



Public Health
England

Protecting and improving the nation's health

The Public Health Burden of Alcohol and the Effectiveness and Cost-Effectiveness of Alcohol Control Policies

An evidence review

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Executive summary

Alcohol is a prominent commodity in the UK marketplace. It is widely used in numerous social situations. For many, alcohol is associated with positive aspects of life; however there are currently over 10 million people drinking at levels which increase their risk of health harm. Among those aged 15 to 49 in England, alcohol is now the leading risk factor for ill-health, early mortality and disability and the fifth leading risk factor for ill-health across all age groups.

Since 1980, sales of alcohol in England and Wales have increased by 42%, from roughly 400 million litres in the early 1980s, with a peak at 567 million litres in 2008, and a subsequent decline. This growth has been driven by increased consumption among women, a shift to higher strength products, and increasing affordability of alcohol, particularly through the 1980s and 1990s. Over this period, the way in which alcohol is sold and consumed also changed. In 2016 there were 210,000 license premises in England and Wales, a 4% increase on 2010. There has been a shift in drinking location such that most alcohol is now bought from shops and drunk at home. Although consumption has declined in recent years, levels of abstinence have also increased. Consequently, it is unclear how much of the decline is actually related to drinkers consuming less alcohol and how much to an increasing proportion of the population not drinking at all.

In recent years, many indicators of alcohol-related harm have increased. There are now over 1 million hospital admissions relating to alcohol each year, half of which occur in the lowest three socioeconomic deciles. Alcohol-related mortality has also increased, particularly for liver disease which has seen a 400% increase since 1970, and this trend is in stark contrast to much of Western Europe. In England, the average age at death of those dying from an alcohol-specific cause is 54.3 years. The average age of death from all causes is 77.6 years. More working years of life are lost in England as a result of alcohol-related deaths than from cancer of the lung, bronchus, trachea, colon, rectum, brain, pancreas, skin, ovary, kidney, stomach, bladder and prostate, combined.

Despite this burden of harm, some positive trends have emerged over this period, particularly indicators which relate to alcohol consumption among those aged less than 18 years, and there have been steady reductions in alcohol-related road traffic crashes.

The public health burden of alcohol is wide ranging, relating to health, social or economic harms. These can be tangible, direct costs (including costs to the health, criminal justice and welfare systems), or indirect costs (including the costs of lost productivity due to absenteeism, unemployment, decreased output or lost working years due to premature pension or death). Harms can also be intangible, and difficult to cost, including those assigned to pain and suffering, poor quality of life or the emotional

distress caused by living with a heavy drinker. The spectrum of harm ranges from those that are relatively mild, such as drinkers loitering near residential streets, through to those that are severe, including death or lifelong disability. Many of these harms impact upon other people, including relationship partners, children, relatives, friends, co-workers and strangers.

In sum, the economic burden of alcohol is substantial, with estimates placing the annual cost to be between 1.3% and 2.7% of annual GDP. Few studies report costs on the magnitude of harm to people other than the drinker, so the economic burden of alcohol consumption is generally underestimated. Crucially, the financial burden which alcohol-related harm places on society is not reflected in its market price, with taxpayers picking up a larger amount of the overall cost compared to the individual drinkers. This should provide impetus for governments to implement effective policies to reduce the public health impact of alcohol, not only because it is an intrinsically desirable societal goal, but because it is an important aspect of economic growth and competitiveness.

Reflecting three key influencers of alcohol consumption – price (affordability), ease of purchase (availability) and the social norms around its consumption (acceptability) – an extensive array of policies have been developed with the primary aim of reducing the public health burden of alcohol. The present review evaluates the effectiveness and cost-effectiveness of each of these policy approaches.

Taxation and price regulation

Taxation and price regulation policies affect consumer demand by increasing the cost of alcohol relative to alternative spending choices. Policies that reduce the affordability of alcohol are the most effective, and cost-effective, approaches to prevention and health improvement. For example, an increase in taxation leads to an increase in government revenue and substantial health and social returns. According to Treasury forecasts, cuts in alcohol duty since 2013 are projected to have reduced income to the Exchequer by £5 billion over five years, reducing to £3.45 billion when consumption increases are considered. This does not include increases in societal and NHS costs. Implementing a minimum unit price (MUP) is a highly targeted measure which ensures tax increases are passed on to the consumer and improves the health of the heaviest drinkers. These people are experiencing the greatest amount of harm. The MUP measure has a negligible impact on moderate drinkers and the on-trade. Combining an increase in taxation alongside the implementation of a MUP is estimated to lead to substantial reductions in harm and increases in government revenue. This reduction is greater than that achieved by an MUP in isolation. Taxation and pricing policies need to be updated in line with changes in income and inflation, in order to retain the impact on affordability. Bans on the sale of alcohol below the cost of taxation do not impact on

public health in their current form, and restrictions on price promotions can be easily circumvented.

Regulating marketing

The strongest evidence for the impact of marketing comes from reviews of longitudinal and cohort studies of children, which consistently report that exposure to alcohol marketing increases the risk that children will start to drink alcohol, or if they already drink, will consume greater quantities. While the relationship between marketing and child alcohol consumption does not directly provide evidence that limiting marketing will reduce consumption, the evidence is sufficient to support policies that reduce children's exposure to marketing. Emerging research has focused on specific mechanisms to do this, such as watershed bans or online age verification filters. The available evidence is not able to guide the most effective and cost-effective approach. While modelling studies have estimated that complete and partial marketing bans are highly effective and cost-effective, these measures are rarely implemented. A consistent body of research demonstrated considerable violations of content guidelines within self-regulated alcohol marketing codes, suggesting that the self-regulatory systems that govern alcohol marketing practices are not meeting their intended goal of protecting vulnerable populations.

Regulating availability

Policies that sufficiently reduce the hours during which alcohol is available for sale – particularly late night on-trade sale – can substantially reduce alcohol-related harm in the night-time economy. When simultaneously enforced and targeted at the most densely populated areas this policy is cost-effective. While there is a clear relationship between the density of alcohol outlets and social disorder, the research is more mixed for other outcomes and causation is unclear. Using the scientific literature within the constraints of the Licensing Act 2003 has proved challenging. Low quality evidence suggests public-private partnerships involving voluntary pledges to reduce the number of units in the market are ineffective, given that most industry activity occurred regardless of the pledge and related to the launch and promotion of new products, potentially increasing the size of the market.

Providing information and education

Although playing an important role in increasing knowledge and awareness, there is little evidence to suggest that providing information, education and labels on alcoholic beverages is sufficient to lead to substantial and lasting reductions in alcohol-related harm. Though a popular strategy, education programmes are not cost-effective. Nonetheless, these policies increase public support for more stringent (and effective) policies and labels on alcoholic beverages fulfil a consumer right to be better informed.

These policies are appropriate as important components in any overall policy approach. The delivery of education messages by the alcohol industry has no significant public health effects.

Managing the drinking environment

At best, interventions enacted in and around the drinking environment lead to small reductions in acute alcohol-related harm. However, their implementation is resource intensive. This aspect has been overlooked in much of the scientific literature to date. Multicomponent community programmes are effective, cost-effective and are amenable to local implementation. However, the evidence is predominantly based on the experience in Sweden and may not directly translate to the English context. Other interventions in this area, while not firmly supported by the evidence, may be enacted based on solid principle, such as the use of safer glassware alternatives, or voluntary initiatives to remove the sale of cheap and high strength alcohol. The latter can be undermined if this type of alcohol is readily available from neighbouring areas.

Reducing drink-driving

Enforced legislative measures to prevent drink-driving are effective and cost-effective. Policies which specify lower legal alcohol limits for young drivers are effective at reducing casualties and fatalities in this group and are cost-saving. Reducing drink-driving is an intrinsically desirable societal goal and is a complementary component to a wider strategy that aims to influence drinkers to adopt less risky patterns of alcohol consumption.

Brief interventions and treatment

Health interventions aimed at drinkers who are already at risk (eg Identification and Brief Advice) and specialist treatment for people with harmful drinking patterns and dependence are effective approaches to reducing consumption and harm in these groups. Typically, these interventions show favourable returns on investment. However, their success depends on large-scale implementation and dedicated treatment staffing and funding streams, without which they are less effective.

The policy mix

It is known that stronger overall policy environments are associated with lower levels of binge drinking and alcohol-related cirrhosis mortality. The Organisation for Economic Co-operation and Development (OECD) suggests that combining alcohol policies may create a 'critical mass' effect, changing social norms around drinking to increase the impact on alcohol-related harm. Alcohol policy should be coherent and consistent. For example, warning labels highlighting the risks of alcohol consumption should not be

undermined by a unit price that encourages heavy consumption. Such consistency is essential to creating a supportive environment for society, including for those who wish to adopt healthier lifestyles by reducing their alcohol consumption, and for those who drink at hazardous and dependent levels. The challenge for policy makers is implementing the most effective and cost-effective set of policies for the English context. This review provides evidence to identify those policies.

Overview of this report

This review was commissioned by the Department of Health, which asked Public Health England (PHE) to provide an overview of alcohol-related harm in England and possible policy solutions. There have been several previous reports on this issue, including an Academy of Medical Sciences report (1), an expert synthesis (2), an overview by the World Health Organization (WHO) (3), and most recently, a review by the OECD (4).

The present report offers a broad and rigorous summary of the types and prevalence of alcohol-related harm, and evidence for the effectiveness and cost-effectiveness of alcohol control policies. Effectiveness is defined as the degree to which an intervention reduces the public health burden (health, social, and economic) of alcohol. The findings are interpreted within the English context and will be relevant to academics and researchers, public health professionals and policymakers in the health and non-health sectors.

A detailed overview of the methodology used to derive the evidence in this report can be seen in Annexe 1. Briefly, electronic databases combined with hand-searching of reference lists and input from an independent expert group (Annexe 2) was used to identify reviews and primary studies pertaining to alcohol-related harm and the effectiveness and cost-effectiveness of alcohol control policies. Data were extracted using a uniform template, and quality of evidence was assessed using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) criteria (5,6). This evidence was translated into a narrative review of each policy approach. A full glossary of the terms used in this report can be seen in Annexe 3.

Abbreviations

AA	Alcoholics Anonymous
AAF	Alcohol attributable fraction
ABV	Alcohol by volume
ACE	Adverse childhood experience
AIDS	Acquired immune deficiency syndrome
AOD	Alcohol outlet density
ASA	Advertising Standards Authority
AuD	Australian dollars
AUD	Alcohol use disorder(s)
AUDIT	Alcohol use disorders identification test
AWLPI	All-Wales licensed premises intervention
BAC	Blood alcohol concentration
BCAP	UK code of broadcast advertising
BI	Brief interventions
BMI	Body mass index
CAP	UK code of non-broadcast advertising, sales promotion and direct marketing
CBT	Cognitive behavioural therapy
CDP	Chronic disease prevention
CI	Confidence interval
CIP	Cumulative impact policy
CISS	Christo inventory for substance misuse services
CJS	Criminal justice setting
CMO	Chief Medical Officer
DALY	Disability adjusted life year
DANTE	Dealing with alcohol-related problems in the night-time area
DNA	Deoxyribonucleic acid
DPPOs	Designated public place orders
ECJ	European Court of Justice
ED	Emergency department
eIBA	Electronic identification and brief advice
EQ-5D	A standardised instrument for use as a measure of health outcome
EU	European Union
FASD	Foetal alcohol spectrum disorder
GDL	Graduated driver licences
GDP	Gross domestic product
GP	General practitioner
GRADE	Grading of Recommendations Assessment, Development and Evaluation

HES	Hospital episode statistics
HIV	Human immunodeficiency virus
HMRC	Her Majesty's Revenue and Customs
HR	Hazard ratio
HSE	Health Survey for England
IBA	Identification and brief advice
ICD-10	International Classification of Diseases
ICER	Incremental cost-effectiveness ratio
ID	Identification
IPV	Intimate partner violence
IQI	Interquartile interval
IQR	Interquartile range
IRR	Incident rate ratio
MD	Mean difference
MET	Motivational enhancement therapy
MI	Motivational interviewing
MUP	Minimum unit price
NDTMS	National Drug Treatment Monitoring System
NHS	National Health Service
NICE	National Institute for Health and Care Excellence
NZD	New Zealand dollars
OASys	Offender Assessment System
OECD	Organisation for Economic Co-operation and Development
Ofcom	Office of Communications
ONS	Office for National Statistics
OR	Odds ratio
PED	Price elasticity of demand
PHC	Primary health care
PHE	Public Health England
PND	Penalty notice for disorder
QALYs	Quality adjusted life years
RAID	Rapid Assessment, Interface and Discharge
RCT	Randomised controlled trial
RD	Responsibility Deal
RTC	Road traffic crash
RR	Relative risk
SBNT	Social behaviour network therapy
SchHARR	School of Health and Related Research
SD	Standard deviation
SE	Standard error
SMART	Self-management and recovery training
SMD	Standardised mean difference

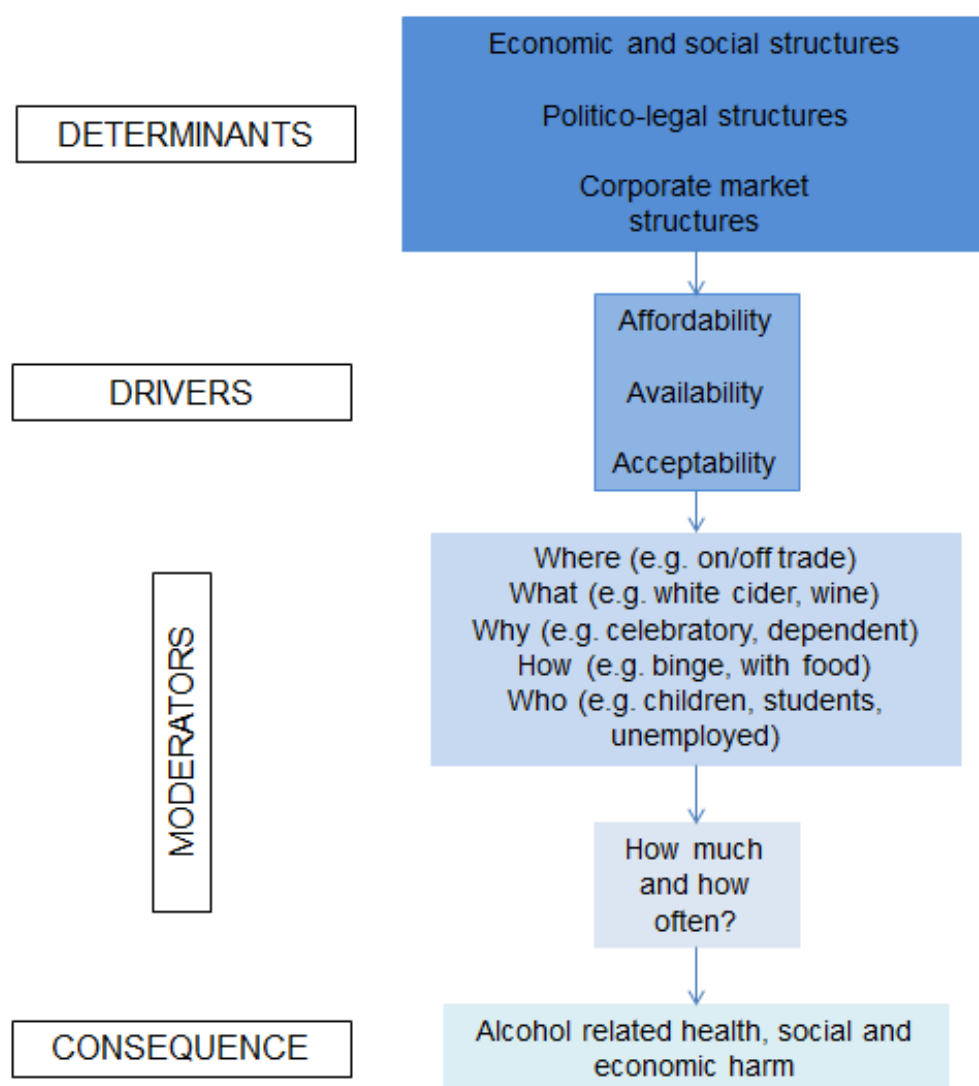
STAD	Stockholm Prevents Alcohol and Drug problems
STI	Sexually transmitted infection
TB	Tuberculosis
TSF	Twelve step facilitation
TV	Television
UK	United Kingdom
US	United States
USD	United States dollars
VAT	Value added tax
WHO	World Health Organization
WKS	Wernicke-Korsakoff syndrome
YLL	Years of life lost

Part A: Alcohol-related harm

Introduction

In England, alcohol misuse is the biggest risk factor attributable to early mortality, ill-health and disability for those aged 15 to 49 years, for all ages it is the fifth most important (7). The harm caused by alcohol is determined by levels of alcohol consumption at both the individual- and population-level. These levels are heavily influenced by access to alcohol, which comprises three variable factors or drivers: how easy it is to purchase or consume alcohol (availability), how cheap alcohol is (affordability) and the social norms surrounding its consumption (acceptability) (3). These drivers are largely determined by economic and social structures, politico-legal structures and corporate/market structures.

Figure 1: Conceptual framework of the determinants, drivers and moderators of alcohol-related harm, adapted from (8)



Alcohol consumption can have adverse health and social consequences for the drinker, as well as for other individuals. Its consumption has been identified as a component cause for more than 200 health conditions covered by the International Classification of Disease (ICD-10) and injury codes (3) and is associated with social consequences such as loss of earnings or unemployment (9,10), family or relationship problems (11,12) and problems with the law (13,14). Many of these harms affect associates of the drinker, such as a partner, child, relative, friend, co-worker or stranger (15,16).

Alcohol-related harms can be tangible and can be given an economic cost, such as injuries (17), or can be intangible and almost impossible to cost such as emotional distress caused by living with a heavy drinker (16). The harms can be relatively mild, such as drinkers loitering near residential streets (18), or can be severe including death or a lifelong disability (19).

Aside from environmental factors, the health and social harm caused by alcohol is determined by three related dimensions of drinking:

- the volume of alcohol consumed
- the frequency of drinking occasions
- the quality of alcohol consumed

For most alcohol-related diseases and injuries, there is a clear dose-response relationship between the volume of alcohol consumed and the risk of a given harm. With increasing dose, there is increasing risk. For example, all alcohol-related cancers exhibit this relationship (20). The relationship is often more complex for social harms, for example, increasing alcohol consumption can lead to unemployment, but unemployment can increase alcohol consumption (9).

The dose at which risk begins to increase varies for different harms. For example, the risk of road traffic crash (RTC) begins at a blood alcohol concentration (BAC) of around 40g of alcohol per 100ml of blood (21), and at 50g pure alcohol per day, men have almost a 60% higher risk of getting hypertension compared to their non-drinking counterparts (22).

As well as the volume of alcohol consumed, the frequency of drinking occasions affects the risk of harm. For example, repeated heavy drinking is associated with dependence (23) whereas, a single bout of heavy drinking is associated with injuries and risk of cardiovascular disease (24). The latter relates to the fact that any cardioprotective effect of low-risk patterns of alcohol consumption, are completely undone in the presence of heavy episodic drinking.

The quality of alcohol primarily relates to home-made or illegally produced alcohol, which can be contaminated with methanol or other toxic substances and are known to

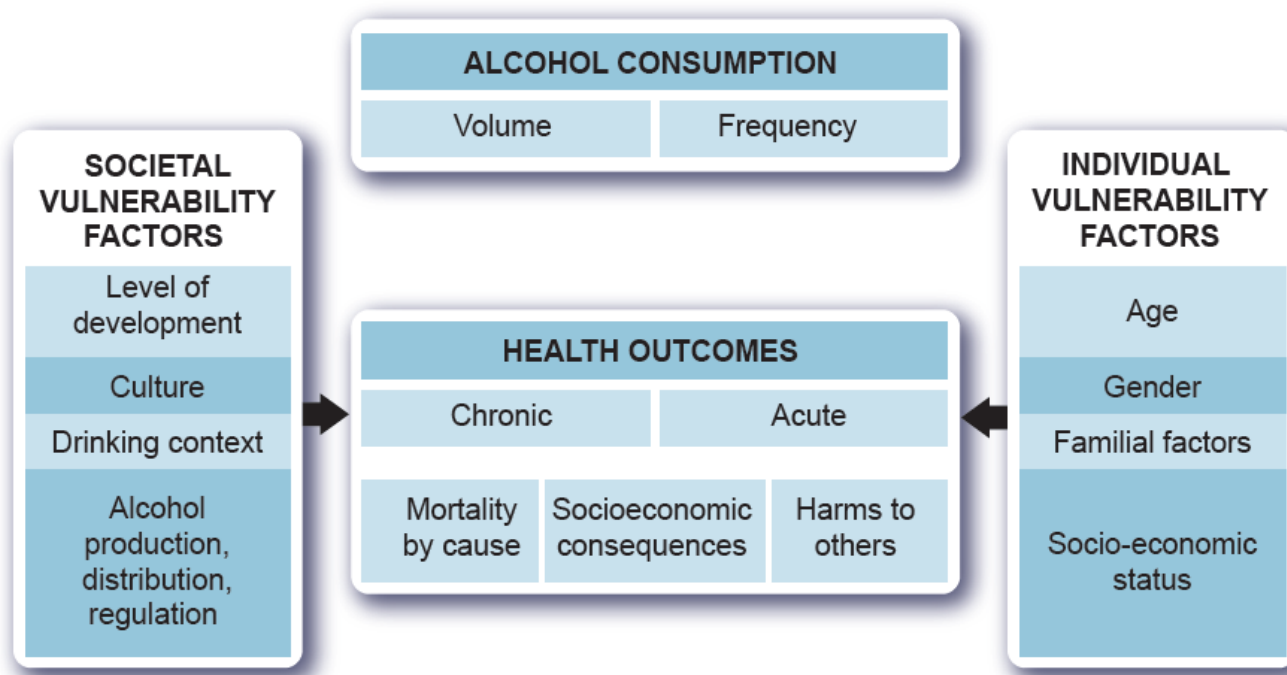
cause higher levels of harm (25). In England, and other high income countries, there are relatively low levels of home-made or illegally produced alcohol, therefore this aspect is not considered in this time-limited review (26).

In addition to the volume and pattern of drinking, a number of individual risk factors moderate alcohol-related harm, such as (3):

- age: children and young people are more vulnerable to alcohol-related harm
- gender: women are more vulnerable to alcohol-related harm from higher levels of alcohol use or particular patterns of drinking
- familial risk factors: exposure to abuse and neglect as a child and a family history of alcohol use disorders (AUD) is a major vulnerability
- socioeconomic status: people with lower socioeconomic status experience considerably higher levels of alcohol-related harm
- culture and context: the risk of harm varies with the culture and context within which the drinking takes place, for example drinking while driving can result in serious penalties and harm
- alcohol control and regulation: a critical factor in determining levels of alcohol-related harm in a country is the level and effectiveness of alcohol control and regulations

A conceptual framework of the harm caused by alcohol consumption can be seen in Figure 2.

Figure 2: Conceptual framework of the harm caused by alcohol, adapted from (3)



The overall cost of alcohol-related harm

Overall, the harmful use of alcohol results in a significant health, social and economic cost to society and ranks among the five top risk factors for disease, disability and injury throughout the world (19). There are three major categories of alcohol-related health, social and economic costs (3):

- the *direct* economic costs of alcohol consumption, for example, costs to health and social care, the police and criminal justice system and the unemployment and welfare systems
- the *indirect* costs of alcohol consumption, for example, lost productivity due to absenteeism, unemployment, decreased output, reduced earnings potential and lost working years due to premature pension or death
- the *intangible* costs of alcohol consumption, for example, costs assigned to pain and suffering, poor quality of life, or costs from money spent on alcohol in families where the money should be spent on other things

The direct costs of alcohol misuse are typically borne by government, whereas indirect costs tend to be borne by society at large and intangible costs by drinkers, their families and their associates. There is an inevitable uncertainty in any attempt to quantify the economic burden of alcohol and it is likely that such evaluations capture only a fraction of the true 'cost' of alcohol-related harm.

Several countries have attempted to estimate a monetary quantification of the health, social and economic costs associated with alcohol use. By using methodologically similar studies from four high income countries, Rehm and colleagues estimated the total costs of alcohol to be 2.5% of gross domestic product (GDP) in 2007 (27), equivalent to £47 billion in 2016. The majority of these were indirect costs (72% of all costs), followed by health care costs (13%), other direct costs (12%) and law enforcement costs (3%).

A somewhat less rigorous estimate of the likely global economic burden of alcohol suggested costs in the range of \$210 to \$665 billion in 2002, equivalent to 0.6% to 2% of global GDP (28). A substantial portion of this total was made up of intangible costs. The review highlighted the key problems in deriving these figures, associated with the methods and definitions used in the literature, omitted costs and the applicability of applying estimates from one country to a different country.

Importantly, there is evidence from a cost-of-illness study in Scotland, to suggest that there are inequalities in the distribution of the health, social, crime, labour and productivity costs of alcohol misuse, with around 40% of the total costs arising from the 20% most deprived areas (29). Notably, the burden of alcohol misuse did not simply arise from deprived groups, but was experienced more by these groups. Nonetheless,

the estimate was hindered by a lack of available data and for two included cost categories, social care and labour and productivity costs, there were no data available to establish the distribution of costs by deprivation.

A Cabinet Office estimate placed the economic costs of alcohol in England at around £21 billion in 2012, equivalent to 1.3% GDP, made up of the costs associated with alcohol-related health disorders and disease, crime and anti-social behaviour, loss of productivity in the workplace and problems for those who misuse alcohol and their families, including domestic violence (30). However, these estimates are outdated and concerns regarding the assumptions and methodological judgements in deriving this estimate have been raised (31). They nevertheless provide insight into the scale of the problem.

Researchers have also attempted to quantify the burden of some specific harms relating to alcohol. A review indicated that the economic burden of alcohol dependence alone is large, with annual total direct costs in European countries ranging from €1 billion to €7.8 billion in 2012, equivalent to 0.04% to 0.31% of a country's annual GDP (32). The main driver for direct costs was hospitalisations for alcohol dependent patients, which was shown to consume as much as 15% of annual GDP per inhabitant for a single patient.

Estimates of the direct costs to the NHS in the UK stood at £3 billion for conditions attributable to alcohol consumption in 2005/06, equivalent to 3.2% of the total health care costs (33). These costs included £374 million for cirrhosis of the liver and more than £330 million for RTC. Since then, alcohol-related liver cirrhosis morbidity and mortality has increased (34) and there have been small decreases in the number of RTC (35).

Few studies in the existing research report costs on the magnitude of harm to people other than the drinker, such as crime, violence and to the developing foetus (36). It therefore follows that many overall estimates of the economic burden of risky alcohol consumption across countries is generally underestimated. Even when the harm imposed on drinkers' associates is 100% attributable to alcohol, for example foetal alcohol spectrum disorder (FASD), any attempt at costing the impact and magnitude on society, or the health care system, is rare.

Despite the range and difficulties in estimating the economic burden of alcohol, it is clear that alcohol use consistently exerts a considerable burden both nationally and worldwide. This burden is borne by governments, society at large and individual drinkers and their associates. This evidence provides a powerful argument for governments to invest in the health of their populations, not only because improved health is intrinsically desirable, but also because it is an important determinant of economic growth and competitiveness.

Trends in alcohol consumption

Introduction

Information on the amount of alcohol consumed by the general population and by sub-populations is needed to monitor health and inequalities, develop effective policies and allocate resources to high-risk groups.

