increase employment opportunities in the cannabis industry for people disproportionately impacted by prohibition. However, as detailed in a New York Times story<sup>54</sup> (March 2022), this approach to address equity has proven difficult for several reasons including that people are not experienced retail operators; as a cash-only business (due to federal laws), there is a high risk of crime and theft which brings very high security costs to the legal stores; and the industry is not profitable (as quoted “[I] did better selling

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<sup>54</sup> <https://www.nytimes.com/2022/03/15/business/cannabis-dispensaries-oakland.html>

weed on the street”). Despite the policy intention to support Black communities to establish legal cannabis businesses, this news story suggests significant problems in practice. In addition, greater outlet density in poorer neighbourhoods is likely to contribute to higher consumption and therefore higher harms (Berg et al., 2018).

Another important consideration is gender and the extent to which men and women are differentially responsive to alcohol and/or tobacco control policies, especially given gender differences in consumption rates (Higgins et al., 2015). There is limited research evidence on how the regulation of alcohol and/or tobacco affects women differently from men (Fitzgerald et al., 2016). The systematic review literature is suggestive however, of gender differences, for example that men are more impacted by outlet density regulations; and that women may be more price sensitive (Fitzgerald et al., 2016; Nelson, 2014). However, given the limited strong evidence, implications for cannabis regulations for men compared to women cannot be drawn.

Regulatory impact assessments<sup>55</sup> are a tool to assess the positive and negative effects of proposed cannabis regulations. Taking equity into consideration in these regulatory impact assessments is crucial to being aware of potential intended and unintended effects on vulnerable and/or marginalised populations.

#### 11.4 Some other important considerations for cannabis regulation

Beyond addressing each of the multiple regulatory approaches for cannabis, as covered in Chapters 3 through 10, and thinking through the specific population groups and equity (as above), there are some broader considerations in translating the evidence from alcohol and tobacco to cannabis. We canvass these briefly here.

##### 11.4.1 Prevalence and stage of epidemic

The underlying population prevalence matters for the choice and relative emphasis between regulatory control measures. Effective regulation differs for low prevalence versus high prevalence substances. The current prevalence of use for Europe differs significantly between the three substances (last month consumption: alcohol = 60%; tobacco = 18%, cannabis = 4%; see Table 1). The widely different prevalence rates speak to the social acceptability and norms surrounding regular alcohol, tobacco, and cannabis consumption.

The stage of an epidemic is another important issue to consider when applying regulatory strategies (Caulkins, 2007). Prevention strategies are most important early on when prevalence is low; harm reduction and treatment strategies are more important later, when prevalence is higher. This would suggest that given the current low population prevalence of cannabis use relative to tobacco and alcohol, the most important regulations will be those that support the prevention of commencement of consumption. This means a focus on advertising restrictions, retail sales regulations, public consumption bans and price. All these mechanisms reduce the acceptability and availability of cannabis and contribute towards lower population prevalence of consumption.

Lower population prevalence of consumption is key to alcohol control policies. In this work for the Swiss government, we recognise that the summary of systematic reviews of alcohol regulations are

<sup>55</sup> Also referred to as Health Impact Assessments

predominantly focused on regulations that reduce total population consumption. As noted in Chapter 2, the most common outcome measure used in alcohol (and to a lesser extent tobacco) control research is total population consumption, rather than high-risk or harmful consumption. Regulatory measures are regarded as effective if they reduce total population consumption. This is an assumption that should be empirically interrogated for its application to cannabis.

The history of alcohol policy is very instructive for understanding the importance of this issue. Alcohol policy has seen two distinct phases: up to the 1950s, the focus was on ‘alcoholism’ and those individuals who were ‘alcoholic’. Policy focussed on correcting this deviance, providing treatment, care and support for people afflicted with alcoholism. The population consumption of alcohol was irrelevant for dealing with ‘alcoholics’. In that sense there were two categories of people: those who drank socially unproblematically and people who drank problematically. This is mirrored in the drug policy discourse around recreational (non-problematic) use versus problematic use. Alcohol policy historically, concerned itself solely with the ‘alcoholics’. In the 1960s and 1970s, as summarised by Room & Livingston (2017) there was a paradigm shift. The work of French researcher Sally Ledermann, and Norwegian Ole-Jorgen Skog, empirically demonstrated that the “levels and patterns of drinking in the population as a whole affected the rates of drinking-related problems in that population” (Room & Livingston, 2017, p. 11).