Population consumption theory links population level consumption with alcohol-related harm and contends that overall consumption is directly, and dose-related to the level of alcohol-related harm in a population. As the consumption of a population increases, so does alcohol-related harm and vice versa. Contemporary alcohol policy rests on this fundamental assumption (1,37,38).

This section outlines how alcohol consumption is measured in the UK and England and how levels of alcohol consumption have changed over time.

Measuring alcohol consumption

Alcohol consumption in England is most commonly measured through large scale surveys, usually conducted in private households. The Office for National Statistics (ONS) has asked questions about drinking in various surveys¹ since the 1980s (39) and the Health Survey for England (HSE) has asked questions since its inception in 1991 (40).

While the range and depth of questions asked has varied year-on-year, all of these surveys have sought to estimate the frequency and quantity of the different alcohol products consumed. Respondent reports on the types of beverages consumed are then converted into standard units of alcohol. A unit in the UK is 8g of pure alcohol. A standard method for converting to units was agreed for UK surveys in 2007 (41). This change in methodology led to a discontinuity in time series which span 2006.

'Clearances' can serve as another measure of alcohol consumption, by examining the total amount of products released to the market for purchase and on which buyers have paid tax. Alcohol clearances do not directly measure consumption. Instead, they represent the amount of alcohol that has been legally sold. This data cannot include alcohol which people drink abroad, import personally or brew at home.

It is widely acknowledged that household surveys underestimate population level alcohol consumption with estimates suggesting they record between 55% and 60% of

¹ The General Lifestyle Survey; General Household Survey; Opinions and Lifestyle Survey

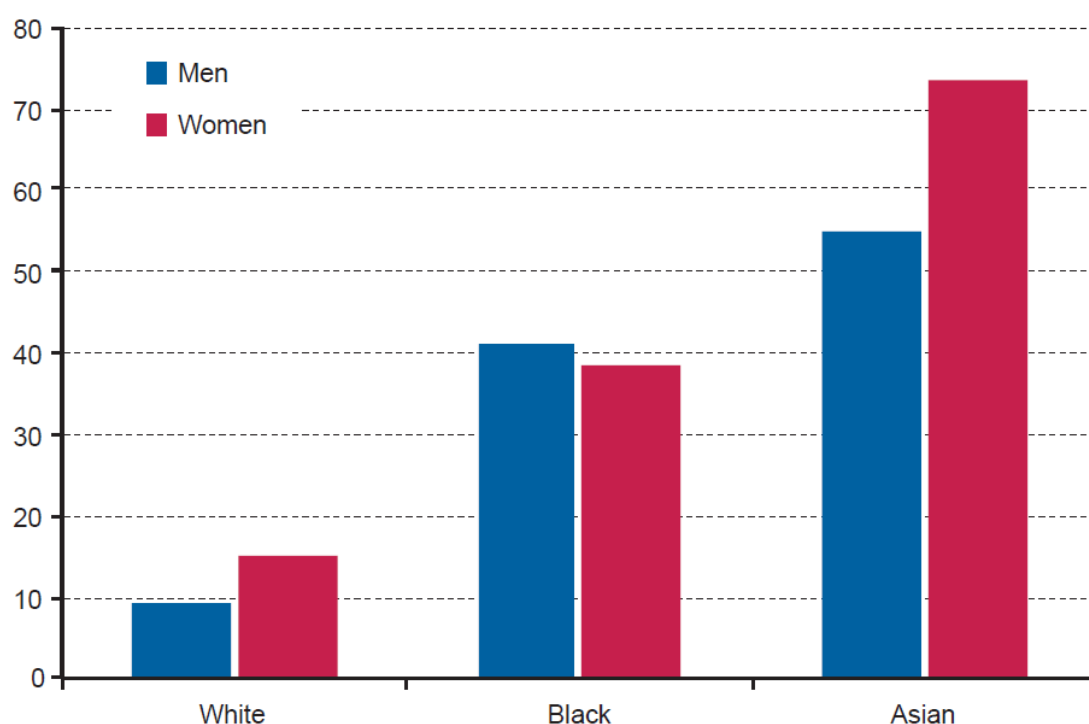
consumption compared with actual sales (42,43). Retrospective analysis reports the discrepancy to be 430 million units a week, equivalent to a bottle of wine per adult drinker per week (43).

This discrepancy occurs because some populations are not covered by surveys, including children, non-UK visitors and adults not living in private households (44). The latter group may include people with non-typical levels of alcohol consumption, including students, adults in social care, those in hostel accommodation and the homeless. Secondly, some groups who are likely to drink more, although eligible to take part in surveys, are harder to reach, for example, young men. Also, heavy drinkers can live lifestyles that make them harder to contact and to persuade to take part in health-related surveys. Finally, survey respondents can underestimate their consumption for example by excluding drinking on special occasions such as celebrations or holidays or underestimating drink size with home poured drinks such as spirits.

Current consumption

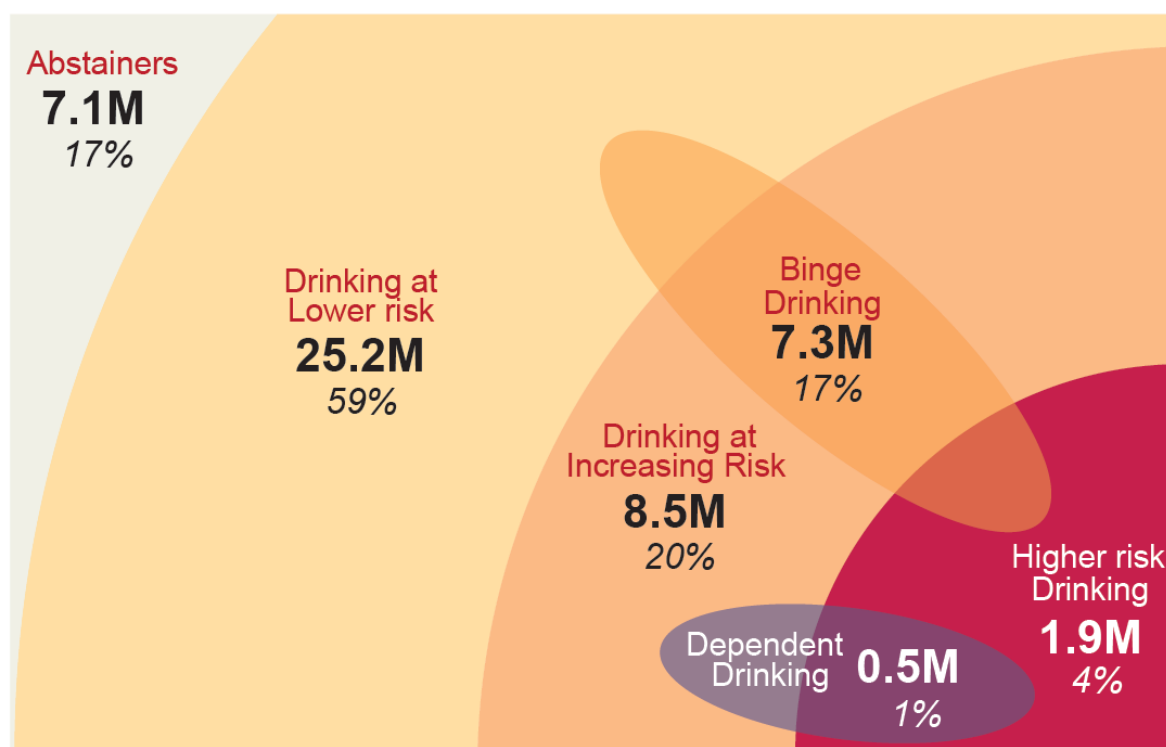
The most recently published data on consumption is from the 2014 HSE (40). Eighty-two per cent of adults said that they drank alcohol and had done so in the last 12 months. Men were more likely than women to report drinking, 85% and 79% respectively. The proportion of men and women who drink increases as neighbourhood deprivation decreases, in other words, the highest rates of alcohol consumption are in the least deprived areas. The proportion of adults who do not drink varies between ethnic groups (Figure 3).

Figure 3: The proportion of people who do not drink alcohol by race and gender, England 2014 (40)



In 2014, over 10 million adults were regularly drinking more than 14 units of alcohol each week (Figure 4). Of these, 1.9 million were drinking at high-risk levels, defined as drinking more than 35 units per week for women and more than 50 units per week for men.

Figure 4: The distribution of drinkers in England, 2014^[i] (40)



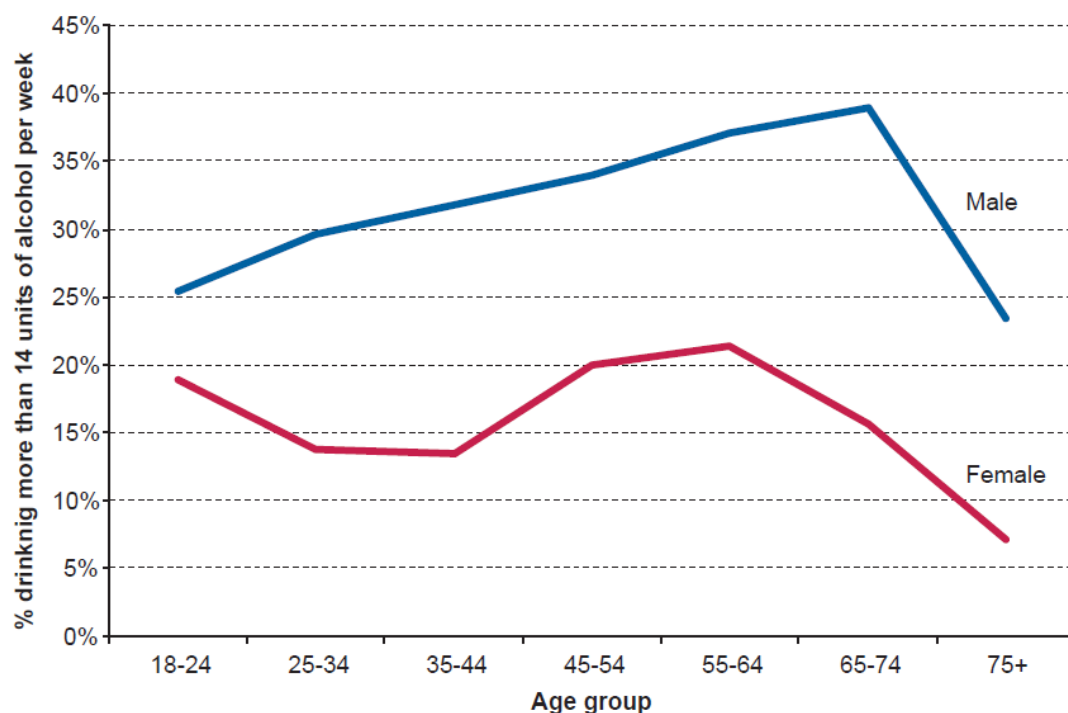
[i] Lower risk defined as ≤ 14 units; Increasing risk defined as > 14 and ≤ 50 units for men and ≤ 35 units for women; Higher risk defined as > 50 units for men and > 35 units for women; Binge drinking defined as 8+/6+ units on heaviest drinking day in previous week for men and women respectively; Dependent drinking derived from the Adult Psychiatric Morbidity Survey

Levels of alcohol consumption vary with age and gender (Figure 5). Among men, the prevalence of drinking more than 14 units a week increases with age and is most common among men aged 65 to 74 years. Thirty-nine per cent of men this age drink at this level. Among women, the proportion who drink more than 14 units a week declines between the ages of 25 and 44 years, and is highest among women aged 55 to 64 years with 21% of women this age drinking at this level. Drinking at these levels declines for men aged over 75 years and women aged over 65 years. Frequent drinking defined as drinking on five or more days each week, increases with age for men and women up to the age of 64 years and then declines.

For men and women, binge drinking, defined as exceeding eight units in one day for men and six units in one day for women, is highest in the youngest age groups, peaking in the 25 to 34 years group and then reduces with age. Nineteen per cent of men and

11% of women were exceeding these daily values on at least one occasion in the previous week in 2014.

Figure 5: The proportion of adults drinking more than 14 units^[i] of alcohol per week by age and gender, England, 2014 (40)



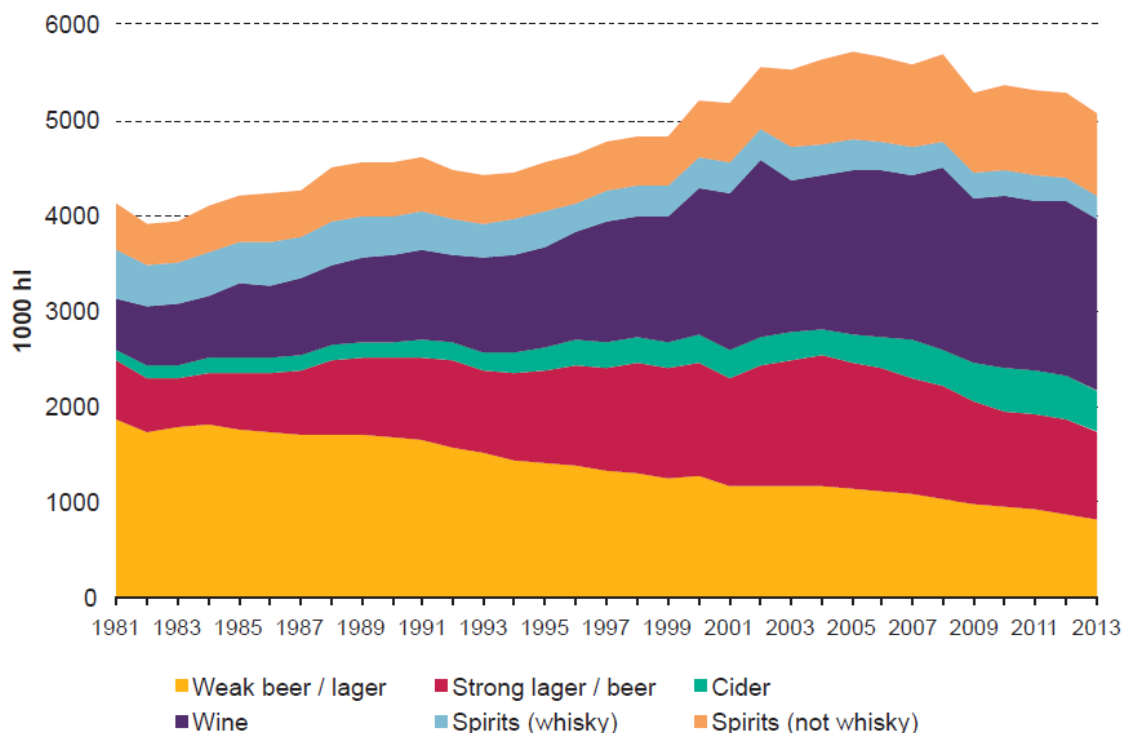
[i] The Chief Medical Officer's low-risk alcohol consumption guidelines

Trends in alcohol consumption

According to Her Majesty's Revenue and Customs (HMRC) duty and tax receipts, alcohol sales in England and Wales have increased by around 42% from roughly 400 million litres in the early 1980s, peaking at 567 million litres in 2008 and have since declined (Figure 6) (45). This increase was predominantly driven by increased consumption by women, a move to higher strength products and increasing affordability of alcohol, particularly in the 1980s and 1990s (45–47). Although consumption has declined in recent years, levels of abstinence have also increased. Consequently, how much of the decline is actually related to drinkers consuming less alcohol and how much to an increasing proportion of the population not drinking at all remains unclear.

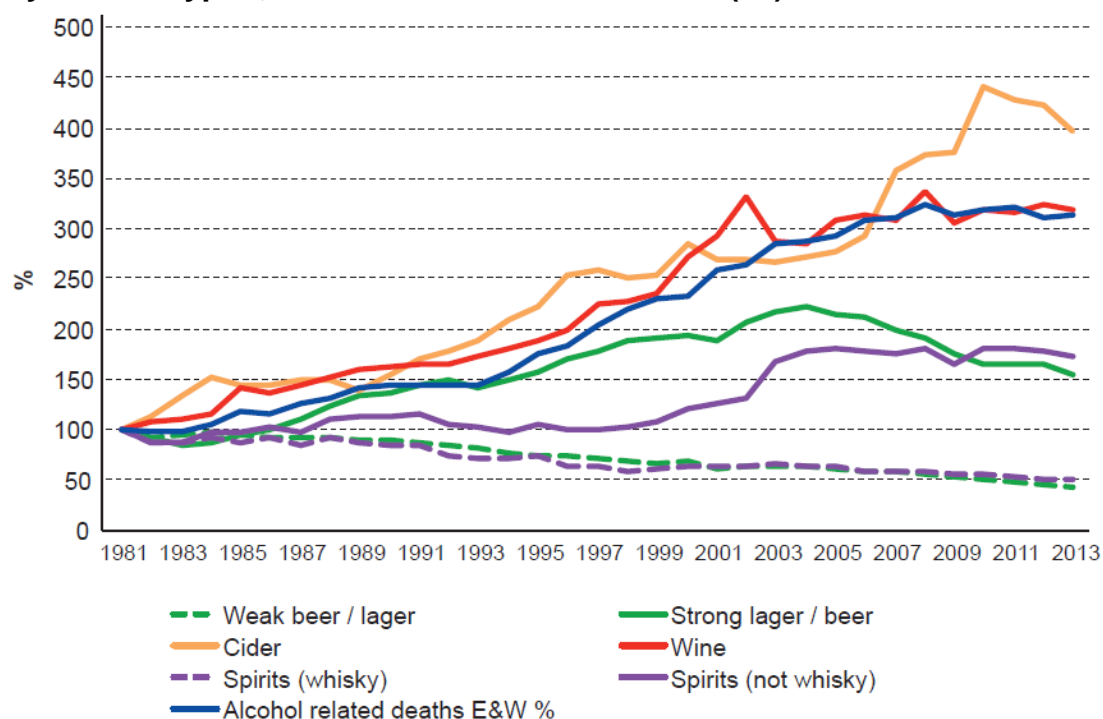
Figure 7 shows the same data as in Figure 6, normalised to 100% in 1980. Over this period the consumption of wine and strong lager or beer has increased, as has the consumption of spirits, though consumption of whisky has decreased. Over this period, the way in which alcohol is sold and consumed also changed. In 2014, alcohol was 60% more affordable than it was in 1980 (48) and in 2016, there were 210,000 licensed premises in England and Wales representing an increase of 3% compared to 2014 (49). There has also been a shift in drinking location and most alcohol is now bought from shops and drunk at home (50).

Figure 6: Cumulative consumption of alcohol in hectolitres in England and Wales by alcohol type^[i] (45)



[i] consumption of beer and lager is split between weak and strong beverages with a cut-off of around 4.2% alcohol by volume (ABV). Spirits consumption is categorised as whisky/non-whisky

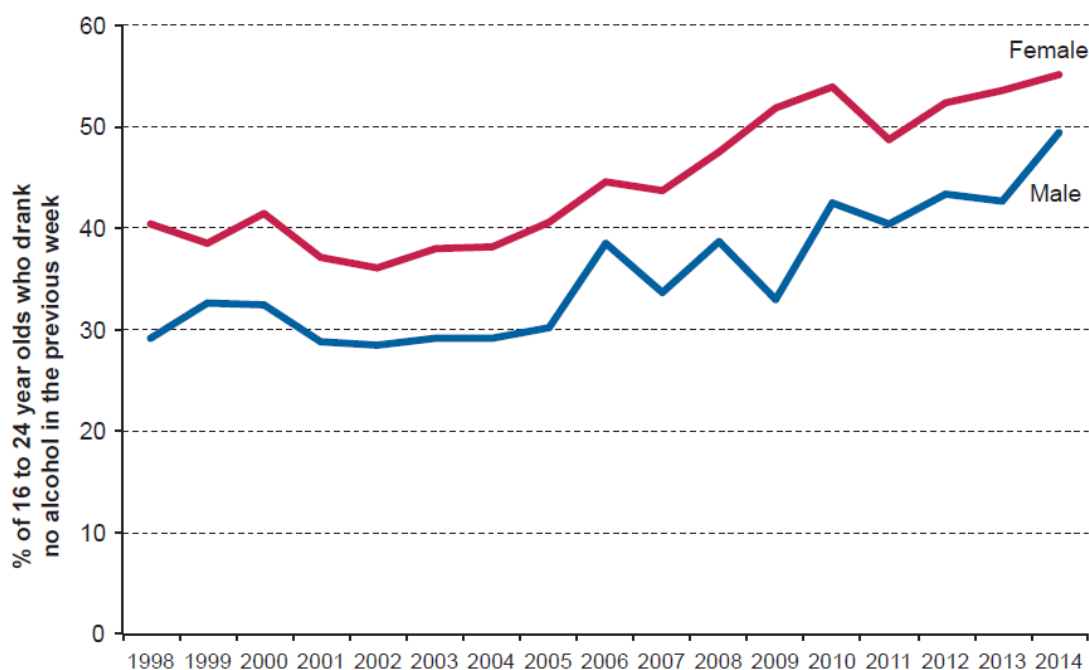
Figure 7: Cumulative consumption of alcohol in hectolitres in England and Wales by alcohol type^[i], normalised to 100% in 1980^[ii] (45)



[i] consumption of beer and lager is split between weak and strong beverages with a cut-off of around 4.2% alcohol by volume (ABV). Spirits consumption is categorised as whisky/non-whisky [ii] An arbitrarily chosen year

Over the past five to 10 years, household surveys indicate a reduction in self-reported alcohol consumption. Fewer men and women report frequent and binge drinking (39,40). The proportion of adults abstaining from alcohol is increasing, particularly for those aged under 25 years (Figure 8).

Figure 8: Percentage of adults aged 16 to 24 years who had drunk no alcohol in the previous week by gender, England 2014 (40)

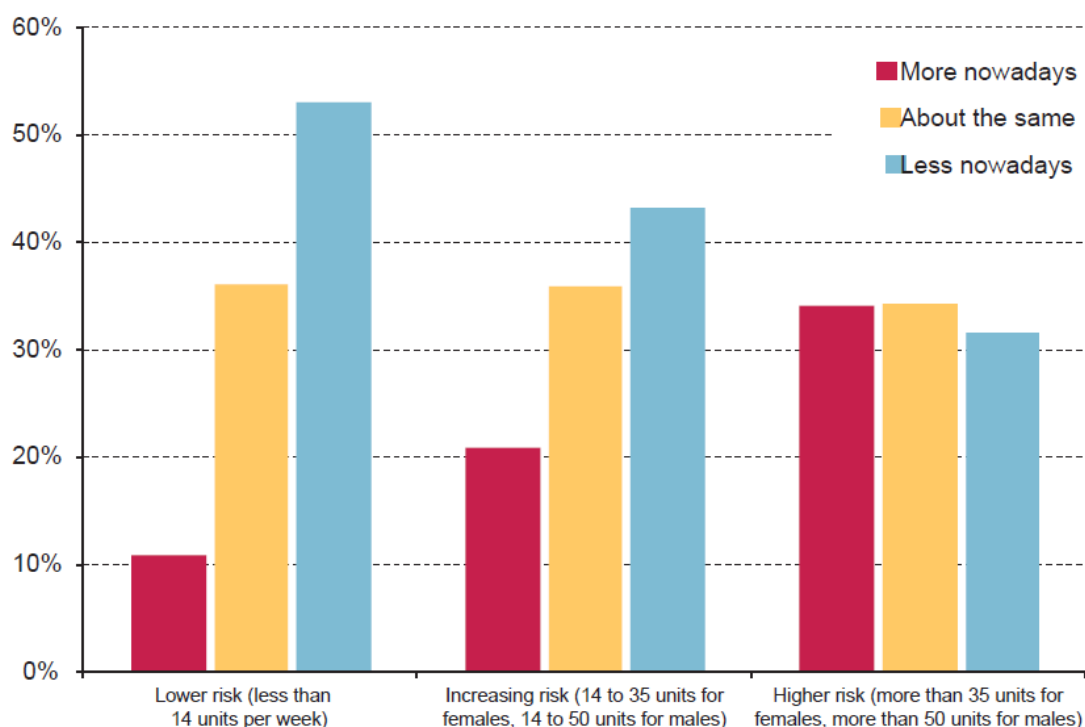


The Smoking, Drinking and Drug Use Survey in England measures alcohol consumption in children aged 11 to 15 years and shows a steady decrease in drinking among this group in recent years (51). In 2014, 38% of pupils aged 11 to 15 years said they had ever had a drink, compared with 61% of pupils of same age 2003. Whether a pupil had consumed alcohol was related to their age, increasing from 8% of 11 year olds to 69% of 15 year olds.

Analysis of 25 years of General Lifestyle Survey data shows that the recent falls in overall consumption can be attributed to reduced consumption and increased abstinence rates in those born after 1985, particularly in males, and a general increase in abstinence rates across all groups (47).

Nonetheless, there is evidence from the HSE that, at an individual level, reduced consumption is more likely in those already drinking at lower-risk levels. Between 2011 and 2013, 89% of those drinking at lower-risk said that they were drinking the same or less than they had five years ago (40). In contrast, two-thirds of those drinking in the highest risk group, defined as more than 35 units a week for women and more than 50 units for men, said they were drinking more or the same as five years ago (Figure 9).

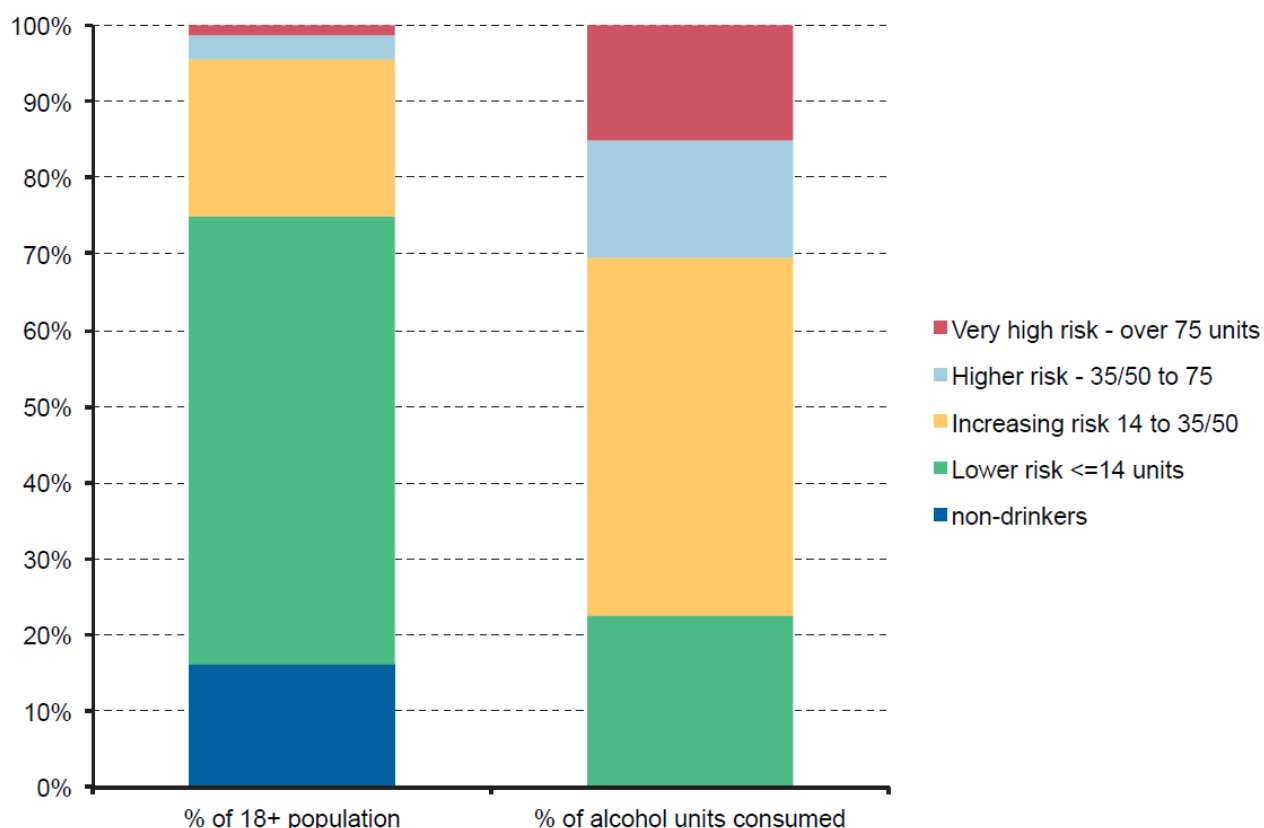
Figure 9: Amount of alcohol drunk now compared to five years ago by consumption risk group, 2011 to 2013 combined, England (40)



Alcohol consumers

Drivers of alcohol consumption apply to all drinkers across the spectrum from harmful drinkers to low risk drinkers. Combined data from the 2012 to 2014 HSE reports that 16% of the population sample are non-drinkers, 58.8% drink at lower-risk levels (≤ 14 units per week), 20.8% at increasing-risk levels (>14 to 35/50 units per week for women and men respectively), and 3.1% at higher-risk levels ($\geq 35/50$ to 75 units per week for women and men respectively). For illustrative purposes, those drinking ≥ 75 units per week have been identified and comprise 1.3% of the population. This group, alongside the higher-risk drinkers comprise only 4.4% of the population, but consume over one third of all self-reported alcohol (Figure 10). The combination of increasing-risk, higher-risk and extreme drinkers accounts for about 25% of the population and consumes over 75% of the total self-reported alcohol consumption.