This ‘distribution of consumption’ held across countries and populations, bringing with it the shift to the then “new” public health approach: policy concerned itself with the total population consumption, and policy efforts focussed on reducing population consumption of alcohol. While this is the prevailing policy approach globally, it is worth noting that it is not without controversy. Vested interests (such as the alcohol industry), cultural inequity (such as wealthy white people consuming alcohol moderately), and the cultural desire to “other” people who experience alcohol (or drug) dependence, have worked against the wholesale acceptance of the ‘total consumption model’ and the associated public health approach of focussing on population level consumption. As Room and Livingston (2017) note, this focus on population level consumption “remains politically contentious, since its implications for policy are inconvenient for important economic interests and conceptual frames” (p. 18). Indeed the WHO “best buys” for alcohol are premised on the effectiveness of measures to reduce overall population consumption. This speaks directly to the goals for cannabis regulation. Assuming the population distribution of cannabis consumption follows the same pattern as alcohol (that is higher total population consumption is associated with greater harms), then public health focussed cannabis regulation would be concerned with reducing total population prevalence.

#### 11.4.2 Market considerations

The stage of market maturity is another important consideration. The majority of the alcohol research is within the context of a privatised market. There are key differences in regulatory opportunities for a newly established market that has not previously existed compared to an established market.<sup>56</sup> Regulations can become much more difficult to implement once a market has been established. In addition to thinking about the market maturity, there are other questions about the number of market players – whether multiple small suppliers and retailers or a few large (multinational) companies (oligopoly). In the main, there has been a preference to avoid oligopolies, as seen in the USA move to a three-tiered system which we understand was motivated by the desire to reduce the power and influence of any one (or small numbers) of big private players – in order to

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<sup>56</sup> Noting that there are already private interests – medicinal cannabis suppliers and retailers.

increase regulatory controls. This is a different context to the current cannabis situation, where arguably there are attempts to try and consolidate the cannabis industry into fewer players to increase the level of regulatory control.

Additionally, there are not the constraints on formulating national policy and configuring markets for cannabis as there is/has been on alcohol and tobacco, due to the lack of free trade agreements in this area. For instance, rules of the European Economic Area resulted in Norway abolishing their alcohol monopolies (Örnberg & Ólafsdóttir, 2008) and elsewhere governments have spent considerable sums fighting industry interests in national and international courts to implement tobacco plain packaging. This would not be the case with cannabis plain packaging regulations.

#### 11.4.3 Regulating the black market for public health outcomes

Finally, much has already been written about how to structure a legal market that has the potential to reduce the size and influence of the black market. Indeed, in some countries, the legalisation of cannabis has been explicitly tied to the policy goal of reducing the black market (for example Uruguay). For this project however, the concern is not with the size of the black market and the ability of a legal regulated market to reduce the black market; rather our task here is to examine the effective regulatory levers from alcohol and tobacco for public health outcomes. This then generates some important questions about the relationship between the black market and public health outcomes.

We think there are two overarching questions: 1. Are there better health impacts in a legal cannabis market compared to an illegal cannabis market? 2. Is the presence of the cannabis black market linked to potential iatrogenic or limited effects of some policy levers/regulations? In relation to the first question, while legal markets may provide accurate consumer information (of limited effectiveness - see chapter 5) and quality control of the product (which for cannabis is not a definitive issue regarding harms), the legal market will most likely increase population prevalence of consumption. Whether that in turn increases cannabis-related harms is yet to be determined (see above discussion of total consumption model), especially in light of the significantly lower harm profile of cannabis compared to alcohol, although there is some very limited research that synthetic cannabinoid use may be reduced with cannabis legalisation (Klein et al., 2022). In relation to the second question, the presence of the cannabis black market does reduce the potential of some regulatory measures to operate with their full force – the most pertinent example is price. If there were no black market for cannabis, then price-setting could be undertaken such that it minimises consumption. These are currently matters of speculation (see section 11.6 below for research gaps) but we think it is useful to keep them in mind when discussing regulations from a public health perspective.

### 11.5 Limitations

Our review focussed on English-language published systematic reviews and meta-analysis. There are thousands of empirical studies of alcohol and tobacco and their regulation which examine public health outcomes. While randomised controlled trials are unusual (because regulatory features mostly cannot be randomised, just observed) other methods are employed to ensure valid comparisons between a regulatory intervention and a suitable comparison or control. These include cohort studies, case control studies, time-series analyses, and cross-sectional studies. Systematic reviews represent the highest level of evidence, and they overcome the potential confounds in any



one individual study. Focussing on systematic reviews also made the three-month project manageable. The limitation is that for some regulatory interventions there were no systematic reviews (to date), or only one or two systematic reviews available. We moderate our conclusions in these circumstances, and in some cases, we cite selected strong individual empirical studies as indicative of effectiveness.

We did not conduct an analysis as applied to the Swiss context specifically – there will be particular cultural, social, and normative aspects in Switzerland where some of the English-language literature is less likely to be applicable; and where the regulatory options need to be shaped by local conditions.

Our work focussed on regulatory measures at the population level – not interventions directed at individual behaviours. We know that treatment works to reduce harmful consumption. This should not be forgotten in establishing systems for the legal regulation of cannabis. Investment in treatment services, especially outpatient counselling services are vital to deal with the potential growing demand from cannabis use disorders. While the data from places that have legalised cannabis is still emerging, there appears to be evidence of increased prevalence of cannabis use disorders in association with legalisation (Leung et al., 2020; Rivera-Aguirre et al., 2022; Smart & Pacula, 2019).

There are some areas which time and resources did not permit coverage of. In the harms to third parties, our review did not include synthesis of the evidence about foetal alcohol spectrum disorder, and the harm to fetuses from alcohol consumption (Jacobsen et al., 2022). Research on prenatal cannabis use disorder has shown adverse neonatal outcomes which are moderated by race/ethnicity as well as co-consumption of tobacco (Shi et al., 2021). Another area that we were not able to cover is home brewing/home distilling. The extent of home brewing/self-supply of alcohol will vary by country/region. We did search for research on this topic and any studies of the impacts of different arrangements to regulate home brewing, but found an absence of research.

## **11.6 Research gaps**

As noted elsewhere, for this work we relied on systematic reviews and meta-analyses because these represent the highest level of evidence. In order to build the evidence-base, individual studies are required which then are subject to systematic review and/or meta-analysis. There are several areas where more research evidence is required, and specific gaps that would assist in understanding how to more effectively regulate cannabis.

Most of the existing research on market structures comes from historical studies and opportunities to analyse natural experiments, when a region or state shifts its market structure. These designs cannot be planned, but in the case of cannabis there is an opportunity to deliberately set out a research agenda around market structures to study the impacts of differing ownership arrangements. There is no comparative outcome research on not-for-profit models. All the research to date has been descriptive in nature and while valuable in its own right, this does not provide evidence one way or another about whether not-for-profit market arrangements are associated with lower, higher, or no different public health impacts.

Given that most alcohol and tobacco markets are structured around private interests (for-profit), the various regulations (such as restrictions on promotions, retail sales regulations, product labelling) all require enforcement (compliance checking and penalties for non-compliance). There appears to be a major research gap on enforcement of the various regulations. Firstly, there have been a number of different approaches to compliance checking, including routine inspections, test purchases and variants of the mystery shopper. But no research has compared these various compliance checking approaches nor established which methods are most effective and least costly. Secondly, no research that we identified has compared the effectiveness of different penalties – whether that be fines, public shaming, restrictions on trade, loss of license or other penalties. Evidence about which penalties have the greatest effect (in terms of both the individual non-compliant trader and the market as whole) would be extremely valuable in setting up systems for cannabis regulation if a for-profit model is chosen.