Figure 10: The distribution of drinkers by risk group and the amount of alcohol consumed, years 2012 to 2014 combined (45)

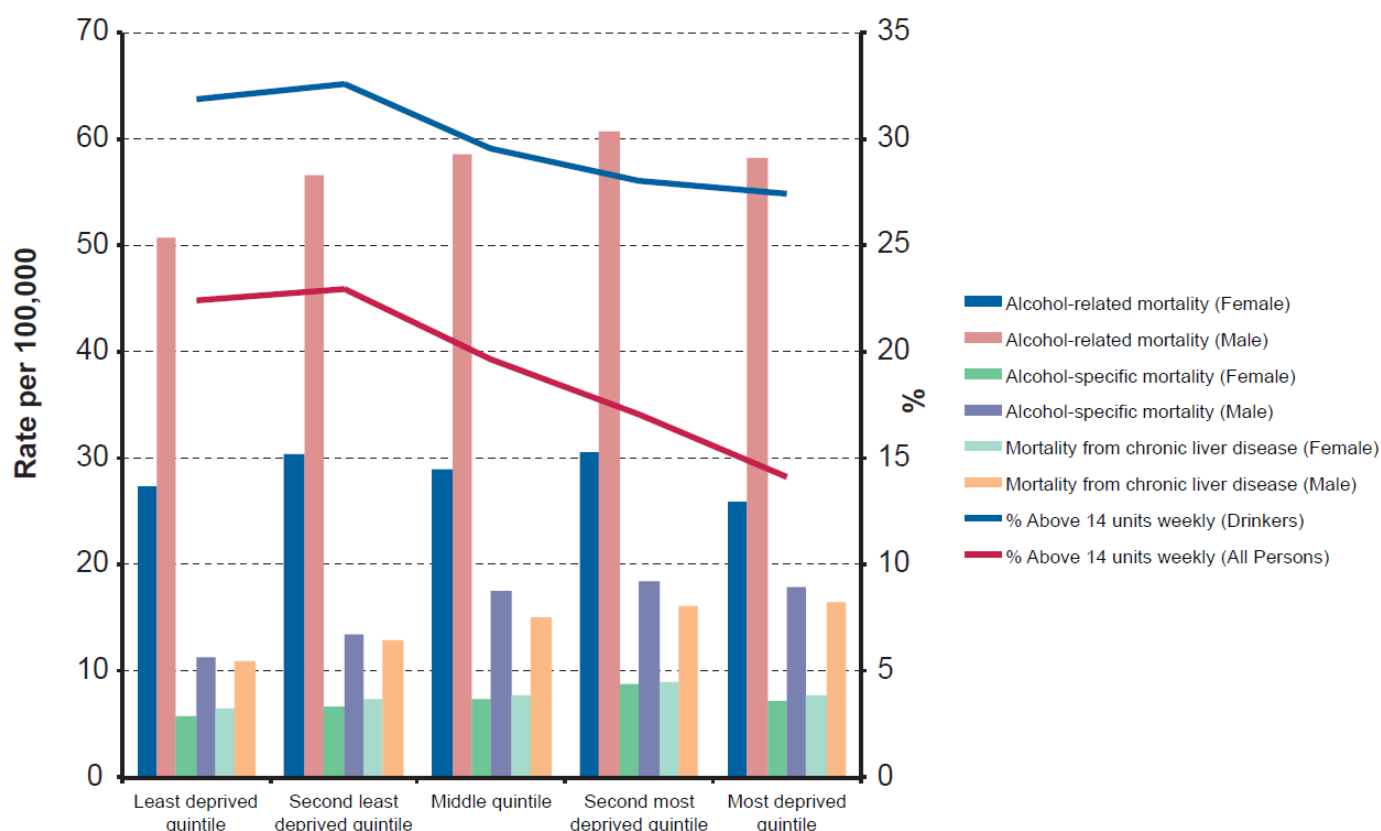


The alcohol harm paradox

People of lower socioeconomic status show greater susceptibility to the harmful effects of alcohol (52) and are more likely to die or suffer from a disease relating to their alcohol use (53). In the English population, rates of alcohol-specific and related mortality increase as levels of deprivation increase (54) and alcohol-related liver disease is strongly related to the socioeconomic gradient (55) (Figure 11).

Lower socioeconomic groups often report lower levels of average consumption, as shown by the decreasing lines in Figure 11. Yet experience greater or similar levels of alcohol-related harm. This is particularly true for mortality from chronic liver disease. This gives rise to what has been termed the 'alcohol harm paradox' whereby disadvantaged populations who drink the same or lower levels of alcohol, experience greater alcohol-related harm than more affluent populations.

Figure 11: Variations in alcohol-related mortality and drinking patterns by deprivation status in England



A number of hypotheses try to explain this pattern although there is limited evidence of the possible impact of each of these factors:

- different drinking patterns in different groups, for example, increased binge drinking in lower socioeconomic groups
- lower resilience and/or compounding effects with other risk factors or health conditions for those in lower socioeconomic groups
- differential access to health services between socioeconomic groups

Alcohol consumption and health

Introduction

All major body systems are affected by alcohol consumption. The effects vary according to a number of factors including age, gender, body mass index (BMI), pattern and volume of alcohol consumption and the length of time someone has been consuming alcohol. The health effects of alcohol can be acute, for example poisoning or injury, and chronic (long term), for example liver cirrhosis, cardiovascular disease or female breast cancer. Of more than 200 International Classification of Disease (ICD-10) disease and injury codes for which alcohol consumption is a component cause, more than 30 include alcohol in their name or definition (3).

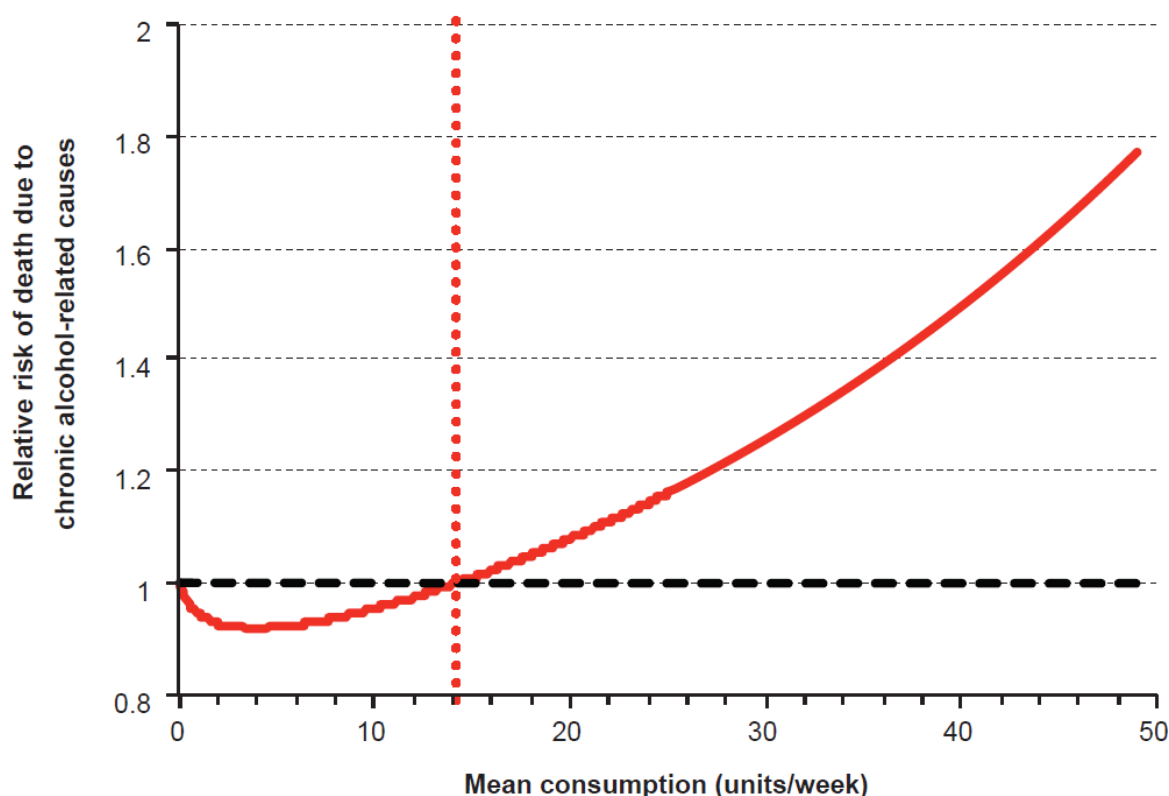
This section outlines the relationship between alcohol consumption and a number of health conditions. Many of the studies in this section are meta-analyses so the quality of the pooled evidence is determined by the quality of the primary research included in the meta-analysis. Some studies report a 'J-shaped relationship', in which light to moderate drinkers have a lower risk of developing a health condition than people who do not drink and heavy drinkers are at the highest risk. This effect is thought to occur largely due to methodological issues of the studies. A brief description of how to interpret this relationship is outlined below.

Interpreting the J-shaped relationship

There has been widespread debate on whether moderate alcohol consumption is good for you. Analyses of multiple studies have identified evidence that moderate drinking may provide some protection against five health conditions: ischaemic heart disease, also known as coronary heart disease, ischaemic stroke, haemorrhagic stroke, hypertensive diseases, also known as high blood pressure and Type II diabetes. For ischaemic heart disease in particular, people who do not drink at all appear to have a higher death rate than those who drink small amounts. These potential protective effects are illustrated in Figure 12 which shows the relationship between the amount of alcohol consumed per day and the risk of dying from a chronic alcohol-related disease (56).

The results show a J-shaped curve, that is, those who drink no alcohol appear to have a greater risk of alcohol-related death than those who drink a small amount of alcohol per week, but as drinking gets heavier, the risk of alcohol-related death increases steadily. This has led to the conclusion that moderate drinking may have protective effects against ill-health.

Figure 12: The relationship between average weekly alcohol consumption and the risk of dying from a chronic alcohol-related disease (56)



However, there are a number of factors to be aware of when interpreting these results. Firstly, comparing the risk of getting ill or dying for people who do drink alcohol with those who do not drink is problematic. Health surveys typically ask about current drinking levels and the classification of ‘non-drinkers’ can include former drinkers, occasional drinkers and people who have never consumed alcohol. This group of ‘non-drinkers’ is not a reliable comparison group as it may include individuals who never started drinking for a variety of reasons which may make them more susceptible to poor health (eg a lifelong disability), and former drinkers who may have stopped drinking due to poor health. Therefore studies that compare the health outcomes of drinkers to non-drinkers and do not account for pre-existing poor health may overestimate any protective effect from alcohol consumption.

Furthermore, health surveys generally underestimate alcohol consumption due to the exclusion or poor representation of people who are hard to access, less able to participate or do not live in private households in addition to inaccuracies in respondents recalling and reporting their drinking behaviour and problems with measurement error as people try to convert their consumption into units of alcohol or standard drinks.

Finally, relating drinking at a single point in time to health outcomes and measuring average daily or weekly consumption without account for drinking patterns can lead to less accurate estimates of any J-shaped relationship.

Recent further analysis has shown that, in the UK, any potential protective effects seems mainly relevant to older age groups, particularly to women, and the peak of any protective effect is achieved at very low levels of consumption, around one unit of alcohol per day (56). Other factors, for example, the health of people who can afford to drink more in older age may be better than those who do not, may explain a substantial part of the protection observed. There are no biological processes which have been robustly evidenced to explain the J-shaped curve effect.

Alcohol-related hospital admissions

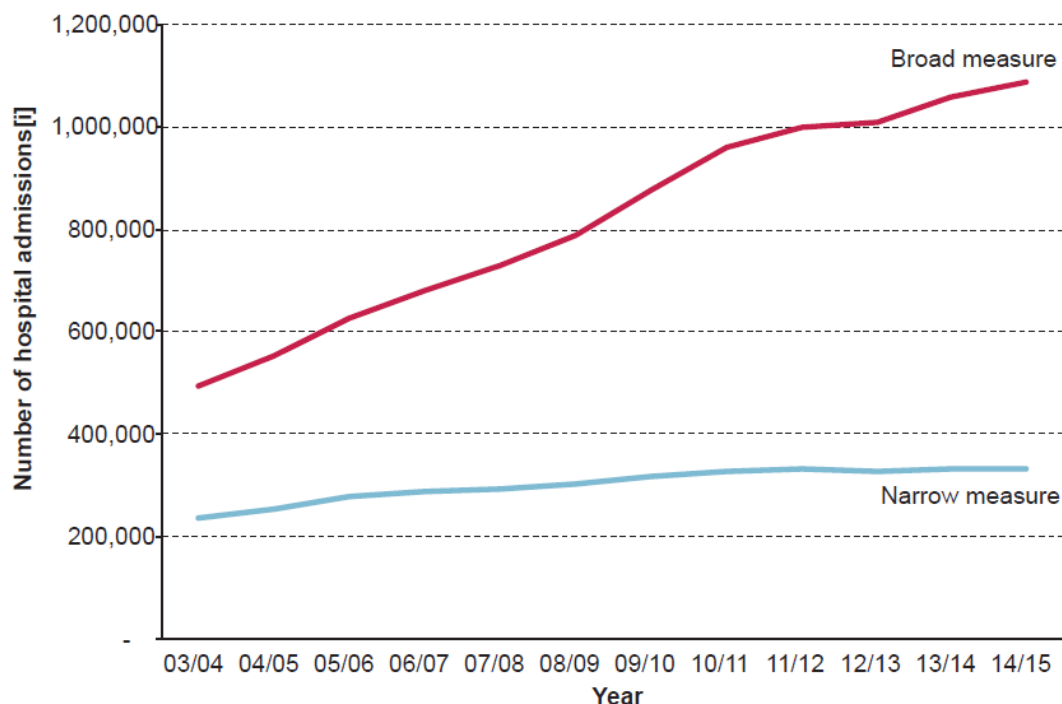
Alcohol-related hospital admissions are used as a way of understanding the impact of alcohol on the health of a population. This section presents data on the number of alcohol-related hospital admissions for diseases, injuries and conditions in England in 2014/15. Estimates of the number of alcohol-related hospital admissions have been calculated by applying the alcohol-attributable fractions (AAF) to Hospital Episode Statistics (HES) data. Two measures for alcohol-related hospital admissions have been used:

- broad measure: where an alcohol-related disease, injury or condition was the primary reason for hospital admission or a secondary diagnosis
- narrow measure: where an alcohol-related disease, injury or condition was the primary reason for a hospital admission or an alcohol-related external cause was recorded in a secondary diagnosis field

The narrow measure is less sensitive to changes in recording practices and therefore enables fairer comparisons between levels of harm in different areas and over time. The broad measure is a better measure of the total burden alcohol has on community and health services.

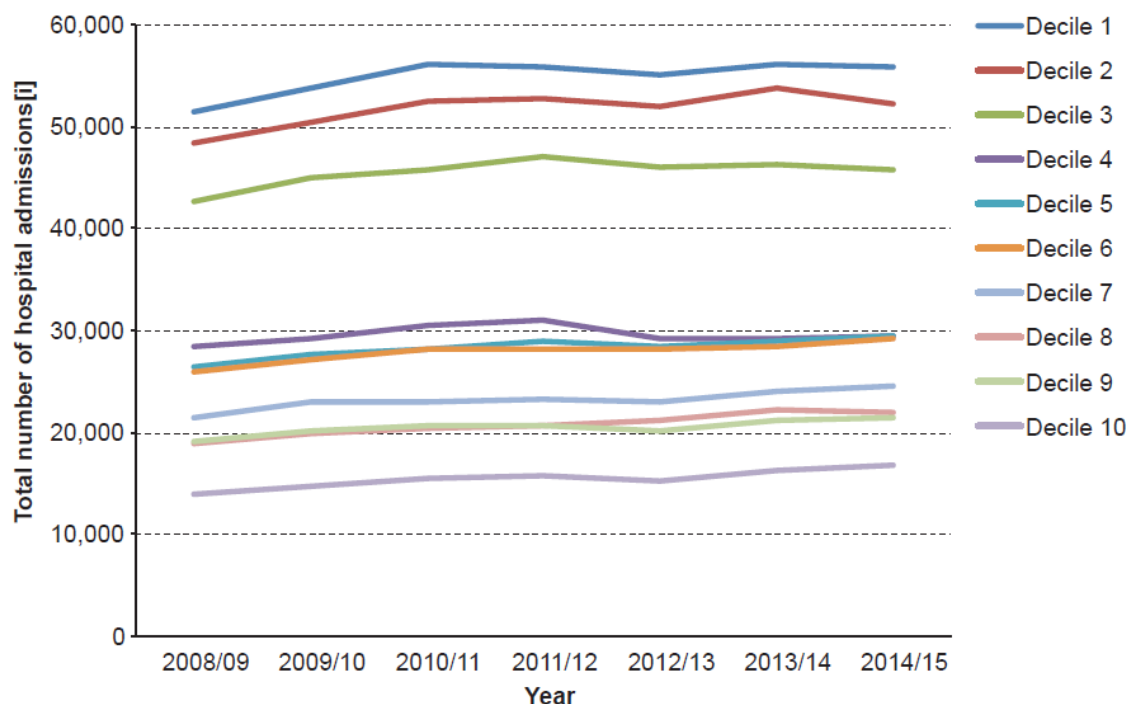
Figure 13 shows the trend in hospital admissions for the broad and narrow measures between 2003/04 and 2014/15 (57). Since 2003/04, alcohol-related hospital admissions have been steadily increasing, accounting for over 1 million admissions in 2014/15, of which about 333,000 were the main reason for admission was attributed to alcohol. Similar trends are seen across all socioeconomic groups (Figure 14), although almost half (47%) of all hospital admissions occur in the lowest three socioeconomic groups.

Figure 13: Total number of hospital admissions in England, 2003/04 to 2014/15, broad and narrow measure (57)



[i] Rounded to nearest 10

Figure 14: Total number^[i] of hospital admissions in England, 2008/09 to 2014/15, narrow measure, by socioeconomic decile, decile 1=least affluent (57)



[i] Rounded to nearest 10

Figures 15 and 16 show the percentage of hospital admissions by disease, injury or condition in 2014/15 according to the broad and narrow measures (57).

Figure 15: The percentage of hospital admissions by disease, injury or condition in 2014/15, broad measure (57)

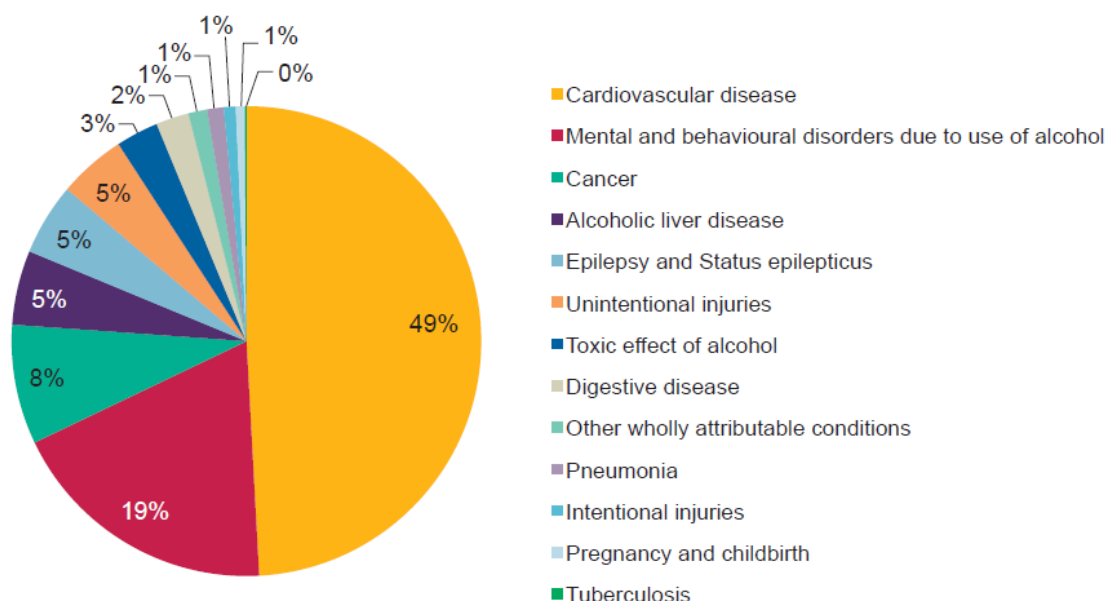
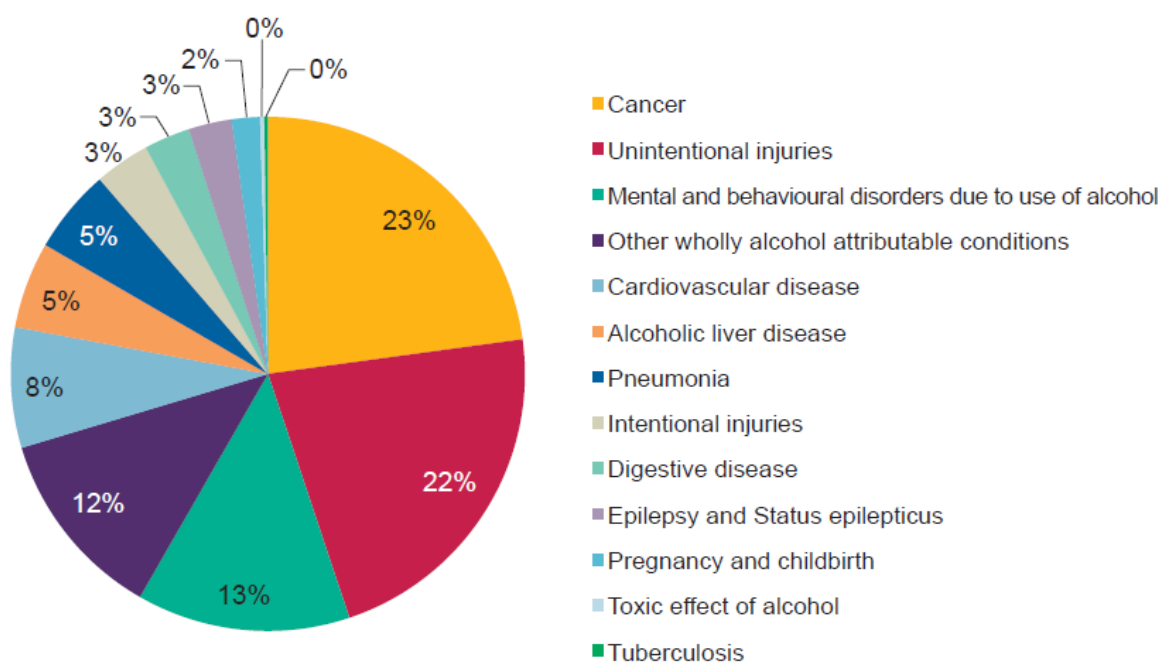


Figure 16: The percentage of hospital admissions by disease, injury or condition in 2014/15, narrow measure (57)



According to the broad measure, admissions for cardiovascular disease account for almost half of all alcohol-related admissions in 2014/15. The next most common admission was for mental and behavioural disorders and then cancer. Admissions for cardiovascular disease namely hypertension, often feature as a secondary diagnosis and is therefore more common among the broad measure.

For the narrow measure, hospital admissions for cancer represent the most common condition for admissions accounting for 23% of all alcohol-related conditions in 2014/15.

Unintentional injuries were the next most common admission, followed by mental and behavioural disorders for alcohol use.

Importantly, the prevalence of an admission does not directly relate to the economic burden of treating that disease. For example, treating a smaller number of cases with liver disease is likely to cost more than treating a greater number with injury.

Tables 1 and 2 show the number of hospital admissions in 2014/15 for the major conditions by socioeconomic decile for the broad and narrow measure (57). Admissions are colour coded displaying a decile range with red representing a greater number of admissions.

Table 1: The number of hospital admissions in 2014/15 for the major conditions by socioeconomic decile for the broad measure^[i]

Broad disease, condition or injury	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Total
Cardiovascular disease	85,070	79,760	72,000	51,060	47,320	50,070	41,860	37,730	36,980	30,190	532,040
Mental and behavioural disorders due to use of alcohol	42,780	35,880	28,030	17,470	16,660	13,950	13,420	9,260	10,470	7,700	195,620
Alcoholic liver disease	11,420	9,550	8,190	4,900	4,600	4,130	3,990	2,970	2,970	2,470	55,190
Cancer	11,400	12,890	12,030	8,000	8,230	9,770	6,880	7,830	6,980	5,090	89,100
Epilepsy and Status epilepticus	9,940	8,510	7,470	5,050	4,650	4,400	3,920	3,360	3,400	2,690	53,390
Unintentional injuries	7,860	7,730	7,130	4,280	4,630	4,400	3,840	3,470	3,670	2,950	49,960
Toxic effect of alcohol	5,790	5,060	4,540	2,740	2,930	2,770	2,080	1,870	1,840	1,380	31,000
Digestive disease	4,350	4,000	3,640	2,160	2,180	2,070	1,820	1,560	1,500	1,190	24,470
Other wholly-attributable conditions	3,040	2,360	2,120	1,150	1,150	1,000	890	700	720	610	13,740
Pneumonia	1,870	1,930	1,750	1,060	1,100	1,100	970	890	880	740	12,290
Intentional injuries	1,760	1,500	1,310	780	720	680	570	470	480	370	8,640
Pregnancy and childbirth	1,400	960	800	560	540	510	410	330	400	280	6,190
Tuberculosis	300	240	140	110	90	70	100	30	50	30	1,160

^[i] Rounded to nearest 10

Hospital admissions tend to be concentrated in the lowest three socioeconomic deciles with almost half (47%) of all admissions occurring in the three lowest socioeconomic groups. Over half (55%) of all admissions for mental and behavioural disorders due to alcohol use were in the lowest three socioeconomic deciles, and these three groups also accounted for 53% of all admissions for alcoholic liver disease, 53% of all admissions for intentional injuries and 51% of all admissions for alcohol-related complications in pregnancy and childbirth.

Table 3 shows admissions for cancer in 2014/15 separated by cancer type and socioeconomic decile. Admissions are colour coded displaying a decile range with red representing a greater number of admissions.

Table 2: The number of hospital admissions in 2014/15 for the major conditions by socioeconomic decile for the narrow measure^[i]

Description	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Total
Total number of admissions	55,980	52,250	45,700	29,540	29,470	29,110	24,550	21,900	21,570	16,850	326,920
Unintentional injuries	11,800	11,260	10,270	6,340	6,680	6,370	5,620	4,950	5,210	4,200	72,700
Cancer	9,760	11,020	10,160	6,940	6,950	8,380	5,710	6,740	6,100	4,230	75,990
Mental and behavioural disorders due to use of alcohol	9,350	7,870	5,710	3,890	3,690	2,870	3,160	1,840	1,800	1,430	41,610
Other wholly-attributable conditions	7,600	6,490	5,810	3,420	3,620	3,340	2,650	2,250	2,280	1,760	39,220
Alcoholic liver disease	3,830	3,240	2,640	1,670	1,440	1,240	1,310	890	900	820	17,980
Cardiovascular disease	3,430	3,550	3,310	2,360	2,370	2,440	2,100	1,970	1,890	1,680	25,100
Pneumonia	2,830	2,730	2,470	1,530	1,540	1,570	1,400	1,260	1,210	1,060	17,600
Intentional injuries	2,300	1,980	1,670	1,030	940	860	730	590	610	470	11,180
Epilepsy and Status epilepticus	1,750	1,420	1,340	840	730	700	650	480	550	450	8,910
Digestive disease	1,730	1,550	1,410	880	880	770	730	580	590	460	9,580
Pregnancy and childbirth	1,260	850	710	480	480	440	380	290	360	230	5,480
Tuberculosis	180	160	90	70	50	30	70	10	30	20	710
Toxic effect of alcohol	170	140	110	90	80	80	60	50	60	50	890

^[i] Rounded to nearest 10

Table 3: The number of hospital admissions for cancer in 2014/15 separated by cancer type and socioeconomic decile^[i]

	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10
	13%	15%	13%	9%	9%	11%	8%	9%	8%	6%
Total	9760	11020	10160	6940	6950	8380	5710	6740	6100	4230
Liver	3200	3990	3400	2300	2310	3020	1910	2430	2130	1400
Colorectal	2710	2840	2830	1990	2040	2370	1550	1920	1930	1260
Oesophagus	2070	2250	2100	1580	1540	1730	1390	1500	1210	920
Breast	1330	1490	1350	790	800	930	660	670	620	490
Larynx	230	270	260	160	120	180	90	100	90	80
Lip, oral cavity and pharynx	210	180	210	130	140	150	110	110	120	80

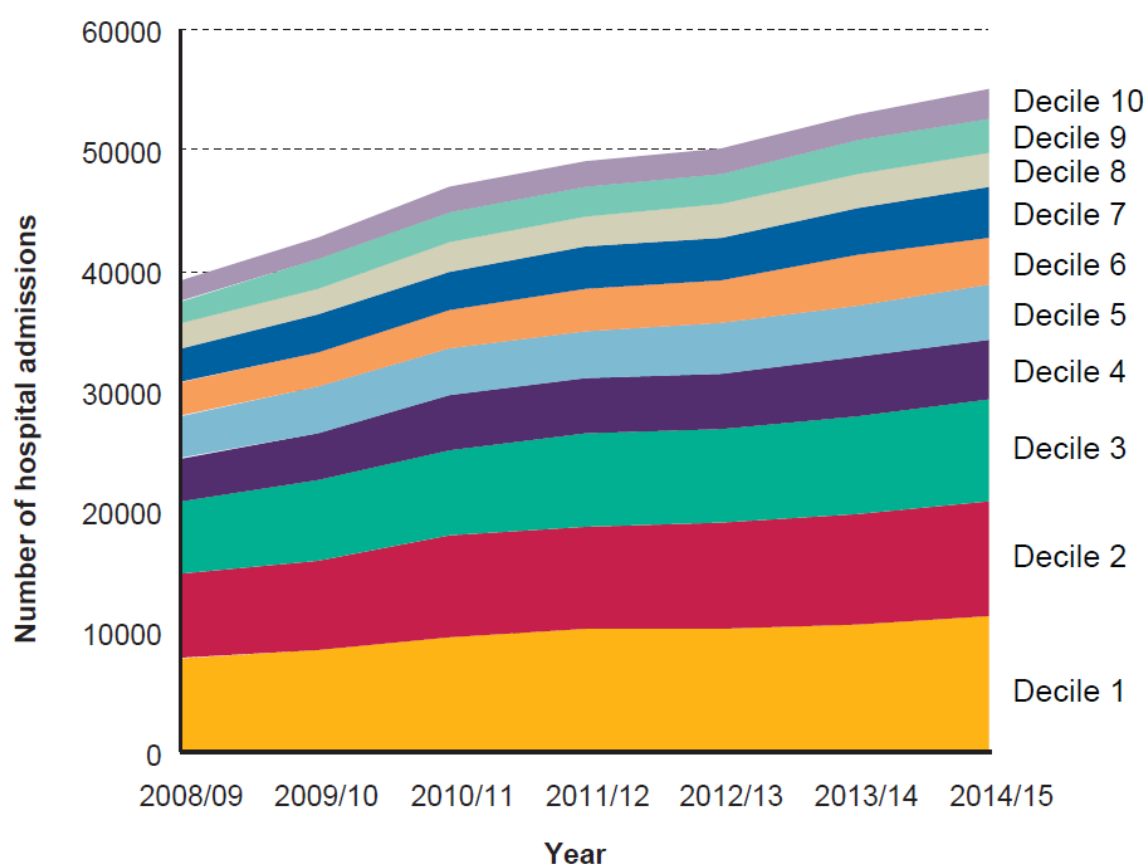
^[i] Rounded to nearest 10

Forty-one per cent of all admissions for cancer occur in the lowest three socioeconomic deciles and almost half (48%) of all admissions for larynx cancer occur in these groups.

Of all admissions, for all socioeconomic groups, admissions for liver cancer are the most common type of admission, accounting for around 29% of all cancer admissions in each group. Forty-one per cent of liver cancer admissions occur in the lowest three socioeconomic groups.

Figure 17 shows the trend in hospital admissions for liver disease by socioeconomic decile between 2008/09 and 2014/15. Admissions have increased by 41% over the period and increases are seen across all groups. In 2014/15, over half (53%) of all admissions for liver disease occurred in the lowest three socioeconomic groups.

Figure 17: The total number of hospital admissions for liver disease by socioeconomic decile between 2008/09 and 2014/15, broad measure



Alcohol-related mortality

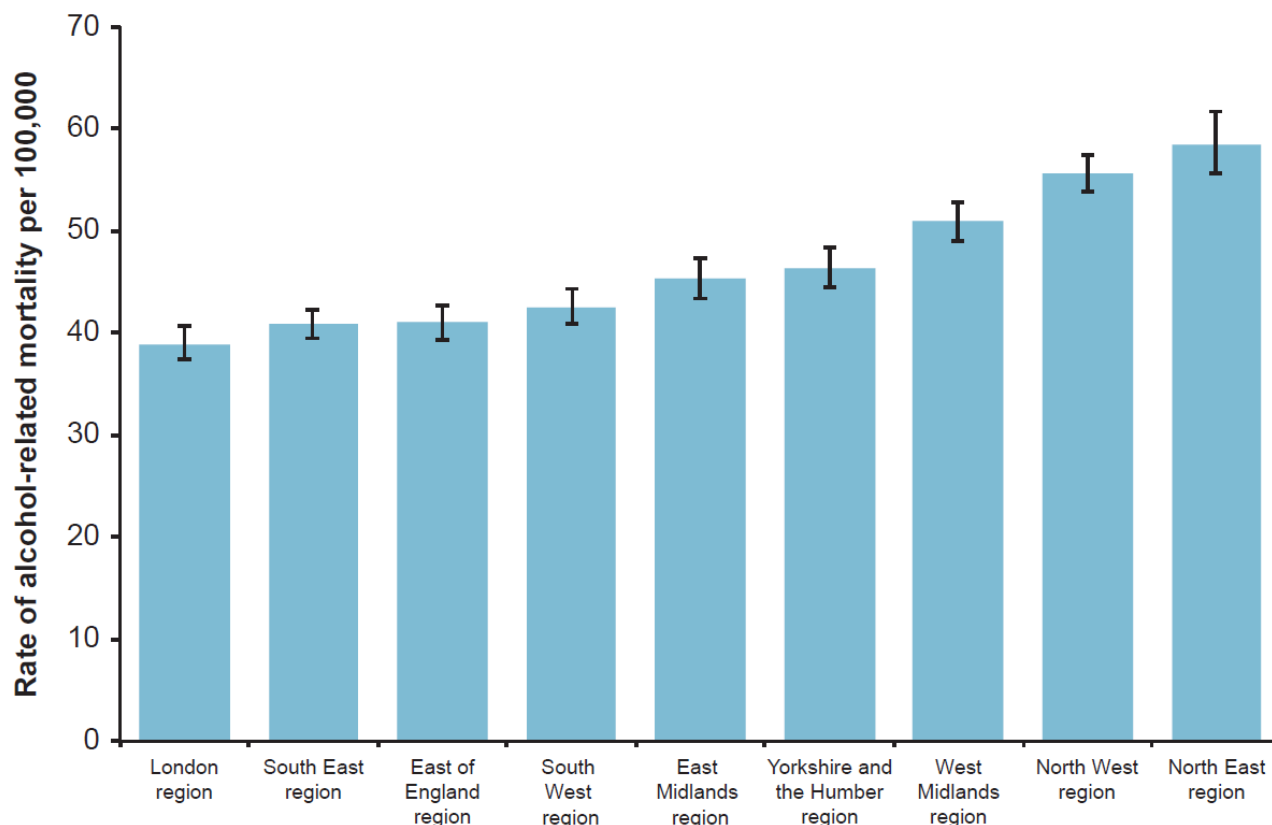
Two measures of alcohol-related mortality are available and published annually (57):

- alcohol-specific mortality: deaths from a cause which is wholly attributable to alcohol such as alcoholic liver disease and alcohol poisoning
- alcohol-related mortality: deaths which are wholly or partially attributable to alcohol

Partially attributable deaths are calculated by applying the AAFs to ONS mortality data for causes of death which are known to be related to alcohol.

In 2014 there were an estimated 23,000 deaths related to alcohol use in England. Approximately 6,000 of these were due to alcohol-specific causes. The rate of alcohol-related mortality for men (65.4 per 100,000) is more than double the rate for women (28.8 per 100,000). There is also significant regional variation with the highest rates in the North East (58.6 per 100,000) and the lowest in London (39.0 per 100,000).

Figure 18: Rate of alcohol-related mortality per 100,000 by English region



ONS publish an alcohol mortality series for the UK. This does not include diseases that are partially attributable to alcohol. However, all deaths from chronic liver disease and cirrhosis (excluding biliary cirrhosis) are included, even when alcohol is not specifically mentioned on the death certificate. While this differs slightly from the PHE alcohol-specific mortality definition, the advantage of the ONS series is that it enables data to be compared across the UK nations and also provides a long consistent time series.

Alcohol-related death rates have been consistently higher in Scotland than in England. However, the rate in Scotland has fallen sharply in the past decade for both men and women while the rate in England has been flat following a period of steady growth since the early 1990s.

Figure 19: Age standardised alcohol-related death rates England, 1994 to 2014 (females)

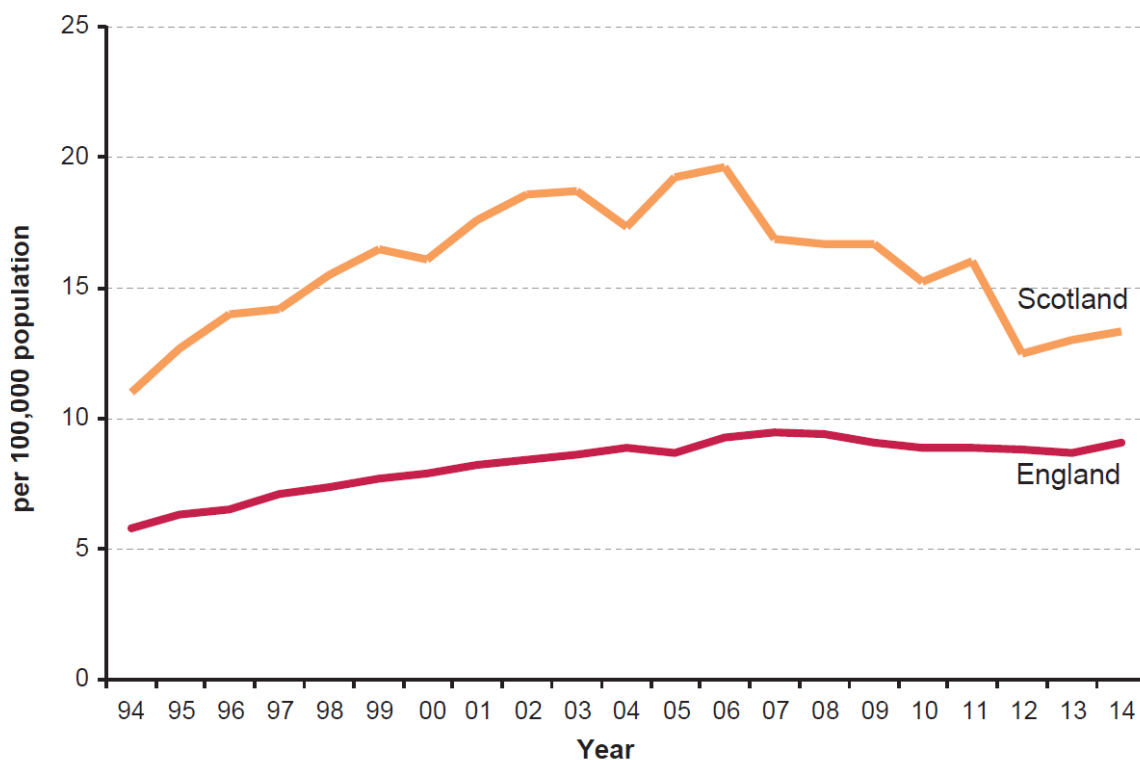
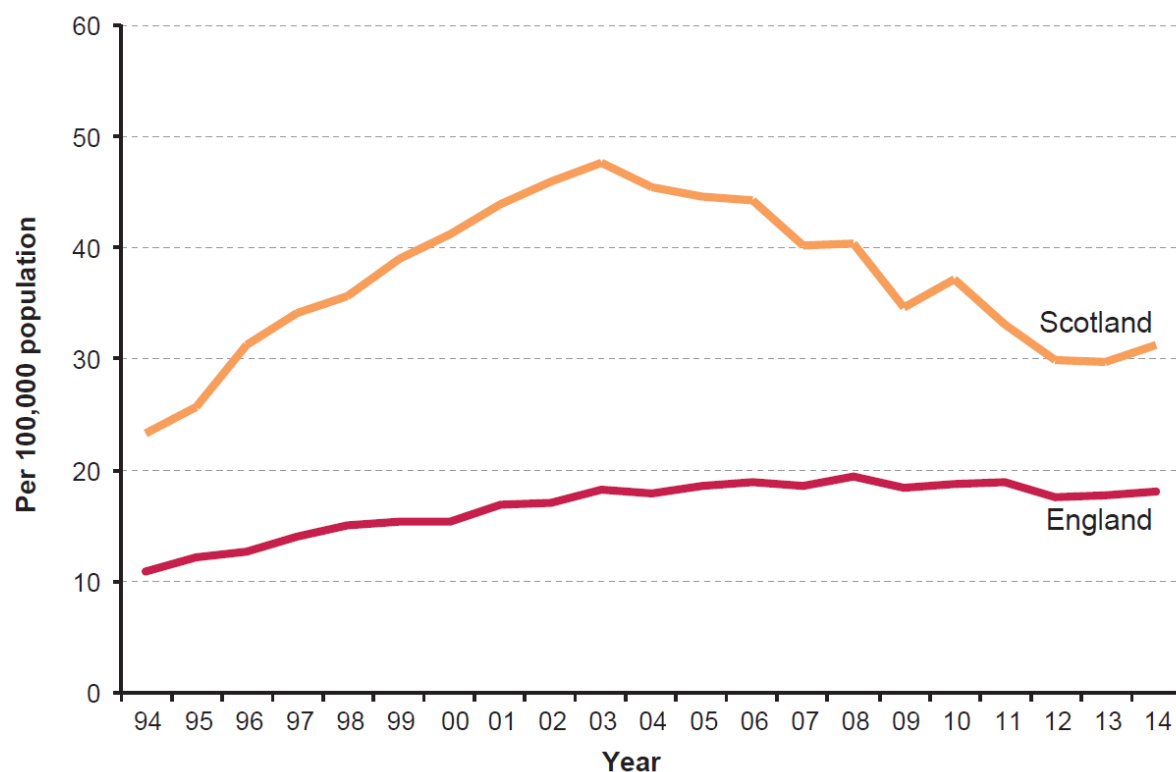


Figure 20: Age standardised alcohol-related death rates England, 1994 to 2014 (males)



For men, age-specific mortality rates increased in the majority of age groups between 1994 and the 2000s when they peaked. The most noticeable increases were in age groups up to 55 to 59 years, where rates at their peak were double those observed in 1994. Rates in these age groups have since fallen significantly, but in older age groups they have remained relatively stable. A similar picture was observed in women; however, only 40 to 44-year-olds and 50 to 54-year-olds experienced significant decreases in rates between the year they peaked and 2014.

Overall, despite improvements in the last decade or so, age-specific alcohol-related death rates were still higher in 2014 than in 1994.

Figure 22: Time trends of male alcohol-related deaths by age group, UK, 1994 to 2014

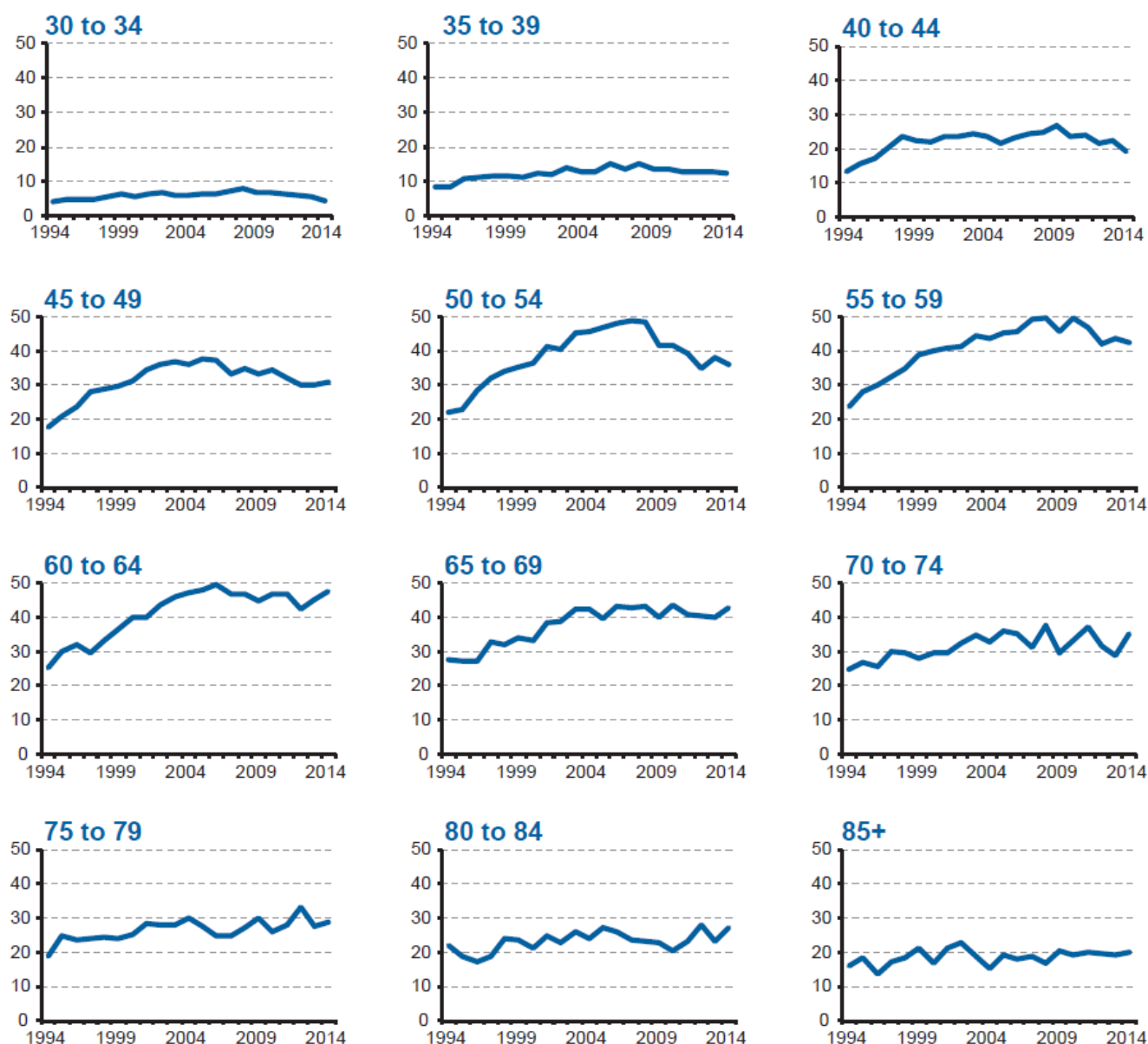
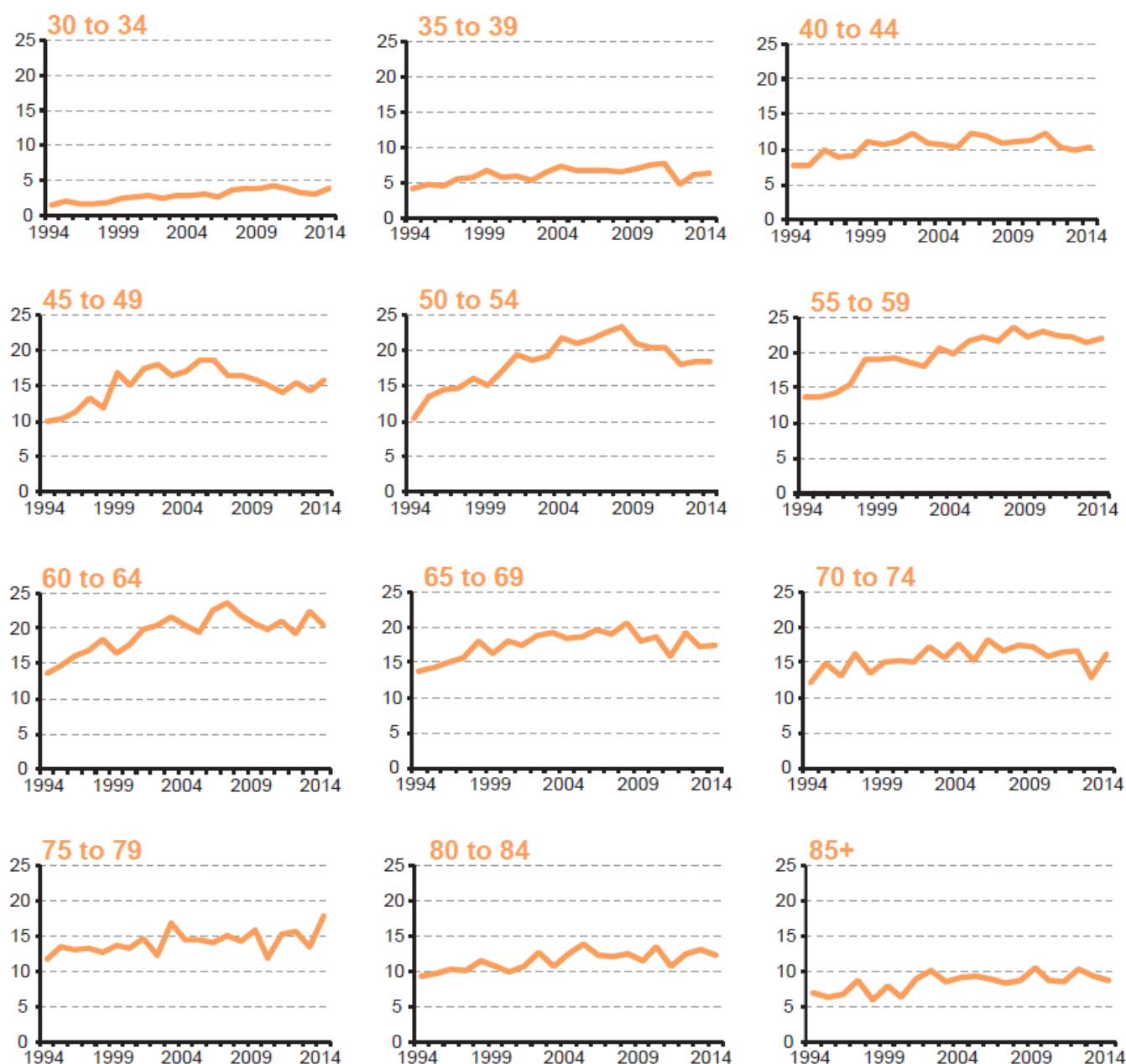


Figure 23: Time trends of female alcohol-related deaths by age group, UK, 1994 to 2014



Average age at death for alcohol-related deaths

ONS mortality data for 2014 has been used to calculate the average age at death for all causes and for alcohol-specific causes. The alcohol averages are for England only. The average age of death for all causes of death in 2014 was 77.6 years. For alcohol-specific causes the average was 54.3 years. All alcohol-specific causes where there were at least 100 deaths in England in 2014 are shown in Table 4.