Cannabis and driving is an active research area, and studies are underway with results emerging. A key research priority is to establish the best detection methods and the most appropriate limits/levels to THC content, that does not impair driving but does not penalise people unnecessarily. More evidence is required about the length of time (hours) after cannabis consumption where driving may be impaired, as well as mechanisms to enforce this.

The regulation of online sales is an important research priority, particularly examining the effectiveness of different regulatory measures for online sales. The one systematic review we located concerned the extent of compliance, but not the effectiveness of regulatory options.

Quantity purchase restrictions is another research priority. As noted, only historical studies are available that concern the impacts of placing limits on the amount of alcohol that can be purchased by any one individual. This is an area of some importance for cannabis regulation, given the desire to limit sales. We also note that proposals to legalise other currently illegal drugs commonly argue for purchase limits (for example Transform Drug Policy Foundation, 2020), adding priority to this research agenda.

There is a large amount of research on price elasticity of demand for both alcohol and tobacco that should translate well for cannabis regulation. Research on the price elasticity of demand for cannabis has been undertaken (for example Amlung et al., 2019), within the context of the illegal market or medicinal cannabis markets. New research on cannabis price elasticity of demand in legally regulated markets will assist in establishing the best price setting levers. In addition, while it appears that higher prices on more harmful forms of cannabis will be a useful tool to nudge people towards purchase of less harmful forms, empirical evidence of pricing as an effective nudge strategy for cannabis is lacking.

The protection of third parties from any harmful emissions from cannabis consumption is a priority research agenda. While smoking cannabis with tobacco will be harmful to third parties given the known emissions from tobacco, there is still limited evidence for any harmful emissions from cannabis smoke on its own, let alone cannabis as vaped. This evidence will be crucial in justifying bans on public consumption.

As discussed earlier in this chapter, the alcohol policy research relies on the ‘total consumption model’ – harms accrue to individuals in a linear relationship with population consumption. This

needs to be empirically tested for cannabis, given the different harm profiles of the two substances. If the ‘total consumption model’ does not hold up for cannabis, some of the regulatory measures discussed here may be less important or relevant for controlling high risk/harmful consumption.

There is little research on the health impacts of black-market sourced cannabis. Most drug policy relies on the assumption that black market drugs contain very harmful cutting agents and other contaminants (as suppliers seek to maximise profits by increasing quantity weights with cutting agents). The toxic fentanyl in the North American heroin market is a classic example where illicit supplies are associated with significantly more harm than a legally regulated supply for that particular drug. Is this true for cannabis? Is the margin of harm for an illegally purchased gram of cannabis significantly higher than for a legally purchased gram of cannabis? The research so far does not seem to suggest so.

Aside from the quality of the product itself, one other major public health harm from illicit markets is violence and injury. Is this also the case with the cannabis black market? These questions are important because understanding the relationship between the black-market health harms and the legal market health harms will help guide public health policy concerning the regulation of cannabis. Of course, it may be that there are considerations other than public health (i.e., crime, stigma) driving regulation, in which case, lessons can be drawn from those fields as to what are the best settings to achieve desired outcomes.

A clear gap in the literature is the lack of directly comparable alcohol and tobacco products to edible cannabis products. We recognise the emergent literature in cannabis from legal markets here as a guide to appropriate regulatory settings and also literature from alcohol and tobacco on regulations concerning psychoactive products.

Finally, there has been some concern that cannabis product proliferation is associated with higher consumption (and hence higher harms). There is no empirical data that we are aware of that tests the association between the number of product types available and the associated population harm.

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## Appendix 1: Database searches – search terms (keywords and subject headings)

This appendix provides the list of specific search terms that were used for each of the four databases. The Cochrane library was hand searched. Each database has a different structure and thesaurus for its subject headings and keywords. Note: EMBASE and PubMed both use 'subject headings' which contain many of the keywords required for the searches but which are not shown here.