Table 4: The average age of death for all causes, and alcohol-related causes

Cause of death	No. of deaths	Average age at death
All causes (England & Wales)	501,424	77.6
All alcohol-specific causes	5,884	54.3
Alcoholic liver disease	4,329	55.8
Mental and behavioural disorders due to use of alcohol	489	57.5
Toxic effects of alcohol (unspecified)	395	42.4
Accidental poisoning by exposure to alcohol	369	49.1
Ethanol poisoning	107	40.5

Years of life lost due to alcohol

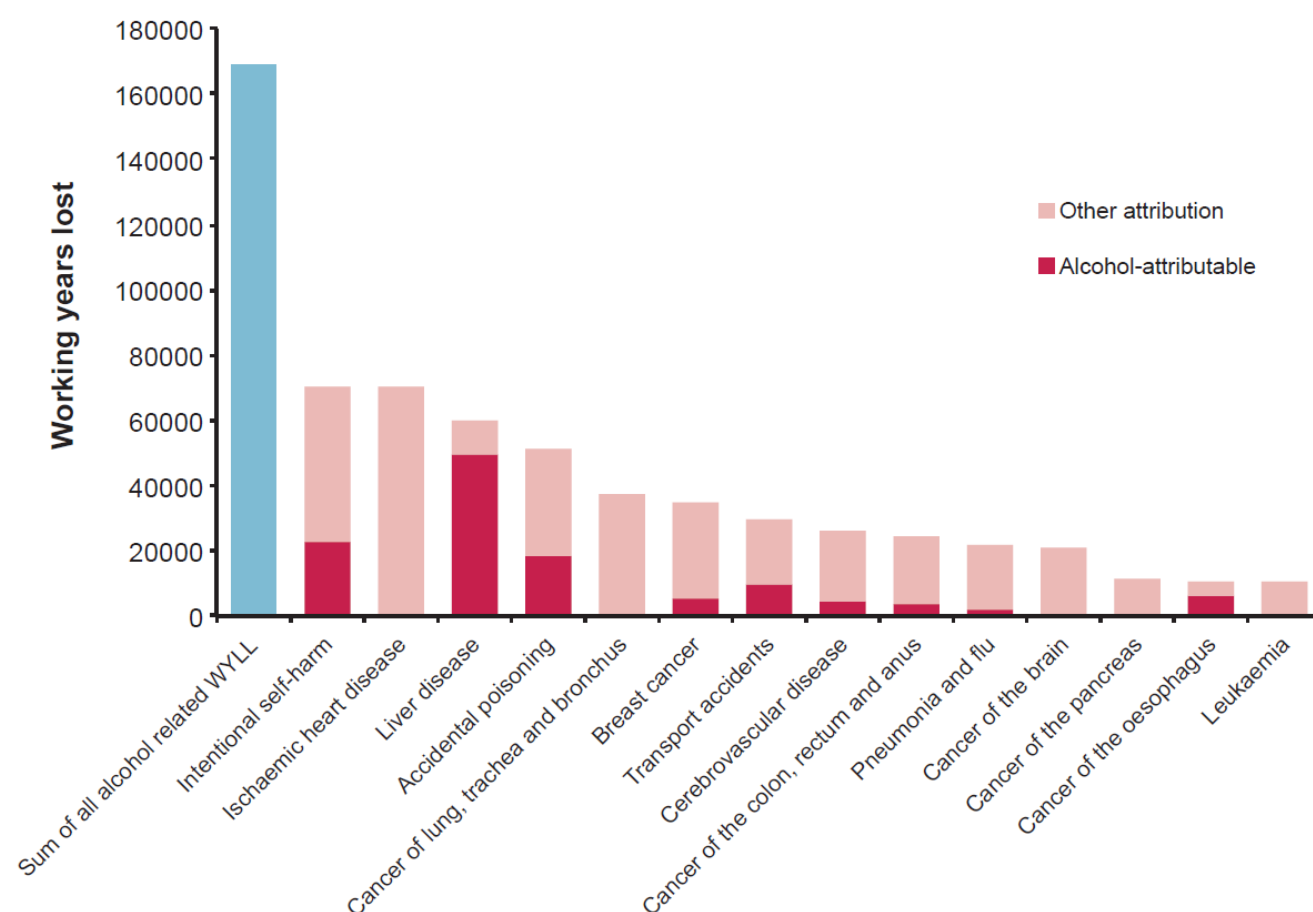
In England in 2015 there were an estimated 301,000 potential years of life lost due to alcohol in persons aged under 75. This compares with around 360,000 years of life lost due to tobacco.

Alcohol-related deaths typically occur at younger ages than smoking-related deaths and deaths from all causes. As a result alcohol leads to a large number of lost working years. In 2015 there were an estimated 167,000 working years lost due to alcohol, 16% of all working years lost in England. More working years are lost to alcohol than the 10 most frequent cancer types combined.²

Figure 24 shows the causes of death which lead to the greatest number of working years lost in England and the contribution that alcohol makes to each of these causes. The most significant of these is liver disease with 50,000 working years lost due to alcohol each year.

² The top 10 cancers in terms of deaths in 2015 were cancers of the lung, colon & rectum, prostate, breast, pancreas, oesophagus, bladder, liver, non-hodgkins lymphoma and leukaemia. Some of these cancers are also alcohol-related

Figure 24: Working years lost by underlying cause of death, England 2015



Note: YLL is calculated from the number of years between an alcohol-related death in those aged 16 to 64 and the age of 65. Alcohol-related deaths in those aged under 16 are allocated a loss of 49 years. An alcohol-related death is defined by an underlying cause of death with a condition taken from the corresponding Alcohol Attributable Fractions. This number is then multiplied by the associated AAF and summed

Cancer

Cancer is the name given to a collection of related diseases. In all types of cancer, some of the body's cells begin to divide and spread into surrounding tissues.

There is strong evidence for an association between alcohol consumption and cancer including cancers of the oral cavity and pharynx, oesophagus, female breast, colorectum, larynx, liver, stomach, pancreas, lung and gallbladder. For certain cancers, including breast cancer, any level of drinking increases your risk so there is no 'safe' level of drinking. In England in 2014/15, there were over 89,300 hospital admissions for cancer, accounting for 8% of all alcohol-related hospital admissions (57).³

³ Broad measure

A meta-analysis of over 570 observational studies including almost 500,000 cases calculated relative risks (RR) of site-specific cancer for light drinkers, moderate drinkers and heavy drinkers compared with non-drinkers for 23 types of cancer (20). Light drinkers were defined as those consuming the same or less than 12.5 grams of pure alcohol per day [g/day], moderate drinkers were defined as those who consumed above 12.5g to 50g/day and heavy drinkers were defined as those who consumed as much as, or more than 50g/day.

Compared to zero consumption, any level of alcohol consumption was associated with an increased risk of:

- cancers of the oral cavity and pharynx
- oesophagus cancer
- female breast cancer

Compared to zero consumption, moderate and heavy, but not light alcohol consumption, was associated with an increased risk of:

- colorectum cancer
- larynx cancer

Compared to zero consumption or occasional consumption, heavy consumption of alcohol was associated with an increased risk of:

- liver cancer
- stomach cancer
- pancreas cancer
- lung cancer
- gallbladder cancer

Compared to zero consumption, there was no increased risk for the following at any level of alcohol consumption:

- skin cancer
- prostate cancer
- small intestine cancer
- cervix cancer
- endometrium cancer
- ovary cancer
- bladder cancer
- brain cancer

Hodgkin's and non-Hodgkin's lymphoma had inverse associations with alcohol consumption and the risk of cancer of the kidney and thyroid was lower for light or moderate drinkers compared with non-drinkers.

The study had the following limitations:

- variability in the included studies was high for some types of cancer
- drinking patterns were not accounted for
- beverage type was not accounted for
- under-reporting of consumption could explain the association with light drinking

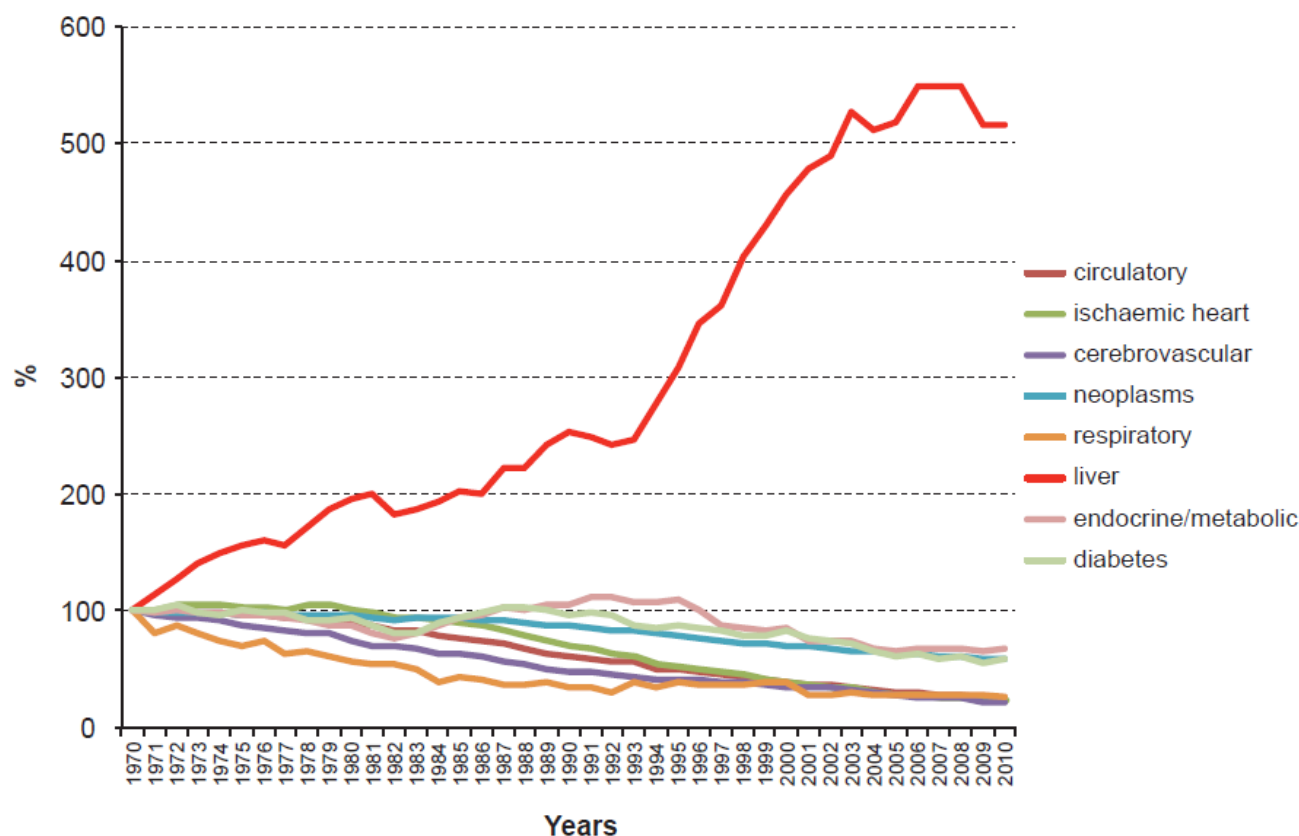
Two large observational studies including almost 140,000 participants shows that for men who have never smoked, the risk of alcohol-related cancers is not appreciably higher for light and moderate levels of alcohol consumption, defined as less than 30g/day (58). However, for women who have never smoked the risk of alcohol-related cancers, mainly breast cancer, increases even within the range of up to 14g/day. Similarly, in a cohort study of over 5,500 men followed up for 30 years, compared to never smokers who did not drink, men who smoked and drank more than 15 units per week had the highest mortality from smoking-related cancers, relative rate=7.1 (95% confidence interval [CI]=4.2, 12.0) (59). This suggests that while alcohol consumption and smoking as isolated behaviours both increase the risk of getting cancer, simultaneous smoking and alcohol consumption increases the risk to a greater extent than either behaviour alone.

Liver disease

Alcoholic liver disease is a type of damage or disease to the liver caused by excessive alcohol consumption, including fatty liver disease, alcoholic hepatitis and cirrhosis. Liver disease is responsible for 86% of directly attributable mortality from alcohol in the UK (48), and mortality rates from alcoholic liver disease have increased 400% since 1970, and in people younger than 65 years have risen by almost five-times (Figure 25) (34). These increases over recent decades are almost entirely due to alcohol-related liver disease. In England in 2014/15, there were over 55,600 hospital admissions for liver disease, accounting for 5% of all alcohol-related hospital admissions (57).⁴

⁴ Broad measure

Figure 25: Standardised UK mortality rate normalised to 100% in 1970 (34)



A meta-analysis of 17 observational studies showed that for both sexes, there is a continuous dose-response relationship between average alcohol consumption and the risk of liver cirrhosis illness and death (60) (Table 5).

Table 5: Relative risk (95% confidence interval) of liver cirrhosis associated with alcohol consumption by sex and end point (60)

		Death (mortality)			Illness (morbidity)		
Gender	Pure alcohol g/day	RR	P-value	95% CI	RR	P-value	95% CI
Women	>0-12	1.9	0.013	1.1-3.1	0.4	0.105	0.1-1.2
	>12-24	5.6	<0.001	4.5-6.9	1	0.981	0.5-1.9
	>24-36	7.7	<0.001	6.3-9.5	2.4	<0.001	1.8-3.2
	>36-48	10.1	<0.001	7.5-13.5	1.9	<0.001	1.4-2.6
	>48-60	14.7	<0.001	11.0-19.6	5.9	<0.001	3.7-9.3
	>60	22.7	<0.001	17.2-30.1	6.1	<0.001	4.6-8.0
Men	>0-12	1	0.991	0.6-1.6	0.3	0.026	0.1-0.9
	>12-24	1.6	<0.001	1.4-2.0	0.3	<0.001	0.2-0.4
	>24-36	2.8	<0.001	2.3-3.4	0.7	0.029	0.5-1.0
	>36-48	5.6	<0.001	4.5-7.0	2	<0.001	1.5-2.7
	>48-60	7	<0.001	5.8-8.5	2.3	<0.001	1.7-3.2
	>60	14	<0.001	11.7-16.7	5	<0.001	3.9-6.4

Obesity induced fatty liver can progress to cirrhosis and liver failure, but obesity can also amplify the impact of alcohol consumption on the liver. Data from two prospective cohort studies of almost 10,000 participants showed that the excess risk of liver disease due to BMI was small compared with that due to alcohol, but the relative excess risk due to being both overweight and consuming alcohol was large (RR=5.6, 95% CI=1.1, 10.1) (61). The effect of the combination of high BMI and alcohol was greater than the additive effect of the two separately. In simple terms for a person with a BMI >35, the liver risk doubles at any given alcohol intake.

The cardiovascular system

The following section outlines the relationships between alcohol consumption and cardiovascular outcomes, namely, hypertension, stroke, heart disease and atrial fibrillation.

Hypertension

Hypertension, or high blood pressure, is a chronic medical condition in which the blood pressure in the arteries is elevated. In 2014/15 there were 449,000 admissions to hospital for hypertension, accounting for 84% of all admissions for cardiovascular problems and 41% of all admissions (57).⁵

A meta-analysis of 12 observational studies showed linear relationships between alcohol consumption (g/day) and hypertension in males (22). In females, the relationship is J-shaped (see *Interpreting the J-shaped relationship*). For females, the risk of hypertension increased at 15 g/day and increased more rapidly up to levels of 100g/day compared to men. Different definitions and measures of hypertension were used across the included studies though nine of the 12 studies used a gold standard measure.

Stroke: haemorrhagic and ischemic

Hypertension is a risk factor for haemorrhagic stroke, which results from bleeding in or around the brain. Ischemic stroke occurs when an artery to the brain is blocked. Observational studies show that the relationship between alcohol consumption and stroke varies according to type of stroke, and the nature of the outcome, in other words illness or death. In 2014/15, there were over 2,400 hospital admissions for stroke, accounting for less than 1% of all alcohol-related hospital admissions (57).⁶

⁵ Broad measure

⁶ Broad measure

A meta-analysis of 27 longitudinal studies demonstrated a J-shaped relationship between alcohol consumption and risk of stroke and reported RR (95% CI) for drinkers relative to non-drinkers of 1.0 (0.9, 1.1) for stroke illness and 1.1 (0.9, 1.2) for stroke death (see *Interpreting the J-shaped relationship*) (62). Drinkers who consumed more than 60g/day were at increased risk of incident stroke compared with abstainers, RR=1.6 (1.3, 2.0). These findings have been corroborated by other reviews (63,64).

In a cohort study of over 5,500 men followed up for 30 years, compared to never smokers who did not drink, men who smoked and drank more than 15 units per week had the highest mortality from stroke deaths, relative rate=3.3 (1.9, 5.5) (59). This suggests that while alcohol consumption and smoking as isolated behaviours both increase the risk of stroke, simultaneous smoking and alcohol consumption increases the risk to a greater extent than either behaviour alone.

Heart disease

As well as chest pain (angina), the main symptoms of heart disease are heart attacks and heart failure. However, not everyone has the same symptoms and some people may not have any symptoms before heart disease is diagnosed. In 2014/15, there were 533,600 hospital admissions for cardiovascular disease, accounting for 49% of all alcohol-related hospital admissions (57).⁷

The relationship between average alcohol consumption and heart disease morbidity and mortality is J-shaped (see *Interpreting the J-shaped relationship*) (62,65–67). However, the J-shape no longer appears if an individual has taken part in heavy or episodic drinking (65). It should be noted that adjustment for risk factors other than age and smoking was not optimal in most studies included in the review.

Genetic studies are casting doubt on the idea that moderate alcohol consumption is protective against heart disease (68). Mendelian randomisation uses measured variation in genes of known function to examine the causal effect of a modifiable exposure on disease in non-experimental studies. They suggest that a reduction of alcohol consumption, even for light and moderate drinkers, is beneficial for cardiovascular health. It is not yet clear if these assumptions are fully warranted and further advances in research methodology are required (69).

In a cohort study of over 5,500 men followed-up for 30 years, compared to never smokers who did not drink, men who smoked and drank more than 15 units per week had the highest mortality from coronary heart disease, relative rate=1.9 (1.5, 2.5) (59). This suggests that while alcohol consumption and smoking as isolated behaviours both

⁷ Broad measure, includes figures for stroke (see *Stroke: haemorrhagic and ischemic*)

increase the risk of coronary heart disease, simultaneous smoking and alcohol consumption increases the risk to a greater extent than either behaviour alone.

Atrial fibrillation

Cardiovascular problems associated with alcohol consumption can occur because of single episodes of binge drinking. Binge drinking, even at moderate levels, is a risk factor for atrial fibrillation, which is characterised by a severe, irregular heartbeat. In England in 2014/15, there were almost 77,200 cases of cardiac arrhythmia, which would include atrial fibrillation, accounting for 7% of all alcohol-related hospital admissions (57).⁸

A meta-analysis of seven observational studies, including around 12,500 cases of atrial fibrillation and almost 195,000 controls, concluded that there is a linear relationship between self-reported alcohol consumption and the risk of atrial fibrillation (70). Compared to non-drinkers, the RR (95% CI) was:

- 1.08 (1.06, 1.10) for 12g/day
- 1.17 (1.13, 1.21) for 24g/day
- 1.26 (1.19, 1.33) for 36g/day
- 1.36 (1.27, 1.46) for 48g/day
- 1.47 (1.34, 1.61) for 60g/day

When the analysis was repeated according to the type of alcoholic beverage consumed, consumption of spirits and wine was associated with increased risk of atrial fibrillation, but consumption of beer was not. These findings corroborated those of an earlier meta-analysis of 14 observational studies (71).

Pregnancy

Alcohol is a teratogen, which means that it can affect foetal development. Teratogens can cause birth defects or complications during pregnancy. Foetal alcohol spectrum disorder (FASD) is an umbrella term for a group of conditions that can occur in a person whose mother consumed alcohol during pregnancy. Problems may include an abnormal appearance, short height, low body weight, small head size, poor co-ordination, low intelligence, behaviour problems and problems with hearing or seeing. The most severe form of the condition is known as foetal alcohol syndrome (FAS), a condition in which children have:

- restricted growth
- facial abnormalities
- learning and behavioural disorders which may be severe and lifelong

⁸ Broad measure

In England in 2014/15, there were over 6,700 hospital admissions for spontaneous abortion and low birth weight, accounting for less than 1% of all alcohol-related hospital admissions (57).⁹

Alcohol consumption during pregnancy is associated with the baby being born prematurely or underweight. In January 2016, the CMO reviewed the evidence for drinking during pregnancy (72). The scientific literature concludes that at consumption levels of one to two units per day, there are increased risks of low birth weight, preterm birth and being small for gestational age, which rises with rising consumption. The review also reported an increased likelihood of child behaviour problems following moderate prenatal exposure to alcohol of four to five units per occasion and no more than nine units per week, and showed that drinking more than 1.5 units per day is associated with an increased risk of miscarriage in the first three months of pregnancy.

Overall, the report supports precautionary guidance that it is safest to avoid drinking in pregnancy and recommends that *“if you are pregnant or planning a pregnancy, the safest approach is not to drink alcohol at all, to keep risks to your baby to a minimum”* and *“drinking in pregnancy can lead to long-term harm to the baby, with the more you drink the greater the risk”*.

The central nervous system

Alcoholic neuropathy

Alcoholic neuropathy is damage to the nerves that results from excessive alcohol consumption. Symptoms include numbness in the arms and legs and abnormal sensations such as pins and needles. Alcoholic neuropathy is considered to be wholly attributable to alcohol use (73). In England in 2014/15, there were 920 hospital admissions for alcoholic polyneuropathy and degeneration of the nervous system due to alcohol, accounting for less than 1% of all alcohol-related hospital admissions (57).¹⁰

Epilepsy

Epilepsy is a neurological condition which causes repeated seizures. In England in 2014/15, there were over 53,700 hospital admissions for alcohol-related epilepsy, accounting for around 5% of all alcohol-related hospital admissions (57).¹¹ A meta-analysis of six observational studies including almost 1,500 controls and almost 1,000 cases of epilepsy shows a relationship between heavier levels of alcohol consumption and the risk of epilepsy (74). Compared to non-drinkers, those consuming 12g, 48g, 72g

⁹ Broad measure

¹⁰ Broad measure

¹¹ Broad measure

and 96g/day had RRs (95% CI) of 1.2 (1.1, 1.2), 1.8 (1.6, 2.1), 2.4 (2.0, 3.0) and 3.3 (2.5, 4.3), respectively.

The majority of studies included in the review focused on withdrawal seizures, with only a few dedicated solely to epileptic events. Despite the author's best efforts to extract the relevant data on non-withdrawal seizures, it is possible that some data on alcohol withdrawal seizures may still have been included in the meta-analysis.

Brain damage

Wernicke-Korsakoff's syndrome

Alcohol is a known cause of Wernicke-Korsakoff's Syndrome (WKS) which is a disease resulting from thiamine deficiency related to heavy alcohol use (73). The disease is characterised by a loss of memory, changes in vision and changes in muscle co-ordination. If the disease is caught early enough, the symptoms can be reversed by administering intravenous thiamine, however if left untreated, the disease can lead to irreversible memory loss. WKS can be considered to be a form of entirely 'preventable nutritional dementia' and post-mortem studies suggest that WKS occurs in about 2% of the general population rising to 12.5% in dependent drinkers (75). Evidence suggests that WKS is poorly recognised and treated in the UK (76).

In England in 2014/15, there were 203,700 hospital admissions for mental and behavioural disorders due to alcohol use, which accounted for almost 19% of all alcohol-related hospital admissions (57).¹² Admissions for Wernicke-Korsakoff syndrome are included, though not exclusively, within this category of admissions.

Dementia

Dementia describes a set of symptoms that may include memory loss, difficulties with thinking, problem-solving or language. Dementia is caused when the brain is damaged by diseases, such as Alzheimer's disease or a series of strokes.

Overall, the research assessing the relationship between alcohol consumption and dementia is mixed. While some studies suggest that alcohol consumption is associated with a decreased risk of dementia or Alzheimer's disease, a number of other studies do not. These findings could have arisen for a number of reasons, including:

- differences in drinking patterns
- individual differences, including genetic risks
- length of study follow-up

¹² Broad measure

- possible interactions with other lifestyle-related factors such as smoking
- alcohol consumption can damage the cardiovascular system which can increase the risk of dementia
- many heavy drinkers may have died prematurely and therefore not lived long enough to develop age-related disorders such as dementia

A meta-analysis of 15 longitudinal studies concluded that light to moderate alcohol consumption is associated with a 25% to 28% reduction in risk of Alzheimer's disease, vascular disease and any dementia in older adults compared to non-drinkers (see *Interpreting the J-shaped relationship*) (77). Heavy drinking was not associated with an increased risk in any of the outcomes, although heavy drinkers may have been excluded, lost at follow-up or have died, which would bias the results because this group may have developed dementia as a result of alcohol consumption, but not been counted within the scientific literature.

A systematic review of 15 longitudinal studies has largely confirmed the finding that light to moderate alcohol consumption is associated with a reduced risk of dementia, however identified two studies with conflicting results (78). For example, one study showed no difference in dementia risk between non-drinkers and infrequent drinkers, defined as those who drank less than once a month, odds ratio (OR)=0.9, 95% CI=0.4, 2.1, nor frequent drinkers, defined as those who drank several times a month, compared with infrequent drinkers, OR=1.4 95% CI=0.7, 3.2.

A meta-analysis of eight cohort studies found no association between alcohol consumption and the risk of dementia, RR=0.7, 95% CI=0.6, 1.0 however there was large variability across the included studies (79). Similar findings were reiterated in an overview of systematic reviews of longitudinal studies (80).

Injury

The risk of injury resulting from alcohol consumption increases with the amount of alcohol consumed. There are AAF for morbidity and mortality for a range of unintentional and intentional injuries including (73):

- road traffic crashes (RTC) (see *Reducing drink driving*)
- poisoning
- fall injuries
- fire injuries
- drowning
- water transport accidents
- air or space transport accidents
- work or machine injuries
- firearm injuries

- inhalation and ingestion of gastric contents
- accidental excessive cold

In England in 2014/15, there were almost 50,400 hospital admissions for unintentional injuries, accounting for almost 5% of all alcohol-related hospital admissions (57).¹³ In addition, a further 31,900 hospital admissions were caused by ethanol poisoning or the toxic effects of alcohol.

A meta-analysis of 28 observational studies assessed the relationship between alcohol consumption and injury (17).

The strength of observed relationship depended on the recall period and design that was used in the study (81). Measures which recorded usual frequency of alcohol consumption for example, last week's consumption, tended to overestimate the risk of injury from alcohol, whereas using a shorter recall period, for example yesterday, was methodologically stronger because it reduced recall bias. Case-crossover studies, where the case acts as his or her own control, tended to overestimate the risk between alcohol consumption and injury compared to case-control studies, where both the case and control are drawn from the same cohort, for example, patients attending the same emergency department.

Unsafe sex

A meta-analysis of 12 randomised controlled trials (RCT) showed that the intention to engage in unsafe sex¹⁴ increases with increasing levels of alcohol consumption (82). Specifically, an increase in blood alcohol concentration (BAC) of 0.1 mg per ml of blood resulted in an increase of around 3% (2.0%, 3.9%) in the likelihood of engaging in unprotected sex. Neither gender nor the type of sample used, such as community or college sample significantly modified this relationship, however the definition of intent to have unprotected sex has been highly variable across the research in this area.

Similar findings have been reported in a more recent meta-analysis of 30 experimental studies, which showed that alcohol consumption is associated with greater intentions to engage in unprotected sex and this relationship is stronger when sexual arousal is heightened (83).

Alcohol consumption is also associated with higher levels of casual sexual relationships and experiences, as outlined in a meta-analysis of 29 observational studies, but the strength of relationship was variable (84). These findings have important implications for both unwanted pregnancy and also sexually transmitted infections (STI). A meta-analysis of 17 observational studies shows that among people who are diagnosed with

¹³ Broad measure

¹⁴ Defined as sex without a condom

human immunodeficiency virus (HIV) or acquired immune deficiency syndrome (AIDS), alcohol use was significantly associated with unprotected sex (85).

Mental health and wellbeing

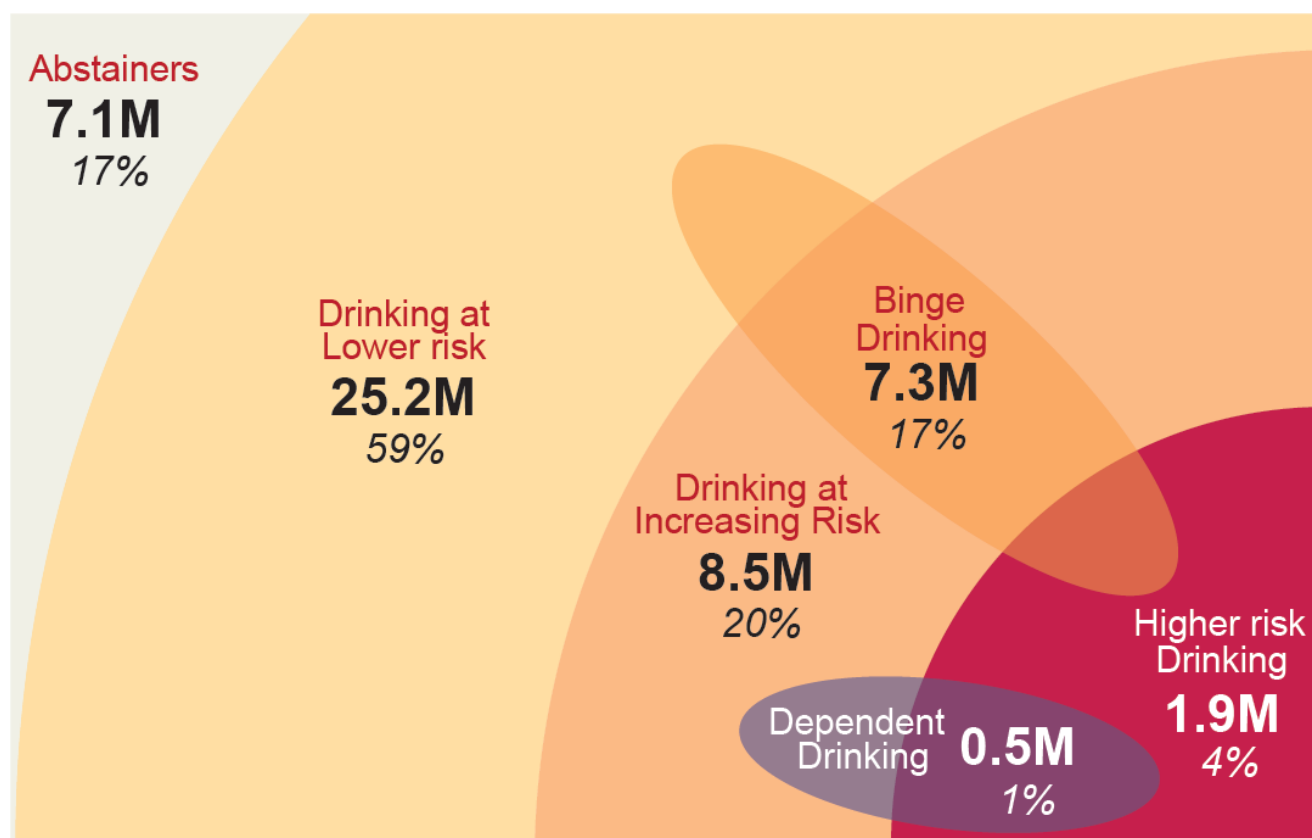
Alcohol use disorders

Alcohol use disorders (AUD) is a term used to describe people who are drinking at hazardous and harmful levels, as well as those who are dependent on alcohol (86). Hazardous drinking is a pattern of alcohol consumption that increases the risk of harmful consequences for the user. Harmful use refers to alcohol consumption which results in consequences to physical and mental health. Alcohol dependence is a cluster of behavioural, cognitive, and physiological phenomena that may develop after repeated alcohol use. Typically, these include:

- a strong desire to consume alcohol
- impaired control over its use
- persistent drinking despite harmful consequences
- giving drinking a higher priority than other activities and obligations
- increased alcohol tolerance
- physical withdrawal reactions when the person stops drinking

The distribution of drinkers in England is outlined in Figure 26.

Figure 26: The distribution of drinkers in England (40)



[i] Lower risk defined as ≤ 14 units; Increasing risk defined as > 14 and ≤ 50 units for men and > 14 and ≤ 35 units for women; Higher risk defined as > 50 units for men and > 35 units for women; Binge drinking defined as $8+/6+$ units on heaviest drinking day in previous week for men and women respectively; Dependent drinking derived from the Adult Psychiatric Morbidity Survey

In England in 2014/15, there were 203,700 hospital admissions for mental and behavioural disorders due to alcohol use, accounting for almost 19% of all alcohol-related hospital admissions (57).¹⁵

Depression and anxiety

Depression is a mental disorder characterised by a pervasive and persistent low mood that is accompanied by low self-esteem and a loss of interest or pleasure in normally enjoyable activities. Anxiety disorders are a category of mental disorders characterised by feelings of anxiety and fear, where anxiety is a worry about future events and fear is a reaction to current events. These feelings may cause physical symptoms, such as a racing heart and shakiness.

The current research suggests a causal link between AUD and depression, meaning that increasing alcohol use increases the risk of depression (87). The presence of either

¹⁵ Broad measure

AUD or depression doubles the risk of the second disorder, with pooled OR around 2.0. The most plausible association between AUD and depression is one in which AUD increases the risk of depression, rather than vice versa.

Bipolar disorder

Bipolar disorder is a mental illness characterised by periods of depression and periods of elevated mood. The elevated mood is significant and is known as 'mania' or 'hypomania', depending on its severity, or on whether symptoms of psychosis are present.

A review of bipolar disorder and AUD shows that the two conditions commonly occur in the same individual (88). Bipolar disorder can affect up to 3% of the population and co-occurring bipolar and AUD up to 13% of the population.

Suicide

An individual may die by suicide following a single bout of heavy drinking or as a result of suicidal ideation attributable to chronic heavy drinking. In England in 2014/15, there were 5,800 hospital admissions for intentional self-harm and a further 170 admissions for events of undetermined intent, accounting for less than 1% of all alcohol-related hospital admissions (57).¹⁶ Among men aged 25 to 34 years, intentional self-harm was the leading cause of alcohol-related death and in women of this age it was the second (73).

A meta-analysis of 31 observational studies has shown a significant association between AUD and suicidal ideation (OR=1.9, 1.4, 2.4), attempted suicide (OR=3.1, 2.5, 3.8) and completed suicide (OR=2.6, 2.0, 3.2), (RR=1.7, 1.3, 2.2) (89). Similar findings have been observed in a review of the relationship between addiction and suicide which reported that between 10% and 69% of completed suicides tested positive for alcohol use and 10% to 73% of attempted suicides tested positive for alcohol use (90).

Other health correlates

Diabetes

Diabetes is a lifelong condition that causes a person's blood sugar level to become too high. There are two main types of diabetes, Type I and Type II. The incidence of Type I diabetes is not caused by lifestyle factors such as alcohol consumption, however Type II diabetes can be. The present review focuses only on the effect of alcohol consumption on Type II diabetes.

¹⁶ Broad measure

Research analysing the association between alcohol and Type II diabetes typically identifies a reduction in risk at relatively moderate levels of exposure (*see Interpreting the J-shaped relationship*) (91). However more recent analysis suggests that there is no reduction in Type II diabetes risk at any level of alcohol consumption in men. Women experience a decreased risk of Type II diabetes at less than 61g/day relative to abstainers (92).

Pancreatitis

Acute pancreatitis is a condition where the pancreas becomes inflamed over a short period of time. Chronic pancreatitis is a condition where the pancreas becomes permanently damaged from inflammation. In England in 2014/15, there were about 17,200 hospital admissions for pancreatitis, accounting for 1.6% of all alcohol-related hospital admissions (57).¹⁷

A meta-analysis of seven studies including almost 160,000 participants and over 3,600 cases of pancreatitis showed that there are different relationships between alcohol consumption and the risk of different types of pancreatitis in men and women (93). The risk of chronic pancreatitis increases with alcohol consumption for both sexes and for acute pancreatitis in men. However the relationship between alcohol consumption and acute pancreatitis in women suggests that compared to non-drinkers, women who drink less than 40g/day are at lower risk of acute pancreatitis (*see Interpreting the J-shaped relationship*). Above these levels, women are at increased risk of developing chronic pancreatitis. Similar findings were reported in an earlier review (94).

Pneumonia

Pneumonia is inflammation of the tissue in one or both of the lungs. In England in 2014/15, there were about 12,400 hospital admissions for pneumonia, accounting for over 1% of all alcohol-related hospital admissions (57).¹⁸

A meta-analysis of five observational studies including over 110,000 individuals and almost 2,500 cases of pneumonia shows that the risk of pneumonia increases with increasing alcohol consumption (95). Compared to non-drinkers, those drinking 24g, 60g and 120g/day had RRs (95% CI) of 1.1 (1.0, 1.2), 1.3 (1.1, 1.7) and 1.8 (1.1, 2.3) respectively. These findings corroborate those of an earlier review (96). The meta-analysis also showed that people with AUD had an eightfold risk of pneumonia compared to people without AUD (RR=8.2, 95% CI=4.9, 13.9) (95).

¹⁷ Broad measure

¹⁸ Broad measure

Tuberculosis

Tuberculosis (TB) is a bacterial infection which is spread through inhaling tiny droplets from the coughs or sneezes of an infected person. TB mainly affects the lungs however can affect any part of the body. In England in 2014/15, there were 1,200 hospital admissions for tuberculosis, accounting for less than 1% of all alcohol-related hospital admissions (57).¹⁹

A meta-analysis of 21 observational studies concluded that there is a strong relationship between heavy drinking, defined as either drinking more than 40g/day or a clinical diagnosis of AUD, and risk of TB, however did not find an association for levels of consumption of <40g/day (96). Heavy drinking was associated with a RR (95% CI) of 2.9 (1.9, 4.6). Heavy alcohol consumption affects the immune system which may facilitate susceptibility to the infection and conversion to active TB in infected individuals. Possibly, drinking in certain social environments could facilitate the spread of TB infection.

Overweight and obesity

BMI is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is calculated by dividing a person's weight in kg by the square of their height in meters (kg/m²). The World Health Organization (WHO) definition of overweight is a BMI of equal to or greater than 25 and for obesity is greater than or equal to 30.

An important indirect consequence of alcohol consumption lies in its high calorific value. At 7kcal/g, alcohol is the highest calorie substance, second only to pure fat (97). Despite this, a clear cause-and-effect association between alcohol consumption and weight gain is not apparent based on the available evidence. However, a recent review reports observational and experimental evidence to suggest a reasonable link between alcohol consumption and obesity for some individuals (98).

Overall, it seems that light-to-moderate alcohol consumption is less likely to be a risk factor for obesity than heavy drinking. Heavy and binge drinking are more consistently linked with obesity. A similar review including 31 observational and experimental studies also report mixed results, and note that relationships between alcohol consumption and weight gain are mainly reported from studies with data on heavier drinking (99).

A review carried out by the National Obesity Observatory also did not find a clear causal relationship between alcohol consumption and obesity and notes that the effects of

¹⁹ Broad measure

alcohol on body weight may be more pronounced in people who are already overweight and obese (97). The review highlights that:

- alcohol consumption can lead to an increase in food intake
- many people are unaware of the calories contained in alcoholic drinks

There is also strong evidence for a synergy between alcohol consumption and the risk of liver disease. For someone with a BMI of greater than 35, the risk of developing liver disease effectively doubles for any given level of alcohol consumption (61).

The mixed evidence regarding the relationship between alcohol and obesity may be due to multiple factors including:

- gender
- beverage type
- frequency and amount of alcohol consumed
- drinking pattern, for example binge drinking
- physical activity level
- sleeping habits
- depression symptoms
- psychosocial problems
- chronic illness
- medication use
- history of alcohol use
- predisposition to weight gain

Psoriasis

Psoriasis is one of the most common dermatological (skin) disorders, characterised by flaky, crusty patches of skin, covered with silvery scales. A meta-analysis of 15 observational studies found an association between alcohol consumption and psoriasis (100). The overall OR (95% CI) of psoriasis for drinkers compared to non-drinkers was 1.5 (1.2, 2.0). However, this finding was based on a small sample, and lacked data on other environmental risk factors such as smoking, BMI or ethnicity.

Alcohol and the family

Introduction

It is well recognised that alcohol can negatively impact on the family including the drinker's partner, siblings or children (101). Drinking can impair the ability to perform a family role and contribute to household functioning. For example, time spent drinking can compete with the time that could be spent on family life and alcohol costs money which could be spent on other things. There are a wide range of alcohol-related harms that are experienced by family members including violence, financial problems, absenteeism from work or school and disrupted relationships (2). These harms can occur even before a child is born (*see Pregnancy*).

During childhood, the home and family are often a child's primary source of what is normal or acceptable drinking, and parents exert a powerful influence on drinking behaviour in their offspring (102,103). Some parents choose to give their children alcohol with the view that it will increase their child's resistance to peer influence and protect them from alcohol-related problems later in life (104). However parental supply of alcohol has been shown to be associated with alcohol use, intentions to drink and risky drinking, in adolescents (105–107). In the UK in 2010, 80% of adults thought that parental drinking was a serious problem for children and 84% of adults agreed that parental drinking was as harmful to children as parental drug use (108).

There is a fairly large and consistent literature from studies of identical and non-identical twins demonstrating that alcohol dependence has an inherited component of between 40% and 60% and also affects the likelihood of developed alcohol-related physical diseases including liver cirrhosis (109,110).

This section reviews the evidence for the impact of alcohol on the family including the impact of parental alcohol consumption and attitudes on children, the parental provision of alcohol, relationship breakdown, adverse childhood experiences and intimate partner violence.

The impact of parental alcohol consumption and attitudes on children

Parental alcohol consumption and attitudes about consumption can have a negative impact on children, young people and the family. This impact can range from instilling unhealthy social norms and attitudes around drinking through to child maltreatment (*see Adverse childhood experiences*). It is difficult to estimate the full impact of parental drinking on children, as little data exists. Nonetheless, in England, it is estimated that almost 94,000 babies under one year old live with a parent who is a hazardous or

harmful drinker (111) and in 2014/15, 26% of patients receiving treatment for alcohol problems lived in a house with a child (112). In 2010, more than 100 children, including children as young as five, contacted ChildLine every week, with concerns about their parents drinking or drug use (108).

During childhood, the home and family are often a child's primary source of what is normal or acceptable drinking. A UK national survey and in-depth case studies shows that parents are the most important influence on attitudes to alcohol in children aged five to 12 years (102). Broadly, the parents in the sample believed that children should not be introduced to alcohol at home until their mid-teens and should not be allowed to drink in public until they reach 18. However, analysis of the case studies showed that parents actually introduce their own children to alcohol at home at an earlier age (see *Parental provision of alcohol*). Most parents argued that they should equip their children with the right personal qualities and skills to enable them to make sensible individual choices about alcohol once beyond the family and home. However, some parents complained about other parents who allowed their children to binge drink in public places, suggesting that not all children have positive family support. While parents generally believed it was unacceptable to be drunk when responsible for children, in practice, many allowed their offspring opportunities to see them drunk at parties, family events and particularly while on holiday. During these drinking occasions, many families initiated their children into tasting alcohol and this was most often instigated by parents, not children. Analysis of the children's account of alcohol showed that all the children in the sample were aware that alcohol is only for adults, and some also recognised the age restrictions on the sale of alcohol. Children tended to have a reasonable awareness of the social harms associated with alcohol however they had a relatively poor grasp of the potential health risks. This suggests that children are not taught to recognise the health consequences of drinking. Importantly, the children's accounts showed strong evidence of direct and indirect transmission of parental attitudes towards alcohol and patterns of drinking.

Data from the Smoking Drinking and Drug use survey of school-aged children in England, suggests that the perceptions of family attitudes towards pupils' drinking has changed (51). In 2008, 45% of pupils thought that their parents would not like them drinking, rising to 56% in 2014. Perceived parental disapproval decreased as the age of pupils' increased, from 77% of 11 year-olds decreasing to 30% of 15 year-olds.

Further analysis of the Smoking Drinking and Drug Use survey of school-aged children in England also suggests that the drinking behaviour of children mirrors those of who they live with (51). In 2014, children who lived with other people who drank were more likely to have drunk alcohol in the last week, odds ratios (OR) increasing from 1.7 for pupils who lived with one person who drank to 3.6 for pupils who lived with three or more drinkers. Compared to pupils who said that their families would (or did not) like

them drinking alcohol, those who said that their parents would (or did) let them drink (as long as they didn't drink too much) were more likely to have drunk alcohol in the last week (OR=4.3). The small number of pupils who said that their parents did not mind how much they drank had an odds ratio of OR=15.1.

Research has shown that children of parents with alcohol use disorder (AUD) are more likely to develop AUD in later life. Retrospective analysis of a population-based national sample of around 44,000 adults showed high levels of AUD in children of AUD parents (113). Compared with offspring of non-AUD parents, offspring of one AUD parent had a 2.5-fold increase (95% confidence interval [CI]=2.4, 2.6) and offspring of two AUD parents had a 4.4-fold increase (95% CI=3.9, 5.0) in the odds of lifetime AUD. Female offspring were more vulnerable to the impact of parental AUD compared to male offspring. Similar findings have been reported by a Danish longitudinal birth cohort study of over 7,000 people (114). These results suggest that inherited factors related to AUD are important in determining the risk of AUD among offspring.

The finding that parental AUD is strongly associated with AUD in adult offspring has not been replicated in a meta-analysis of almost 90,000 students in the US (115). Family history of AUD was moderately related to AUD and was only weakly related to levels of alcohol consumption in this cohort. This finding may reflect sampling bias as students in the US tend to come from families which are more socially and financially stable. Therefore, those with a positive family history of AUD may represent the most functional of all families with AUD.

A note on genetics (and epigenetics)

As with most diseases alcohol dependency has inheritable and environmental determinants. It has been known for many years from twin studies, that the inheritable component is very strong, accounting for 40% to 60% of the tendency for a person to become dependent on alcohol, and also affect the likelihood of developed alcohol related physical diseases including liver cirrhosis (109,110).

The environmental components of problem drinking could be linked to 'social contagion' whereby problematic drinking is a learned behaviour and children come to imitate the behaviour of their parents (101), but also include factors such as the availability and price of alcohol (1). Modern developments in epigenetics also provide possible mechanisms whereby drinking behaviours could theoretically modulate genetic predisposition by changing the methylation status of DNA (116). An EU report concluded that it is *"the balance between environmental and genetic factors that is important. It is not genetic factors on their own that make someone an alcoholic or a problem drinker"* (101).

Parental provision of alcohol to children and adolescents

Parents can choose to provide their children with alcohol either for supervised consumption or consumption elsewhere. Often parent's supply alcohol to their children because they believe that it increases their resistance to peer influence and protects them from alcohol-related problems later in life (104). However parental supply of alcohol has been shown to be associated with alcohol use, intentions to drink and risky drinking, in adolescents (105–107). Children who start drinking early are more likely to become more frequent and binge drinkers and underage drinking is associated with school and educational problems, unprotected sex, consumption of illicit drugs, violence and drinking problems in later life (118–121). A review including 16 studies showed that parents are a common source of alcohol provision for teenagers and this provision is associated with teenager's current and future drinking (122). Parents consider their provision to be appropriate based on the belief that it gives parents a degree of control over what, and how much, their child is drinking. However, this suggests that parents are unaware of the evidence which links early initiation to alcohol with increased alcohol consumption and related harms.

Findings from a review of 22 cross-sectional and longitudinal studies also shows that parental provision of alcohol is generally associated with increased adolescent alcohol consumption and, in some instances, increased binge drinking, as well as higher rates of alcohol-related problems (106).

Data from the 2014 Smoking Drinking and Drug use survey of school-aged children in England also shows that the most common ways children obtain alcohol are from their parents or guardians (51). Seventeen per cent of the sample obtained alcohol this way. The next most common way to obtain alcohol was from friends or to take it from home without permission, 17% and 15% of the sample obtained alcohol in this way, respectively. Sources of access to alcohol varied with age. Among 11 year-olds, the most common source was having been given it by parents or guardians (4% of the sample obtained alcohol in this way). Fifteen year-olds obtained alcohol from a broader range of sources and were most likely to have been given alcohol by friends (33% of the sample) parents (32% of the sample), taken alcohol from home with permission (23% of the sample) or asked someone else to buy it (21% of the sample).

Pupils who drank alcohol were most likely to say that they usually drank with parents (56%), with friends of both sexes (52%), with brothers, sisters or other relatives (37%) or with friends of the same sex (35%). This represents a change from recent years, when pupils who drank were more likely to say that they drank with friends of both sexes than with their parents.

A number of factors have shown to be associated with the parental provision of alcohol in an Australian sample (123). Parents were more likely to provide alcohol for their children (aged 14 to 16 years) in the next six months if they believed their child already drank alcohol, if they had a higher score on the Alcohol Use Disorders Identification Test (AUDIT), were atheist or had already provided children with alcohol in the last three months.

Relationship breakdown

There are many reasons why relationships can break down. Evidence from reviews report strong associations between the breakdown of parental relationships and poor outcomes for children, including socioeconomic disadvantage, physical and psychological ill-health, lower educational achievement, substance misuse and other health damaging behaviours and behavioural problems (124). Research has aimed to understand the role of alcohol consumption in relationship breakdown and parental separation. Parental separation in itself is considered to be an adverse childhood experience (*see Adverse childhood experiences*).

Longitudinal research carried out on a female twin cohort in the US suggests that parental separation is experienced more commonly in children whose parents have AUD compared to children whose parents do not (125). By the time the twins in the cohort were 18 years of age, the proportion of parents who had separated in families of European (or other) ancestry, were:

- 24% in which neither parent had AUD
- 58% in which only the father had AUD
- 61% in which only the mother had AUD
- 75% in which both parents had AUD

These findings suggest that parental AUD is an important factor in relationship breakdown.

Longitudinal research of over 1,000 people born in New Zealand and followed between the ages of 19 and 30 years has estimated that AUD accounts for 4.5% to 4.6% of the breakdown in marital and cohabiting relationships (12). Men and women who exhibited more symptoms of AUD were more likely to report relationship breakdown than their non-dependent counterparts (OR=1.6 95% CI=1.1, 2.5). Similar findings were observed in a cohort of almost 20,000 Norwegian couples, where retrospective analysis showed that high levels of alcohol consumption was a predictor of divorce, particularly if both partners were heavy drinkers (126).

Alcohol dependence is also an important predictor of the timing and survival of first marriages, as shown by a longitudinal study of over 5,000 Australian twins born between 1940 and 1964, including almost 600 men and women with alcohol dependence (127). Among respondents who were married, alcohol dependence was strongly predictive of early separation. The likelihood of marital separation among alcohol dependent women was 95% compared to their non-dependent counterparts and the corresponding figure for alcohol dependent men was 84%.

Adverse childhood experiences

The term 'adverse childhood experience' (ACE) has been used to collectively describe the range of potentially traumatic events during childhood that can have negative lasting effects on health and wellbeing. These experiences range from physical, emotional and sexual abuse, to parental death or divorce. There are strong relationships between parent or carer alcohol use and child maltreatment and being maltreated as a child is associated with marked increases in the risk of problematic alcohol consumption in later life (128).

Studies which quantify the involvement of alcohol use in the perpetration of child maltreatment are rare, however data between 2003 and 2005 shows that in England, almost three-fifths of all serious case reviews of child abuse, reported parental substance misuse (108). This is likely to be an underestimate of the true burden, as many incidents of child abuse remain unreported to authorities (128). Australian data suggests that among children in child protection services, where carer alcohol abuse was identified, children were 22% more likely to experience multiple incidents of child maltreatment over a five year period, compared to children where this was not identified (129).

Experiencing childhood trauma, including ACEs, has important implications for early and later life. Adult health profiles relate to the abuse individuals experience during childhood, as well as to other childhood stressors such as parental alcohol misuse. Data from a national survey of almost 4,000 people in England in 2013 shows that the prevalence of health harming behaviours, such as smoking or drinking, increased with increasing levels of ACE (130). Modelling using this data suggested that nationally, 34% of individuals who have experienced binge drinking before the age of 18 years, equivalent to almost 650,000 individuals, could be accounted for by ACEs.

Similar findings are seen in a review which showed that experiencing maltreatment and stressful life events prior to puberty, and particularly in the first few years of life, is associated with early onset of problem drinking in adolescence and alcohol dependence in early adulthood (131).

Alcohol consumption and intimate partner violence

Intimate partner violence (IPV) has been defined as *“behaviour by an intimate partner or ex-partner that causes physical, sexual or psychological harm, including physical aggression, sexual coercion, psychological abuse and controlling behaviours”* (132).

In a study of 338 social work files from six English local authorities, IPV was reported in 60% of the referrals, parental substance misuse in just over half (52%) of cases, and both issues were present in a fifth (20%) of cases (133).

A large body of research suggests a strong relationship between alcohol consumption and the occurrence of IPV. A meta-analysis of 50 studies has reported a small but significant relationship between female’s alcohol use or misuse and IPV perpetration and a slightly stronger association between male’s alcohol use or misuse and IPV perpetration (134). The relationships are similar for both married and cohabiting couples and other types of relationships such as divorced or separated couples or couples who are dating. Within measures of consumption, binge or heavy drinking patterns were most strongly associated with IPV.

Self-reported alcohol consumption is also associated to being a victim of IPV among women entering treatment for substance misuse (135). For all measures of alcohol consumption, alcohol consumption was greater for violent compared to nonviolent conflict. Measures of alcohol consumption were corroborated by the female participant’s male partners. Furthermore, all levels of alcohol consumption consumed by male partners were higher during violent compared to nonviolent conflict.

Alcohol consumption can be both a cause and consequence of IPV. Alcohol use may increase IPV perpetration but can also serve as a coping strategy in response to IPV. A meta-analysis of 55 longitudinal and observational studies including over 100 estimates explored the relationship between alcohol consumption and IPV in women (136). Longitudinal studies showed a general pattern of positive association between IPV and subsequent alcohol use (observed in 14/15 estimates – not all significant), but also between alcohol use and subsequent violence (9/12 estimates – not all significant). Observational studies reported similar associations. However few studies included in the review adequately controlled for baseline estimates of alcohol consumption or IPV.

Strong evidence suggests a link between alcohol and IPV in the adult population, but less is known about the link between alcohol use in young people and dating violence perpetration. A meta-analysis of 28 longitudinal and observational studies suggests that overall, higher levels of alcohol consumption are positively associated with dating violence perpetration in those aged 11 to 21 years (137). Alcohol use was measured in three ways:

- frequency or quantity of use
- frequency of binge drinking
- problem use

The combined OR (95% CI) for dating violence perpetration for frequency or quantity, binge drinking and problem use were 1.2 (1.2, 1.3), 1.5 (1.2, 1.9) and 2.3 (1.9, 2.8), respectively.

Alcohol and employment

Introduction

The impact of alcohol consumption on employment and the labour market depends on the quantity of alcohol consumed and the frequency of drinking occasions (4). In general, there is a dose-response relationship between societal and individual-level alcohol consumption and sickness absence, with alcohol being a significant risk factor for absenteeism (absence from work) and presenteeism (working while sick due to alcohol consumption) (138). Acute intoxication may lead to absence in the short-term, and long-term absence may arise from chronic patterns of alcohol consumption. In the UK there is no routinely collected data which monitors loss of work productivity due to alcohol consumption however, a 2007 survey in the reported that (139):

- a third of employees admit to being at work with a hangover
- one in 10 report hangovers at work once a month and one in 20 once a week
- 15% report being drunk at work

Furthermore, in England in 2014/15, 73% of clients seeking treatment for alcohol problems were not in paid employment at the start of their treatment (140) and in 2013, over 50,000 individuals in Great Britain were claiming incapacity benefits with a primary disabling condition of alcohol misuse (141).

This chapter reviews the evidence for the relationship between alcohol consumption, employment and the workplace.