**Table 1: Alcohol control measures search terms (subject headings and keywords)**

Alcohol (and synonyms) AND systematic review; meta-analysis AND:

Database	Search terms (keywords and subject headings)
PsychInfo	<p>MAINSUBJECT.EXACT.EXPLODE("Education Policy") OR  MAINSUBJECT.EXACT.EXPLODE("Government Policy Making") OR  MAINSUBJECT.EXACT.EXPLODE("Law (Government)") OR  MAINSUBJECT.EXACT.EXPLODE("Social Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Government") OR  MAINSUBJECT.EXACT.EXPLODE("Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Digital Media") OR  MAINSUBJECT.EXACT.EXPLODE("Social Media") OR  MAINSUBJECT.EXACT.EXPLODE("News Media") OR  MAINSUBJECT.EXACT.EXPLODE("Communications Media") OR  MAINSUBJECT.EXACT.EXPLODE("Mass Media") OR  MAINSUBJECT.EXACT.EXPLODE("Health Care Policy")</p> <p>"(Social Marketing)" OR "(Retail Industry)" OR "(Advertising)" OR "(News Media)" OR  "(Digital Media)" OR "(Marketing)" OR Cost OR Pric* OR Taxation OR "(Mass Media)"  OR "(minimum unit price)" OR excise OR duty OR availability OR "(outlet density)" OR  "(hours of sale)" OR "on-premise" OR "off-premise" OR "(trading hour)" OR "physical  availability" OR lockout* OR "(age limit)" OR "(legal age)" OR "(test purchasing)" OR  "(license)" OR "responsible beverage service" OR "responsible service of alcohol" OR  "dram shop liability" OR monopol* OR "free market" OR "(self-regulation)" OR "alcohol  trusts" OR privatiz* OR "rationing" OR "(alcohol free zone)" OR  "(consumption site ban)" OR "(restriction on consumption)" OR "(drink drive)" OR  "(alcohol impaired driving)" OR sponsorship OR packag* OR "(package label)" OR  "(health warning)" OR "(warning label)" OR "(product label)" OR "(safe drinking  guideline)" OR "(safe consumption guideline)" OR "(drinking guideline)" OR "(alcohol  guideline)" OR "(public policy)" OR "(health policy)" OR "(education policy)" OR bans  OR law OR legislation OR government OR "(government regulation)" OR "market  structure" OR "third party harms" OR "mystery shopper" OR "administrative measures"  OR "for profit" OR "not-for-profit" OR "public consumption" OR "workplace measures"  OR "mandatory training" OR "labels interventions" OR "environmental prevention"  OR "harm reduction" OR "limit purchase quantities" OR "plain packaging" OR "home  brew" OR "self-supply" OR "staff training" OR "sales restrictions" OR "quantity limits"  OR "license revocation" OR "nudge"</p>
EMBASE	<p>regulatory mechanism/price fixing/ price/ consumer price index/tax/ or tax  incentive/  "cost"/ "cost control"/product market/ market/ policy/ or public policy/  retail outlet/purchasing/  licensing/licence/ law enforcement/ or law/government/ or government  regulation/ drunken driving/advertising/ or advertising/ packaging/ or</p>



	<p>packaging material/mass medium/social media/ marketing/ or social marketing/ wine industry/ harm reduction/ alcohol production/ quality control/ workplace/ economics/"systematic review"/ health education/ quality control/</p> <p>price.tw.  regulation.tw.  bans.tw.  advert*.tw.  tax.tw.  packag*.tw.  market.tw.  licens*.tw.  "third party harms".tw.  "mystery shopper".tw.  "test purchase".tw.  "administrative measure".tw.  for-profit.tw.  "mandatory training".tw.  "structural prevention".tw.  "environmental prevention".tw.  "situational prevention".tw.  "staff training".tw.  "quantity limits".tw.  "sales restrictions".tw.  nudge.tw.  "outlet density".tw.  lockout*.tw.  "age limit".tw.  "legal age".tw.  self-regulation.tw.  "alcohol trusts".tw.  "responsible service of alcohol".tw.  "free market".tw.  "government monopoly".tw.</p>
<p>PubMed</p>	<p>Social Control, Formal"[Mesh] OR "Government Regulation"[Mesh] OR "Commerce"[Mesh] OR "Economic Competition"[Mesh] OR "Economics"[Mesh] OR "Taxes"[Mesh] OR "Licensure"[Mesh] OR "Legislation, Drug"[Mesh] OR "Law Enforcement"[Mesh] OR "Driving Under the Influence"[Mesh] OR "Marketing"[Mesh] OR "Advertising"[Mesh] OR "Product Labeling"[Mesh] OR "Mass Media"[Mesh] OR "Social Media"[Mesh] OR "Policy"[Mesh] OR "Public Policy"[Mesh] OR "Health Policy"[Mesh] OR "Social Control Policies"[Mesh] OR "Guidelines as Topic"[Mesh] OR "Workplace"[Mesh] OR "Organization and Administration"[Mesh]</p> <p>Price*[TW] OR Tax [TW] OR Regulation [TW] OR "Retail outlet" [TW] or Packag* [TW] OR Market* [TW] OR Licens*[tw] OR "alcohol policy"[tw] OR "Drunk driving" [TW] OR "Drink driving" [TW] OR "Bans"[TW] OR ""Quality Control" OR "market structure" [tw] OR "third party harms"[tw] OR "mystery</p>