The cost of alcohol to the workplace

The economic costs of alcohol are usually framed in terms of health costs to the individual drinker, however the costs of alcohol consumption are far reaching with many costs borne by relatives, friends, co-workers and employers (142).

Estimates of the costs of alcohol misuse to the workplace have been consistently high with a review estimating the global cost, including absenteeism, unemployment and premature mortality, to be between 2.7% and 10.9% of gross domestic product (GDP) annually in 2002 (28). In England, a 2012 Cabinet Office estimate reported that alcohol misuse costs the English economy £7.3 billion each year (143), however it has been suggested that the methodology and assumptions used in deriving this estimate should be updated (31).

Aside from the £7.3 billion estimate by the Cabinet Office (144), modelling in Scotland suggests that alcohol misuse amounts to £964 million (£866, £1062 million) in costs from losses in labour and productivity (2009/10 prices) (29). These costs totalled the least amount for the least deprived groups in the population, and the most for the most deprived groups. However, the study was limited by a lack of available data, for example, the same values for productivity and employment losses were applied across all groups because values specific to deprivation groups were not available. It is likely that if these had been applied then the gradient in these changes would be smaller.

Survey data suggests that the experience of having a heavy drinking co-worker is common in the workplace and was reported by almost a third of Australian workers (145). Young employees and males were more likely to report alcohol-related absenteeism and 3.5% of workers reported having to work extra hours to cover for others. The total annual cost of this extra work was estimated to be \$450 million (95% confidence interval [CI], \$202, \$703 million) to the Australian economy in 2008.

Modelling in Canada has shown the high costs of lost productivity resulting from people born with foetal alcohol spectrum disorder (FASD) (146). Assuming a counterfactual scenario, in which nobody in Canada was born with FASD, it was estimated that just over 300 individuals aged 20 to 69 years had an FASD-related mortality in Canada in 2011. As a result, there were almost 3,000 years of potential employment lost, translating to a loss ranging from \$88 to \$126 million, amounting to less than 1% of GDP.

Sick leave due to harmful alcohol use

An important cost borne by society from alcohol consumption is the sick-leave taken by drinkers, either due to hangovers or alcohol-related illness. The harmful use of alcohol has acute and chronic health consequences (see *Alcohol consumption and health*), all of which are likely to increase short- and long-term absence. A systematic review of 48 associations from 28 studies reported strong relationships between alcohol use and both short-term and long-term work absence (10). Eighty-three per cent of all reported associations were significant, and every association in the high-quality studies was significant. Consistent associations were seen between frequency of sick leave and frequency of drinking, number of drinks per week, indicators of binge drinking and problem drinking.

Three associations tested the relationships by socioeconomic differences and suggest that:

- the relationship between the number of units consumed per week and the number of absence days is stronger in low-educated males

- the relationship between heavy drinking and long-term sickness absence is stronger in low-income groups
- the relationship between diagnosed alcohol dependence and the number of sickness days among women is stronger in low-income groups
- abstainers have an increased likelihood of sickness absence

The abstainer group may have an increased likelihood of sickness absence because this group includes ex-heavy drinkers, or people who abstain for other health reasons which affect attendance at work (see *Interpreting the J-shaped relationship*).

The relationship between alcohol consumption and sickness absence has also been observed at a population-level. A time series analysis of Swedish data between 1935 and 2002 showed that a one litre per capita increase in total consumption was associated with a 13% increase in sickness absence among men (147). No relationship was observed in women.

Alcohol, job strain and long working hours

Working conditions such as stress at work or long working hours may influence people's drinking habits. People may use alcohol in an attempt to relieve stress at work or excessive alcohol consumption may reduce efficiency at work, which in turn leads to work-related stress.

A meta-analysis of 12 European studies reported that compared to light drinkers, non-drinkers and heavy drinkers had a higher likelihood of reporting job stress (148). Moderate drinkers had lower odds of reporting job stress. No clear evidence for longitudinal associations between job stress and alcohol consumption was found.

A separate meta-analysis demonstrated that people with high levels of job stress were more likely than people with minimal job stress to have four unhealthy lifestyle factors (149):

- high body mass index (BMI)
- higher levels of smoking
- heavy alcohol use
- low physical inactivity

Research also shows an association between the number of hours worked in a week and alcohol consumption. A meta-analysis of 63 published and unpublished cross-sectional and prospective studies explored the effect of working hours on alcohol use (150). Long working hours were associated with an 11% increased likelihood of higher levels of alcohol use in cross-sectional studies.

A similar association (odds ratio [OR]=1.1) for onset of risky alcohol consumption was seen in the prospective studies, meaning that starting to drink alcohol riskily was associated with long working hours. The associations were similar regardless of participants' sex, age, socioeconomic status, geographical region, the type of study sample, prevalence of risky alcohol use in the cohort or participation rate at follow-up.

Eighteen prospective studies with individual participant data allowed for a more detailed analysis of the effect of working hours on alcohol consumption. Compared with standard weekly working hours, defined as between 35 and 40 hours per week, working between 49 and 54 hours and working more than 55 hours a week was associated with an increased risk for new onset risky alcohol use (OR=1.13 and OR=1.12 respectively), for participants who were drinking within recommended limits at baseline.

Alcohol and unemployment

The relationship between alcohol-related problems and unemployment is debated in both science and politics. There are two complementary aspects that are difficult to untangle in that unemployment leads to alcohol consumption, and alcohol consumption leads to unemployment.

An extensive literature review by Henkel and colleagues revealed higher rates of substance misuse, both alcohol and drugs, in unemployed compared to employed samples, and on average unemployed persons consume greater quantities of alcohol (9). Unemployed adolescents and young adults also have significantly higher rates of substance use compared to their employed counterparts.

The review also provided evidence that problematic substance use increases the risk of unemployment, and decreases the chances of employment. For example, a diagnosis of alcohol use disorder (AUD) doubles the risk of shifting from employment to unemployment and drinkers who consume alcohol at high risk are six times more likely not to be employed than low-risk drinkers. This can lead to a downward drift in socioeconomic status termed 'social drift', and is one of the explanations for the alcohol harm paradox (see *The alcohol harm paradox*).

All studies included in the Henkel review included at least one finding demonstrating that unemployment significantly increases AUD. For example, becoming unemployed increases the chance of developing an AUD six fold, compared to those who remain in employment. Rates of alcohol and illicit drug misuse or dependence increases one-to-four times among young people after six months of unemployment compared to their employed peers.

Also included in Henkel's review was a meta-analysis showing that unemployed individuals were more likely to continue using drugs and alcohol during treatment, and to relapse following treatment, compared to their employed counterparts. Similarly, paid employment increased the likelihood of better treatment outcomes.

Difficulties with employment are frequently experienced by those with alcohol dependence. A review of 125 longitudinal and 60 cross-sectional studies showed high levels of problems with keeping and obtaining work and work performance among a sample of people with alcohol dependence (151). Markedly high unemployment rates were reported among the study samples, with an average of 53%, ranging between 24% and 90%. Work-related problems were more frequent among dependent women than dependent men in three studies, however two studies found work-related problems more frequently in men compared to women.

Crime and disorder

Introduction

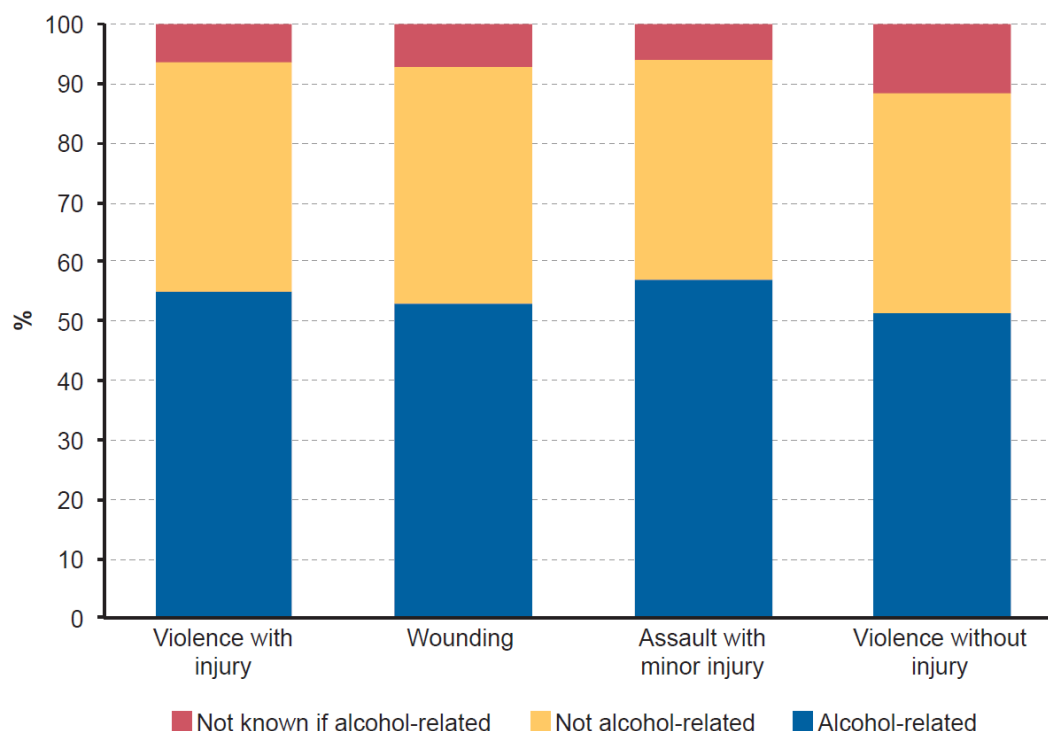
A substantial body of research has looked at the relationship between drinking alcohol and criminal behaviour. Several types of crime have been examined, including aggression and violence, public order offences, acquisitive crime and drinking and driving. While the research literature tends to focus on the relationship between alcohol consumption and criminal behaviour in perpetrators or offenders, the presence of alcohol should be taken into consideration in the victims as well.

Levels of public violence and disorder are associated with the number of pubs and clubs concentrated in an area, with an increased number of premises being associated with increased levels of violence and public disorder (*see Alcohol outlet density*) (152,153). This violence and disorder can take place between groups of people who are intoxicated or can be directed at non-drinkers who are in that area at the time. In 2013/14, surveys in England and Wales revealed that victims of crime believed the offender(s) to be under the influence of alcohol in over half (53%) of all violent incidents, equivalent to over 700,000 offences (154). Alcohol is commonly cited in assaults causing minor injury, wounding and assault without injury and is most commonly directed at strangers (Figure 26).

Alcohol-related violent incidences are more likely to occur at specific days and times during the week (154). Levels of violence are often disproportionately high on weekend nights. On the weekend, 70% of all violent incidents are alcohol-related compared to 35% on weekdays and between midnight and 6am, 84% of all violent incidences are alcohol-related compared to 23% between midday and 6pm. Many of these assaults involve the use of glass or bottles as weapons (155).

While alcohol is often involved in violent and impulsive crime, other less serious types of crime also relate to alcohol such as noise disturbance, littering and anti-social behaviour. Data on the prevalence of these harms is scarce however a survey of over 1,000 participants in the North West of England reported that 43% of respondents have been annoyed by people vomiting or urinating when they have been drinking and 54% have been annoyed by people littering in the street after they have been drinking (156). Most of these offences are handled out of court with Penalty Notices for Disorder (PND) under the Criminal Justice and Police Act 2011.

Figure 26: The proportion of violent incidents where the victim believed the offender(s) to be under the influence of alcohol 2013/14^[i] (154)



^[i] Includes violence with and without injury; questions were only asked if the victim was able to say something about the offender(s), and the offender(s) were perceived to be over the age of 10

Although alcohol-related violence is common in the public arena, it can also take place in private, for example in the form of IPV (see *Intimate partner violence*) or child abuse and neglect (see *Adverse childhood experiences*). Alcohol-related crime can also occur on the road as it is a criminal offence to drive or attempt to drive a vehicle in excess of the legally permitted limit as outlined in the Road Safety Traffic Act (see *Reducing drink-driving*).

Importantly, not all alcohol-related crime and disorder gets reported to the police and levels of reporting tend to be higher in older people (157). As a result, many alcohol-related offences go unrecorded, making it difficult to determine the true prevalence or economic burden of alcohol-related crime.

While there is an inevitable uncertainty in estimating the costs of alcohol-related crime and disorder, most estimates suggest it represents a considerable economic burden. A Cabinet Office estimate in 2004 reported that alcohol-related crime in England cost society £11 billion, equivalent to 0.7% of gross domestic product (GDP) (144). However, this estimate is outdated and there are concerns regarding the assumptions and methodological judgements used in deriving this estimate (31). Better quality estimates from four high income countries placed the total costs of alcohol at 2.6% of gross domestic product (GDP) in 2007, of which 3.5% was made up of law enforcement costs (27).

The types of crime associated with alcohol

Across experimental, survey and victim research, acute alcohol consumption is associated with aggression and violence (158). In the laboratory, intoxication induces aggressive responses (159) and this increases with increasing amounts of alcohol consumed (160). The effects of alcohol on aggression and self-control (161) are an important causal factor in impulsive and violent crime (13).

The role of alcohol in different types of criminal behaviour was examined using a retrospective analysis of over 16,000 US prison inmates (162). Compared to drug offenders, alcohol intoxication was most related to carrying out:

- homicide (odds ratio [OR]=3.6, standard error [SE]=0.07)
- physical assault (OR=3.7, SE=0.09)
- sexual assault (OR=3.2 SE=0.09)
- robbery (OR=2.0 SE=0.08)
- burglary (OR=1.8, SE=0.08)

Overall, the more intoxicated the offender was, the greater the severity of crime. However, alcohol played a role in homicide and physical assault even when offenders drank in moderation.

Further support for the role of alcohol in homicide comes from analysis of data from an Australian national database of homicides (163). Between 2000 and 2006 around half of all homicides were alcohol-related. Homicide was defined as being alcohol-related if police had recorded the offender as having been drinking or drunk or toxicology reports showed that the victim had consumed alcohol. In 60% of these homicides, both the offender and victim had consumed alcohol.

In a longitudinal study conducted in New Zealand, participants with five or more symptoms of alcohol abuse or dependence had a higher likelihood of self-reported offending behaviour, including violent offending, compared to those with no symptoms (13,14). In this cohort, alcohol was not associated with crimes which require planning and co-ordination such as fraud.

Alcohol-related assaults caused by glass and bottles

Many alcohol-related assaults involve the use of glass or bottles as weapons. A retrospective analysis in Scotland indicated that 27% of facial injuries in over 80,000 patients attending hospital were alcohol-related (155). Men were over five times more likely to experience an alcohol-related facial injury than women (rate ratio=6.7, 95% confidence interval [CI] =6.3, 7.1) and people attending hospital from deprived areas

were substantially more likely to suffer facial injury than their affluent counterparts (rate ratio=6.7 95% CI=6.3, 7.1).

Similar findings were seen in an Australian cross-sectional sample of patients aged 12 years or older who presented to an emergency department with an alcohol-related injury (164). Nine per cent of alcohol-related assault injuries were a consequence of a violent incident involving a bottle or glass container. The patient's median age for glassing injuries was 25 years and 18 to 24 year olds accounted for 36% of all cases reported. Overall, the most common glass object involved in this type of injury was a bottle, which accounted for 75% of injuries. However within licensed premises only, drinking glasses were used as a weapon as commonly as bottles, used in 44% and 45% of assaults respectively. The most common injuries were inflicted to the head and face, accounting for 64% of all injuries, and the most common setting for alcohol-related glass injuries was the home, where 33% of these assaults occurred.

UK data shows that the costs of glass-related assault are large. Between 1996 and 1998, Ministry of Justice sponsored executive agency, the Criminal Injuries Compensation Authority, awarded £4.08 million to victims of assaults in licensed premises in the UK (165). Based on a random sample of over 1,000 compensation applications, glass and bottle assaults accounted for 28% of this cost, equivalent to £1.15 million. Injuries caused by glass assaults were more costly than bottle assaults with the mean cost of almost 746 injuries from glass assaults amounting to £2,347, compared to £2,007 for 542 injuries from bottles. Note that levels of alcohol-related crime have declined since this data was published.

The prevalence of alcohol use disorders in the prison population

Given the relationship between alcohol and crime, research has sought to quantify the prevalence of alcohol use disorder (AUD) in prison and probation settings in the North East of England (166). Participants were recruited from four prisons and three probation offices in the North East and completed the Alcohol Use Disorders Identification Test (AUDIT). Scores on AUDIT were compared with information that is routinely recorded on the Offender Assessment System (OASys) which identifies in part alcohol-related need in probation.

In 2004/05, the prevalence of AUD was much higher in the offender population compared to the general population. Of over 700 respondents, 63% of men and 57% of women were identified as having an AUD, with over a third of all individuals scoring within the possibly dependent range indicated by a score of greater than 20 on AUDIT. Prevalence of AUD in the general population for the same time period was 26%. Despite high rates of prevalence in the offender population, around 40% of cases who were classified as hazardous, harmful or possibly dependent on AUDIT were not

identified by OASys which suggests many offenders who need alcohol treatment go undetected.

Data from the National Drug Treatment Monitoring System (NDTMS) shows that across England in 2014/15, there were almost 60,000 prisoners receiving treatment for alcohol problems, of which almost 9,000 (15%) were receiving treatment for the problematic use of alcohol only (167). Of those prisoners whose primary problematic substance was alcohol, 53% reported drinking every day on the past 28 days prior to custody and 51% report drinking 25 or more units on a typical drinking occasion.

Perceptions of alcohol-related crime in the night-time economy

There is no standard definition for the night-time economy. Broadly, it refers to economic activity which occurs between the hours of 6pm and 6am, and typically involves the sale of alcohol in pubs, bars and nightclubs. Alcohol consumption in the night-time economy has many benefits, such as the generation of income, but can also include risks and costs for public health including:

- crime and fear of crime
- ambulance, accident and emergency and hospital costs
- street cleaning around licensed premises and late-night fast-food takeaways
- sale of alcohol to underage or intoxicated persons (see *Managing the drinking environment*)
- noise and light pollution

An opportunistic survey of over 30,000 people in the North West of England showed that nearly half of all respondents avoided the town centre at night because of the drunken behaviour of others and half felt that action was needed to tackle alcohol issues in their area (168). The proportion of respondents avoiding the town centre at night ranged from 25% of those aged 18 to 24 years to 61% of those aged 65 to 74 years. Seventy-one per cent of respondents were concerned about the drunken behaviour of others in their area and 45% were concerned about alcohol-related litter.

An Australian household survey of nearly 700 respondents showed similar results to the survey in the North West of England and showed that many respondents had negative perceptions of their local night-time economy as a result of alcohol (169). In total, 90% considered that alcohol misuse was a problem in their local night-time economy and 46% thought that over 70% of crime in the night-time economy was as a result of alcohol.

Retrospective analysis of the Crime Survey for England and Wales data for the years 2002/03 until 2010/11, shows that respondents who were in or around a licensed premise at the time of being a victim of violent crime were less likely to regard that

violence as a crime compared to respondents who were victimised in other locations (OR=0.5, 95% CI=0.3, 0.7) (170). This suggests that despite a large volume of violent crime occurring in licensed premises, the criminal nature of violence in these locations is not considered by victims.

Alcohol consumption and sexual assault

Alcohol consumption is linked to sexual assault both in the victims and perpetrators. A retrospective analysis of almost 300 sexual assault cases involving complainants between the ages of 12 and 25 years, shows that drinking often precedes sexual assaults in the UK (171). Of nearly 300 cases, 71% of complainants had consumed alcohol before being assaulted. This varied with age from 0% in those aged 12 years to 100% in those aged 24 years. In all but two cases alcohol or drugs were taken voluntarily.

A survey in New Zealand of over 16,000 individuals reported that in 57% of all sexual assaults reported, the victim believed the perpetrator to be under the influence of alcohol (172). Compared to non-drinkers, the risk of being sexually assaulted increased with the victim's drinking frequency and the amount drunk on a typical drinking occasion.

Similarly, a review of 25 observational and experimental studies showed that men's drinking patterns are positively linked with perpetration of sexual assault (173). However few studies examined how alcohol interacts with other risk and protective factors, to increase or decrease sexual aggression.

Part B: Alcohol control policies

Introduction

Among those aged 15 to 49 in England, alcohol is now the leading risk factor for ill-health, early mortality and disability and the fifth leading risk factor for ill-health across all age groups (7). A review of four studies from high income countries using comparable methodologies, cites the gross economic costs of alcohol to range from 1.4% to 2.7% of gross domestic product (GDP) in 2007 (174). There is an inevitable uncertainty in any attempt to quantify the economic burden of alcohol however, it is clear that the harmful use of alcohol consistently exerts a considerable burden both nationally and worldwide. This burden is borne by governments, society at large and individual drinkers and their associates.

Alcohol control policies have been defined as *“any purposeful effort or authoritative decision on the part of governments or non-government groups to minimise or prevent alcohol-related consequences”* (2). Internationally, policy actions range from regulations on price and availability through to targeted interventions for people with alcohol-related problems, such as dependence. Treatment for harmful and dependent drinkers can be considered to be a ‘demand reduction policy’ however in the context of this review it is considered alongside alcohol control policies.

Each control policy is guided by a principle or assumed mechanism of action. For example enforced drink-driving legislation works via a process of deterrence, whereas price regulation works by increasing the price of alcohol relative to other consumer spending choices. This evidence review outlines the evidence for the effectiveness and cost effectiveness of policies in seven broad domains including:

- taxation and price regulation
- regulating marketing
- regulating availability
- providing information and education
- managing the drinking environment
- reducing drink-driving
- brief interventions and treatment

Not all policies lend themselves to the same types of research methods. For example, evaluations of pharmacological drugs are more amenable to study with methods such as randomised controlled trials (RCTs). This nature of evidence can more easily control for confounding variables and therefore their results are more easily interpreted. In contrast, population-level policies, such as marketing regulations, do not lend themselves to these rigorously controlled analytical techniques. As a result the evidence

is more diffuse, relying as it does on modelling or natural experiments, with a range of inevitable confounding factors.

This review brings together the most up-to-date, objective, scientific evidence to outline the consensus view of the effectiveness of alcohol control policies. Where possible, the findings from systematic reviews and meta-analyses are emphasised. The report has undergone multiple levels of peer review including involvement of the leading national and international experts in alcohol policy in an open peer validation event. Full methods for carrying out this review can be seen in Annexe 1, alongside a glossary in Annexe 3.

Taxation and price regulation

Introduction

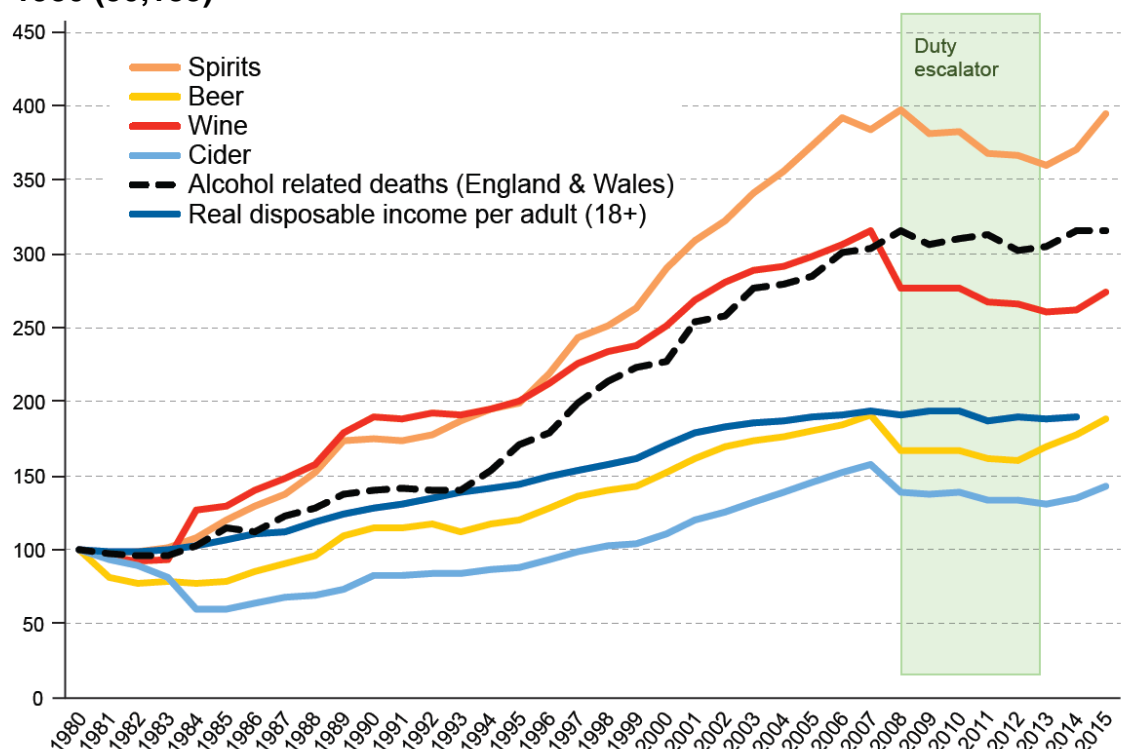
There is a wealth of literature demonstrating that the price of alcohol is an important determinant in its consumption (2–4,175–180). While there is variation in the strength of this relationship, the evidence suggests that an increase in the price of alcohol is accompanied by a meaningful decrease in its consumption.

The affordability of alcohol is a composite measure looking at the net effect of price and income. The affordability of alcohol is one of the key influences on consumers' purchasing choice and consumption behaviour (181). For this reason, addressing pricing to reduce the affordability of alcohol, either through taxation or price regulation, is a key element of policies aimed at influencing consumption patterns and harm. The extent to which affordability influences consumption and harm also depends on income levels (income elasticity) and the extent to which real incomes have changed over time. In theory the impact of price increasing policies could be mitigated if real incomes were rising sufficiently fast, but this has not been the case in recent years.

Alongside this, the impact of alcohol-related harm to third parties has to be taken into account. Earlier chapters of this report describe the wider harms to society including health harms, crime and disorder, harms to the family and loss of employment and productivity. The significant financial burden which alcohol-related harm places on society is not reflected in its market price, with the cost to the individual consumers being lower than the costs of alcohol on taxpayers. Such costs are known as external costs, or negative externalities, and represent partial market failure. There is therefore a strong argument for government intervention to address these negative externalities.