	<p>shopper"[tw] OR "test purchase"[tw] OR "for-profit" [tw] OR "mandatory training"[tw] OR "structural prevention"[tw] OR "environmental prevention"[tw] OR "situational prevention"[tw] OR "Harm Reduction"[Majr] OR "plain packaging"[tw] OR "staff training"[tw] OR "quantity limits" OR "sales restrictions"[tw] OR "license revocation"[tw] OR "license suspension"[tw] OR nudge [tw] OR Lockout*[tw] OR "Outlet density"[tw] OR "age limit"[tw] OR "legal age"[tw] OR "Self regulation" [tw] OR "Alcohol trusts" [tw] OR "Free market" [tw] OR "monopoly" [tw]</p>
PAIS	<p>MAINSUBJECT.EXACT("Alcohol Abuse") OR MAINSUBJECT.EXACT("Alcoholism") OR MAINSUBJECT.EXACT("Alcohol") AND (MAINSUBJECT.EXACT.EXPLODE("Social Marketing") OR MAINSUBJECT.EXACT.EXPLODE("News Media") OR MAINSUBJECT.EXACT.EXPLODE("Digital Media") OR MAINSUBJECT.EXACT.EXPLODE("Health Policy") OR MAINSUBJECT.EXACT.EXPLODE("Markets") OR MAINSUBJECT.EXACT.EXPLODE("Marketing") OR MAINSUBJECT.EXACT.EXPLODE("Government") OR MAINSUBJECT.EXACT.EXPLODE("Policy") OR MAINSUBJECT.EXACT.EXPLODE("Public Policy") OR MAINSUBJECT.EXACT.EXPLODE("Law") OR MAINSUBJECT.EXACT.EXPLODE("Government Policy"))</p> <p>"(Social Marketing)" OR "(Retail Industry)" OR "(Advertising)" OR "(News Media)" OR "(Digital Media)" OR "(Marketing)" OR Cost OR Pric* OR Taxation OR "(Mass Media)" OR "(minimum unit price)" OR excise OR duty OR availability OR "(outlet density)" OR "(hours of sale)" OR "on-premise" OR "off-premise" OR "(trading hour)" OR "physical availability" OR lockout* OR "(age limit)" OR "(legal age)" OR "(test purchasing)" OR "(license)" OR "responsible beverage service" OR "responsible service of alcohol" OR "dram shop liability" OR monopol* OR "free market" OR "(self-regulation)" OR "alcohol trusts" OR privatis* OR privatiz* OR rations OR "(alcohol free zone)" OR "(consumption site ban)" OR "(restriction on consumption)" OR "(drink drive)" OR "(alcohol impaired driving)" OR sponsorship OR packag* OR "(package label)" OR "(health warning)" OR "(warning label)" OR "(product label)" OR "(safe drinking guideline)" OR "(safe consumption guideline)" OR "(drinking guideline)" OR "(alcohol guideline)" OR "(public policy)" OR "(health policy)" OR "(education policy)" OR bans OR law OR legislation OR government OR "(government regulation)" OR "market structure" OR third party harms" OR "mystery shopper" OR administrative measures" OR "for profit" OR "not-for-profit" OR public consumption" OR "workplace measures" OR "mandatory training" OR "labels interventions" OR "environmental prevention" OR "harm reduction" OR "limit purchase quantities" OR "plain packaging" OR "home brew" OR "self-supply" OR "staff training" OR sales restrictions" OR "quantity limits" OR "license revocation" OR "nudge"</p>

**Table 2: Tobacco control search terms (keywords and subject headings)**

Tobacco (and synonyms) AND systematic review; meta-analysis AND:

Database	Search terms (keywords and subject headings)
PsychInfo	<p>MAINSUBJECT.EXACT.EXPLODE("Education Policy") OR  MAINSUBJECT.EXACT.EXPLODE("Television Advertising") OR  MAINSUBJECT.EXACT.EXPLODE("Social Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Digital Media") OR  MAINSUBJECT.EXACT.EXPLODE("Social Media") OR  MAINSUBJECT.EXACT.EXPLODE("Digital Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Taxation") OR  MAINSUBJECT.EXACT.EXPLODE("Communications Media") OR  MAINSUBJECT.EXACT.EXPLODE("Mass Media") OR  MAINSUBJECT.EXACT.EXPLODE("Advertising") OR  MAINSUBJECT.EXACT.EXPLODE("Electronic Retailing") OR  MAINSUBJECT.EXACT("Television") OR MAINSUBJECT.EXACT.EXPLODE("Retailing") OR  MAINSUBJECT.EXACT.EXPLODE("Laws") OR MAINSUBJECT.EXACT.EXPLODE("Health  Care Policy") OR MAINSUBJECT.EXACT.EXPLODE("Government Policy Making") OR  MAINSUBJECT.EXACT.EXPLODE("Costs and Cost Analysis")</p> <p>pric* OR "(price index)" OR "(price policy)" OR "(licensing)" OR bans OR "(regulatory  mechanism)" OR regulation OR advert* OR packag* OR "(product package)" OR  "(quality control)" OR "(consumer protection)" OR taxation OR "public policy" OR  "health policy" OR "education policy" OR "market structure" OR "third party harms"  OR "mystery shoppers" OR "test purchase" OR "administrative measures" OR "for-  profit" OR "not-for-profit" OR public consumption OR "workplace measures" OR  "mandatory training" OR "labels interventions" OR "environmental prevention" OR  "harm reduction" OR "limit purchase quantities" OR "plain packaging" OR "self-  supply" OR "staff training" OR "sales restrictions" OR "license revocation" OR "nudge"</p> <p>"passive smoking" AND "systematic review"</p>
EMBASE	<p>regulatory mechanism/price fixing/ or price/ or consumer price index/tax/tax  incentive/price/tobacco industry/licensing/ licence/ or law/market/ or product  market/smoking cessation/ or smoking ban/ or passive smoking/television/ or  advertising/ or advertising/OR packaging/ or packaging material/mass  medium/social media/marketing/ or social marketing/policy/ or public policy/quality  control/consumer protection/OR retail outlet/ OR smoking ban/ Commercial  phenomena/ economics/ workplace/"cost"/"cost control"/</p> <p>Tobacconist.tw.  Package. tw.  regulation.tw.  Market.tw.  Licens*.tw.  advert*.tw.  "minimum price".tw  "market structure".tw.  "third party harms".tw.  "mystery shoppers".tw.  "test purchase".tw.  "administrative measures".tw.</p>

	<p>“structural prevention”.tw.  “situational prevention”.tw.  “for-profit” .tw.  “public consumption” .tw.  “workplace measures” .tw.  “mandatory training” .tw.  “labels interventions” .tw.  “environmental prevention” .tw.  “harm reduction” .tw.  “limit purchase quantities” .tw.  “plain packaging” .tw.  “self-supply” .tw.  “staff training” .tw.  “sales restrictions” .tw.  “license revocation” .tw.  “nudge” .tw.  Ban.tw.  “quantity limits”tw.  “self regulation”.tw.  “free market”.tw.  “cost control”.tw.  “smoke free” .tw.</p> <p>“passive smoking” AND “systematic review”</p>
PubMed	<p>“Social Control, Formal”[Mesh] OR “Government Regulation”[Mesh] OR  “Commerce”[Mesh] OR “Economic Competition”[Mesh] OR “Economics”[Mesh] OR  “Taxes”[Mesh] OR “Tobacco Industry”[Majr] OR “Licensure”[Mesh] OR “Legislation,  Drug”[Mesh] OR “Law Enforcement”[Mesh] OR “Marketing”[Mesh] OR “Smoke-Free  Policy”[Mesh] OR “Advertising”[Mesh] OR “Product Labeling”[Mesh] OR “Mass  Media”[Mesh] OR “Social Media”[Mesh] OR “Policy”[Mesh] OR “Public Policy”[Mesh]  OR “Health Policy”[Mesh] OR “Social Control Policies”[Mesh] OR <b>“Organization and  Administration”[Mesh] OR “Workplace”[Mesh]</b></p> <p>Price*[TW] OR Tax [TW] OR Regulation [TW] OR Tobacconist [TW] OR “Retail  outlet” [TW] or Packag* [TW] OR “Quality Control”[TW] OR “tobacco policy”  [tw] OR “market structure” [tw] OR “third party harms”[tw] OR “mystery  shoppers”[tw] OR “test purchase”[tw] OR <b>“mandatory training”[tw] OR  “public consumption” [tw] OR “structural prevention”[tw] OR  “environmental prevention”[tw] OR “situational prevention”[tw] OR “Harm  Reduction”[Majr] OR “plain packaging”[tw] OR “staff training”[tw] OR  “quantity limits” OR “sales restrictions”[tw] OR “license revocation”[tw] OR  “license suspension”[tw] OR nudge [tw] OR “administrative measures” [tw] OR  license [tw] OR “plain packaging” [tw] OR ban [tw] OR “self regulation” [tw] OR  advert* [tw] OR “quality control” [tw] OR “consumer protection” [tw] OR label* [tw]</b></p> <p>“passive smoking” AND “systematic review”</p>
PAIS	<p>MAINSUBJECT.EXACT.EXPLODE(“Social Marketing”) OR  MAINSUBJECT.EXACT.EXPLODE(“Retail Industry”) OR</p>

	<p> MAINSUBJECT.EXACT.EXPLODE("Advertising") OR MAINSUBJECT.EXACT.EXPLODE("Tax Policy") OR MAINSUBJECT.EXACT.EXPLODE("Digital Media") OR  MAINSUBJECT.EXACT.EXPLODE("Markets") OR  MAINSUBJECT.EXACT.EXPLODE("Marketing") OR  MAINSUBJECT.EXACT.EXPLODE("Television") OR  MAINSUBJECT.EXACT.EXPLODE("Licenses") OR MAINSUBJECT.EXACT("Policy") OR  MAINSUBJECT.EXACT.EXPLODE("Public Policy") OR MAINSUBJECT.EXACT("Law") OR  MAINSUBJECT.EXACT.EXPLODE("Prices") OR MAINSUBJECT.EXACT.EXPLODE("Price Policies") OR MAINSUBJECT.EXACT.EXPLODE("Price Indexes") OR  MAINSUBJECT.EXACT.EXPLODE("Taxation") OR MAINSUBJECT.EXACT.EXPLODE("Mass Media") </p> <p> "(regulatory mechanism)" OR "(smoking cessation)" OR "(smoking ban)" OR "(passive smoking)" OR regulat* OR advert* OR packag* OR "(product packaging)" OR tobacco OR "(quality control)" OR "(consumer protection)" OR bans OR "market structure" OR "third party harms" OR mystery shoppers" OR "test purchase" OR "administrative measures" OR "for-profit" OR "not-for-profit" OR public consumption" OR "workplace measures" OR "mandatory training" OR "labels interventions" OR "environmental prevention" OR "harm reduction" OR "limit purchase quantities" OR "plain packaging" OR "self-supply" OR "staff training" OR "sales restrictions" OR "license revocation" OR "nudge" </p> <p> "passive smoking" AND "systematic review" </p>
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