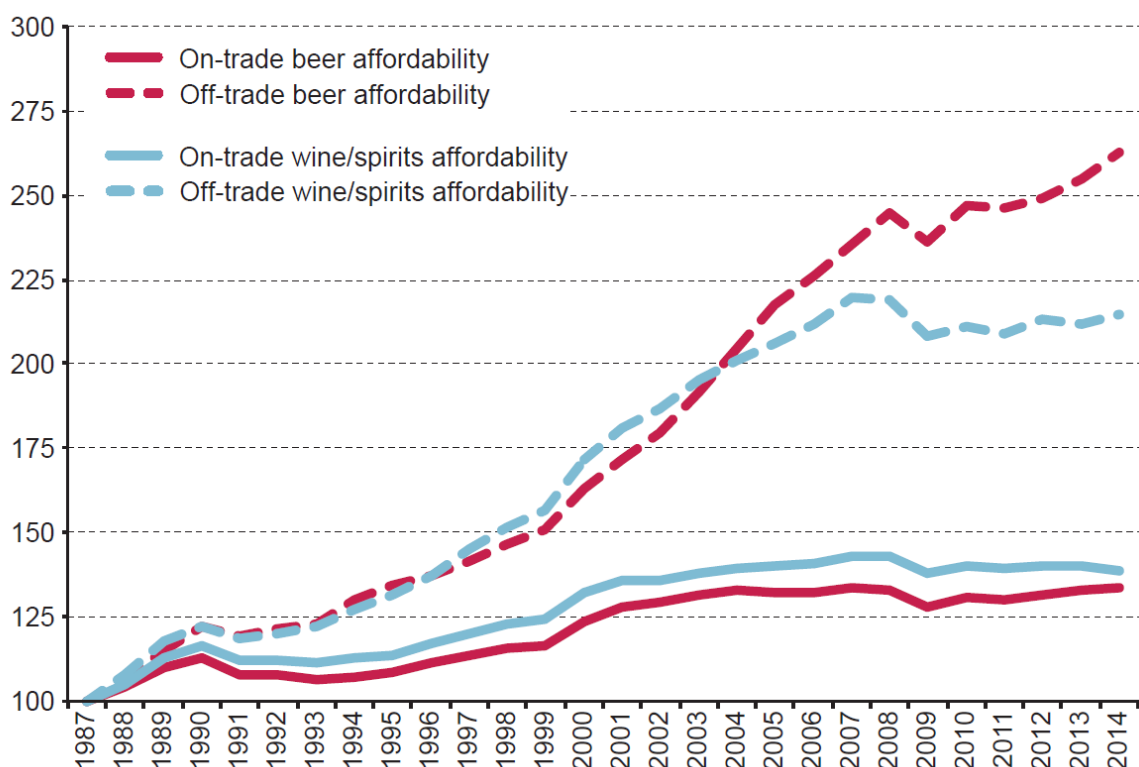
Over the last 30 years, the affordability of alcohol in the UK has steadily increased and alcohol is now 60% more affordable today than it was in 1980 (182). Relatively speaking, disposable incomes have increased and real-term alcohol prices have decreased, particularly in the off-trade sector which is dominated by markets absorbing price increases and regularly discounting alcohol (Figure 27). This has been a common observation across Europe (181). In particular, in the UK, strong alcohol like spirits and wine are now more affordable than in 1980 (Figure 28). Alcohol-related deaths have also increased over this period. In 2008, the UK government introduced a duty escalator that automatically increased alcohol duties by 2% above inflation each year. This was repealed in 2013 and 2014, for beer then cider and spirits, and since, there have been further freezes to beer, cider, and spirits duty.⁴ From 2007/08 onwards, the affordability of alcohol decreased substantially more than household incomes suggesting that of the multiple economic factors influencing alcohol consumption, the 2% duty escalator may have had a relatively larger effect.

Figure 27: Trends in the affordability of alcohol in the UK, 1980 to 2015, indexed to 1980 (50,183)



Note, consumption of beer and lager is split between weak and strong beers with a cut-off of around 4.2%, real disposable income per adult (18+) based on quarter 3 2015

Figure 28: Trends in the affordability of alcohol in the UK in the on- and off-trade sectors 1987 to 2014 (based on consumer price index factsheet and ONS data on inflation and disposable income)



Given that alcohol-related harm is dose-related, population-level alcohol consumption can be viewed as an approximation of population-level harm (45). Therefore, key drivers of total consumption, such as changes in the price of alcohol, represent key drivers of total harm. Accordingly, reductions in alcohol consumption achieved through price increases, translate into reductions in alcohol-related harm (184,185).

A large body of research evidence, and expert consensus reviews by the OECD, WHO, the National Institute for Health and Care Excellence (NICE) and the Academy of Medical Sciences, concludes that alcohol taxation and pricing policies are among the most effective and cost-effective approaches to prevention and health improvement (1–4,8,138,175–177,180,184–186). Such policies have been shown to mitigate a range of adverse health and social consequences and have a relatively low implementation cost compared to other alcohol policies.

This section reviews the evidence on taxation and price regulation as a means to reduce the consumption of alcohol and alcohol-related harm. A number of available policies are appropriate for the UK context, including fiscal measures, such as taxation and regulatory measures, such as minimum prices, bans on below-cost sales and bans on price promotions or discount sales.

Taxation

Alcohol has been viewed as a taxable commodity by governments for a long time. The rationale has been historically linked to the fiscal revenues generated, rather than to their potential public health benefits. However, recently, an increased recognition has been placed on the latter, as evidence has emerged of the strong relationship between price, consumption and harm.

Alcohol is subject to consumption taxes which fall broadly into three different categories:

- excise duties: taxes on specific goods and services
- value added taxes (VAT): taxes on general consumption
- custom taxes: taxes on imported goods

This report focuses predominantly on excise duties which can be used by governments as a lever to influence alcohol consumption, without affecting the sale of other goods.

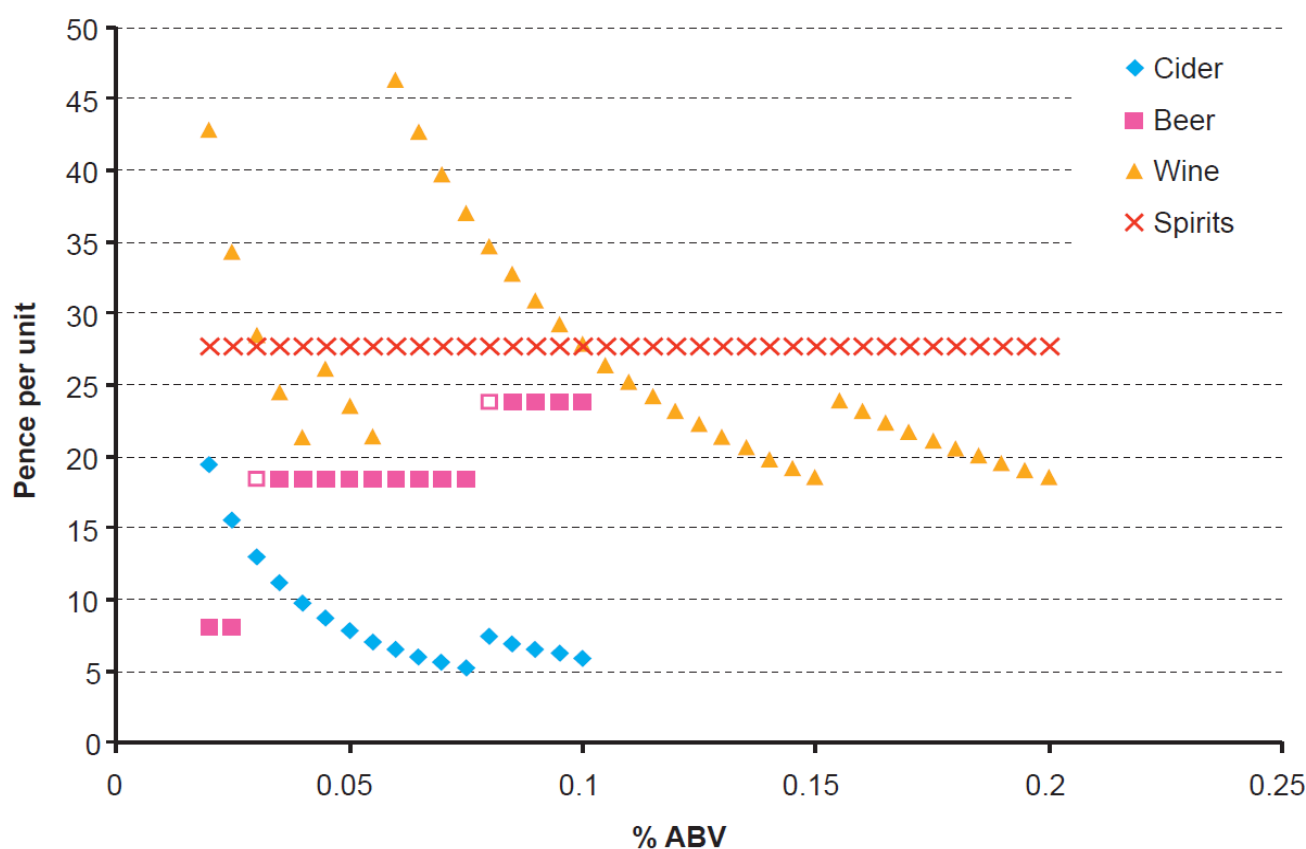
Excise duties are regulated at the European Union (EU) level by two EU directives which detail the methods by which duty must be charged and define the minimum rates which member states must apply (Annexe 4). VAT is also regulated at the EU level and alcohol is among the products for which VAT is levied at standard rate. As a result, member states have the freedom to set their own rates, provided that these are higher

than the minimum rates, but cannot change the structures of excise duties or change the type of VAT rate, which need to be as follows:

- the tax base for beer and spirits is the alcohol content (alcohol by volume [ABV])
- the tax base for wine and intermediate products, for example, cider, port, sherry, is the volume of liquid and is set in specific bands
- VAT is levied on alcohol at standard rate (which cannot be less than 15% according to the EU law and it is currently set at 20% in the UK)

In line with the EU directives, in the UK, wine and cider are taxed per litre of product, within broad strength bands (Annexe 5) and not according to the amount of alcohol, meaning that the rates per unit of alcohol decrease as the strength of the products increase, whereas beer, spirits and alcopops are taxed on alcohol content. The tax per unit of alcohol levied on beer increases with strength according to defined strength bands, while the tax on spirits and alcopops does not vary with strength and is set at £27.66 per litre of pure alcohol (Figure 29). For all alcohol, VAT, currently set at 20%, is applied to the final price which includes the excise duty for alcohol.

Figure 29: Excise duty per unit of alcohol by type of alcoholic beverage (analyses based on duty rates 2016/2017 shown in Annexe 5)



Note: wine and cider refer to still wine and still cider

As a measure to reduce consumption, excise duties on alcohol should be regularly adjusted for inflation as they do not vary according to the product price. Otherwise their real value will erode over time and, other things being equal, they will have a lesser impact on consumption. The duty escalator was introduced to address this concern however this was stopped in 2013 for beer and in 2014 for cider and spirits. Moreover, recently beer, cider and spirits duty were freeze leading to increased affordability of alcohol (Figure 27) (45). The decaying effect of tax over time is exacerbated by disparities in the tax banding of different types of alcoholic beverages (187).

The relationship between price, consumption and harm

The impact of alcohol taxes on health are primarily determined by the responsiveness of alcohol consumption to changes in its price, also known as the price elasticity of demand (PED), and by the substitutions that consumers make as a result of price changes of the products they purchase, also known as the cross-price elasticity.

A number of high-quality systematic reviews and meta-analyses examine the relationship between changes in the price of alcohol and changes in population-level consumption (175–180,184). According to estimates from three meta-analyses, the overall PED for alcohol is in the region of -0.5, suggesting a 10% increase in the price of alcohol would lead to a 5% decrease in its consumption (176,177,179). Although the demand is inelastic, increases in price would lead to a meaningful decrease in consumption. Other things being equal, such inelastic demand also means that increases in price will increase tax revenues. While tax increases increase government revenue, according to the Treasury, recent cuts in alcohol duty have been projected to cost taxpayers £3.45 billion over five years (188–190).

Mean PED values vary according to individual consumption levels, socioeconomic status, setting, and product type (191). A meta-analysis, including 112 studies and more than 1,000 different estimates, found that individuals in general, respond less to changes in the price of beer than to changes in the price of wine and spirits (-0.5, -0.7 and -0.8 respectively) (177). However, in a UK study, this pattern was not observed in the off-trade, where it was found that the demand for beer was more elastic than for wine and spirits (191). Aggregate analysis suggests that moderate drinkers are overall somewhat more price sensitive compared with heavy drinkers (177,192), however an estimate of the average impact masks potential heterogeneity in response to alcohol taxes by different groups. More granular analysis in the UK shows that heavy drinkers are actually more price sensitive than moderate drinkers for most products (193). This is particularly true for price increases of cheap alcohol which is sold in the off-trade. Importantly, elasticities are relative not absolute measures, so a lower elasticity for a high consumption may bring about greater reductions in absolute consumption than a higher elasticity for lower levels of consumption. Other research suggests that adults

are more responsive to changes in the price of alcohol than young people (176,194) and women tend to be more price responsive than men (175).

Price elasticity also differs between the off- and on-trade. In a UK-specific study, demand for cider in the off-trade sector was the most responsive to a change in price (PED: -1.3), and demand for off-trade spirits and on-trade ready-to-drink was found to be the least responsive to a change in price increase (PED: -0.08 and -0.2) (191). Table 6 outlines these results in the grey cells.

Cross-price elasticity of demand measures the extent to which demand for a product changes in response to the change in price of another product. If the cross-price elasticity of demand is positive, the products are substitutes, that is, consumers may increase their demand for one product following an increase in the price of the other product. Conversely, if the cross-price elasticity of demand is negative, the products are complements, meaning that they are usually consumed in combination hence an increase in the price of one product leads to a decrease in consumption of the other product. The cross-price elasticity may strengthen or weaken the ability of tax or pricing policies to influence consumption, according to whether different alcohol products are in effect substitute or complementary products.

A UK study showed that estimated cross-price elasticities were a mixture of positive ($n=46$) and negative ($n=44$) values (191). For example, in the off-trade sector, wine and cider are substitutes, while beer and cider are complementary products (not statistically significant) (Table 6). Further, when the price of alcoholic beverages increases in supermarkets, the demand for alcohol in pubs and bars tends to increase (results not statistically significant).

Table 6: Estimated beverage-specific price-elasticities of demand for the UK (191)

		Purchase									
		Off-sale beer	Off-sale cider	Off-sale wine	Off-sale spirits	Off-sale ready to drink	On-sale beer	On-sale cider	On-sale wine	On-sale spirits	On-sale ready to drink
PRICE	Off-sale beer	-0.980*	-0.189	0.096	-0.368	-1.092	-0.016	-0.050	0.253	0.030	0.503
	Off-sale cider	0.065	-1.268*	0.118	-0.122	-0.239	-0.053	0.093	0.067	-0.108	-0.194
	Off-sale wine	-0.040	0.736*	-0.384*	0.363	0.039	-0.245	-0.155	0.043	-0.186	0.110
	Off-sale spirits	0.113	-0.024	0.163	-0.082	-0.042	0.167	0.406	0.005	0.084	0.233
	Off-sale ready to drink	-0.047	-0.159	-0.006	0.079	-0.585*	-0.061	0.067	0.068	-0.179*	0.093
	On-sale beer	0.148	-0.285	0.115	-0.028	0.803	-0.786*	0.867	1.042*	1.169*	-0.117
	On-sale cider	-0.100	0.071	0.043	0.021	0.365	0.035	-0.591*	0.072	0.237*	0.241
	On-sale wine	-0.197	0.094	-0.154	-0.031	-0.093	-0.276	-0.031	-0.871*	-0.021	-0.363
	On-sale spirits	0.019	-0.117	-0.027	-0.280	-0.145	-0.002	-0.284	0.109	-0.890*	0.809*
	On-sale ready to drink	0.079	0.005	-0.085	-0.047	0.369	0.121	-0.394	-0.027	-0.071	-0.187

Note: Grey cells represent price elasticity of demand and white cells represent cross price elasticity; *=P<0.05

A meta-analysis showed that alcohol taxes and pricing policies significantly affect alcohol-related disease and injury rates (184). Doubling tax rates would decrease alcohol-related mortality by an average of 34.7%. For the same increase in taxation, traffic-crash deaths would decrease by 11.2%, sexually transmitted infections by 5.5%, and violence and crime episodes by 2.2% and 1.4% respectively. A systematic review studying the effect of alcohol taxes on a number of health outcomes also showed a significant relationship between alcohol taxes and traffic fatalities with elasticities ranging from -0.1 to -0.3, as well as between alcohol taxes and violence/crime, with elasticities ranging from -0.09 to -0.13 (175). The study also found an inverse relationship between price and cirrhosis death, although with some variability in the estimated strength of this relationship, as well as alcohol-related cancer and suicide. These findings suggest that the reductions in adverse health effects resulting from a price increase would not be limited to injuries and death among light and moderate drinkers, but would also affect heavy drinkers.

To study the longer-term health outcomes, several model-based studies exist. Although they are based in different geographical settings and rely on different assumptions and methodological approaches, they all predict that taxation has a positive effect on population health and is a cost-effective measure (195,196). Indeed, the WHO analysis shows that increasing the price of alcohol is the most cost-effective strategy in reducing alcohol-related harm (180), and findings from the Chronic Disease Prevention (CDP) alcohol model developed by the OECD suggest that taxation increases lead to large gains in health and life expectancy (4). For example, changes to existing tax arrangements in Germany that generate an overall 10% increase in price at the point of consumption, would reduce the prevalence of hazardous drinking by 10% over 40 years. Such changes would also have a positive impact on employment and productivity, with almost 170,000 working-age people avoiding alcohol-related disabilities each year. Tax increases are also shown to have the potential to generate savings in health care expenditure which outweigh the implementation costs. Findings from the University of Sheffield's alcohol policy model (197) suggest that a 10% increase in the general price of alcohol in England would:

- reduce overall weekly consumption by 4.5%, equivalent to 0.6 units per week
- reduce consumption of high-risk drinkers by 3.6 units per week
- reduce alcohol-related deaths by approximately 1,300 in the 20th year following implementation of the policy
- reduce alcohol-related hospital admissions by approximately 61,000 in the 20th year
- produce societal benefits, including a reduction in health care costs, gains in quality adjusted life years (QALYs),²⁰ and a reduction in crime and work absence, totalling £22.1bn over the 20 year period

²⁰ QALYs valued at £60,000

A potential concern regarding tax increases is that they may have a greater financial impact on less affluent people who tend to spend a larger proportion of their income on alcohol. However, on average, less affluent households consume less alcohol and are more likely to abstain from drinking. As such, they are less likely to be financially impacted by changes in taxation.

An analysis suggests that an increase in alcohol taxation is progressive when considering all households, but regressive when considering only those who consume alcohol such that a 5% rise in alcohol tax is *“if anything, broadly progressive: the worst-off households lose around 0.1% of their budget on average, compared to almost 0.2% for those further up the expenditure distribution”* (198).

When only consumers of alcohol are considered, those who are less affluent lose more than 0.3% of their budget on average, compared to 0.2% for the more affluent. However, to the extent that less affluent groups are more likely to suffer the harms associated with alcohol consumption (199), increasing the price of alcohol through tax has the potential to reduce health inequalities (200).

Cross-border trade, illicit trade and home production are other important phenomena that governments need to take into account when implementing taxation as well as pricing policies. However, there is a lack of data on the changes in alcohol price and tax avoidance and the illicit trade (201). Another concern is the relationship between alcohol's price and consumption of alternative unhealthy substances such as tobacco or psychoactive drugs, for which there is we do not have robust evidence. Qualitative interviews from Scotland suggest there is little evidence that people of substituting alcohol for illicit alcohol or drugs (202).

Pass-through

For tax increases to be effective in reducing harm, they need to be passed on to consumers through price increases, known as 'pass-through'. If tax increases are not passed on to the final price of the product, then there is no change in consumer price and consequently no change in alcohol consumption or alcohol-related harm. Mostly, tax increases are passed on to the final price of the product, however this varies across countries and beverage types (203). In the UK, research shows that retailers tend to raise the prices of their cheaper products by less than the increase in tax, known as under-shifting, and increase the prices of more expensive alcohol by more than the tax increase, known as over-shifting (204).

Under-shifting negatively impacts the effectiveness of tax policy from a public health perspective, as the effectiveness of tax for reducing health and social harms relies on taxes being passed through to consumers.

Minimum pricing

Minimum pricing is a direct price control set by government aimed at preventing the sale of alcohol below a certain price. Unlike tax increases, where the price increase may not necessarily be passed through to the point-of-sale, this policy ensures that a minimum price is paid by the consumer. In principle, this applies to all alcohol, however this policy typically affects the high-strength, cheap products that are predominantly sold in the off-trade.

There are a number of ways of implementing a minimum price. Minimum price can be based on the volume of liquid, on the alcohol content, or both. The Canadian province of British Columbia has implemented a policy affecting the minimum price per ounce of alcohol, not changing with strength, while the province of Saskatchewan has applied a minimum price adjusted for alcohol content according to different strength bands.

Another form of minimum pricing is MUP, which creates a uniform price per unit of alcohol. The minimum price for particular products is then set according to the MUP, strength and volume of alcohol using the formula $MUP \times S \times V \times 100$, where *MUP* is the minimum unit price, *S* is alcoholic strength, and *V* is the beverage volume in litres. The definition of a unit of alcohol varies in different countries and in the UK is equal to 10ml or 8g of pure alcohol.

In 2012, the Scottish Parliament legislated to implement a 50 pence MUP which was met by a legal challenge from the Scotch Whisky Association (SWA) on the grounds of a potential breach of EU free trade regulations. The Scottish Courts considered whether implementing MUP would restrict trade and if so, whether it could be justified on the grounds of health protection, in line with Article 36 of the EU Treaty. In May 2013, they ruled in favour of the legislation, however, following an SWA-led appeal, the case was referred to the European Court of Justice (ECJ) in April 2014.

In December 2015, the ECJ declared that MUP would impede the free movement of goods within the EU and as such that it would only be legal if justified under Article 36 of the Treaty on the Functioning of the European Union. The case has been returned to the Scottish Courts to provide a final ruling, with the onus on the Scottish government to show that minimum pricing is more effective than fiscal alternatives for protecting health (205).

In October 2016, the Scottish Inner House of the Court of Session decided MUP was proportionate and justifiable on health grounds (206). The judges agreed that MUP has advantages over taxation as an increase in taxation might not necessarily translate into an increase in the price of alcohol for consumers. Taxation cannot guarantee “a minimum price” and according to EU laws it is not linked to the strength of alcohol. Therefore, the judges concluded that “*alternative measures including increases in*

taxation, are not capable of protecting life and health as effectively as minimum pricing, while being less restrictive of trade". The SWA however have confirmed they will appeal this decision (207).

Plans for setting a MUP were also published by the Welsh government in July 2015 and the Northern Ireland Health Minister in December 2014. In addition, the Public Health Alcohol Bill published by the Republic of Ireland will introduce MUP at €1 per unit.

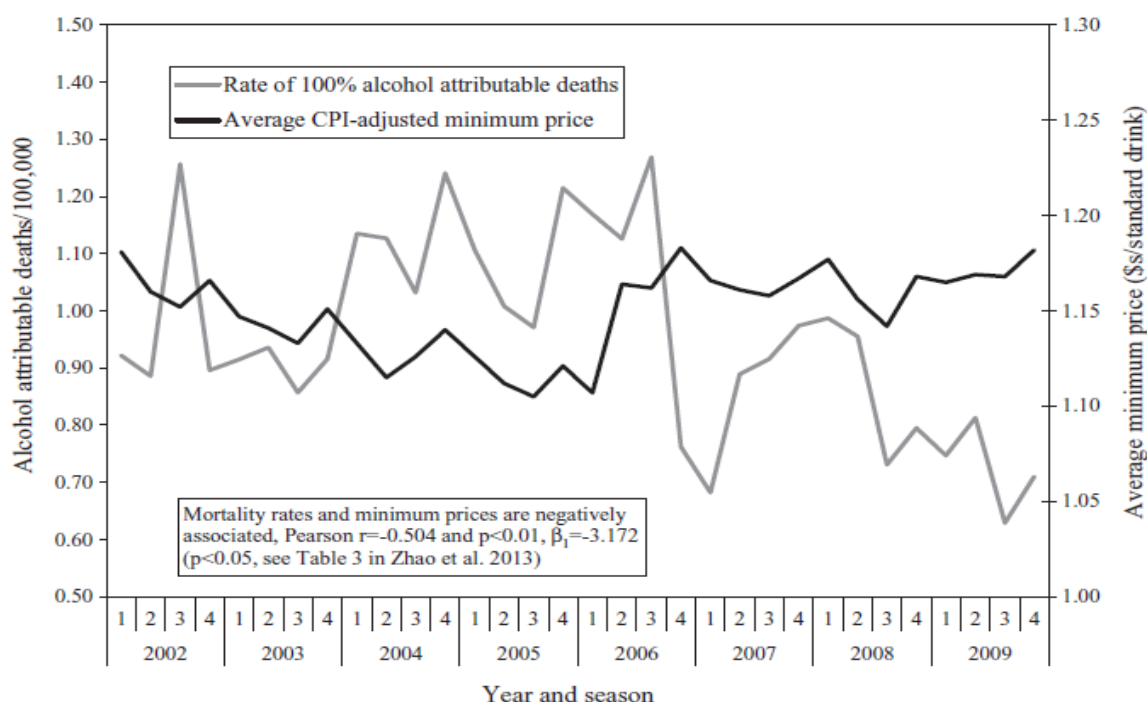
Empirical evidence and epidemiological modelling

In the Canadian province of Saskatchewan, a 10% increase in minimum prices of alcohol reduced consumption of all beverages by 8.4% (208). Consumption reduced by 10.1% for beer, 22% for high-strength beer (>6.5 ABV), 5.9% for spirits and 4.6% for wine. Reductions were greatest in off-trade sales, such as off-licences, compared to on-trade sales, such as bars, largely due to more significant price increases in this latter setting. The neighbouring province of Alberta, where no minimum pricing policy was implemented, showed no change in per capita alcohol consumption over the same time period.

In the Canadian province of Saskatchewan, a 10% increase in minimum prices of alcohol reduced consumption of all beverages by 8.4% two years after its implementation. Equivalent reductions for beer were 10.1%, high-strength beer (>6.5% ABV) 22%, spirits 5.9% and wine -4.6%. Reductions were greatest in off-trade sales, such as off-licences, compared to on-trade sales, such as bars, largely due to more significant price increases in this setting. The neighbouring province of Alberta, where no minimum pricing policy was implemented, showed no change in per capita alcohol consumption over the same time period.

Minimum price policies have also shown to be associated with short-term reductions in alcohol-related mortality and hospital admissions (Figure 30) (209,210). A 10% increase in average minimum price for all alcoholic beverages in British Columbia was associated with a 32% (95% confidence interval [CI]: $\pm 25.7\%$) reduction in wholly alcohol-related deaths within nine months, a 9% reduction in acute alcohol-related hospital admissions and a 9% reduction in chronic alcohol-related hospital admissions two to three years after the policy was implemented.

Figure 30: The relationship between minimum alcohol prices and alcohol-attributable mortality in British Columbia, 2002 to 2009 (211)



Note, CPI=consumer price index

Research has also shown positive impacts of minimum pricing on crime in British Columbia (212). Overall, a 10% increase in minimum price for all alcoholic beverages was associated with a 9.2% decrease in total crime rates between 2002 and 2010 (95% CI: $\pm 3.8\%$). More specifically, there was an observed 18.8% (95% CI: $\pm 17.9\%$) reduction in alcohol-related road traffic violations and a reduction of 9.4% (95% CI: $\pm 3.8\%$) in crimes against persons.

England-specific modelling has been carried out on the effect of a MUP on alcohol consumption, mortality, hospital admissions and crime on different types of drinkers types (defined in Annexe 6) (197,213,214). Different levels of MUP have been modelled since research began, with the most recent focusing on a 60 pence MUP. Figure 31 shows the estimated impact of a 60 pence MUP on alcohol-related deaths and hospital admissions after 20 years (197). Figure 32 shows the impact of the same price increase by drinker type, presented per 100,000 population. Across all measures, high-risk drinkers experience the greatest reduction.

Figure 31: Estimated impact of a 60 pence minimum unit price policy in England on alcohol-related deaths and alcohol-related hospital admissions (broad and narrow measure) (197)

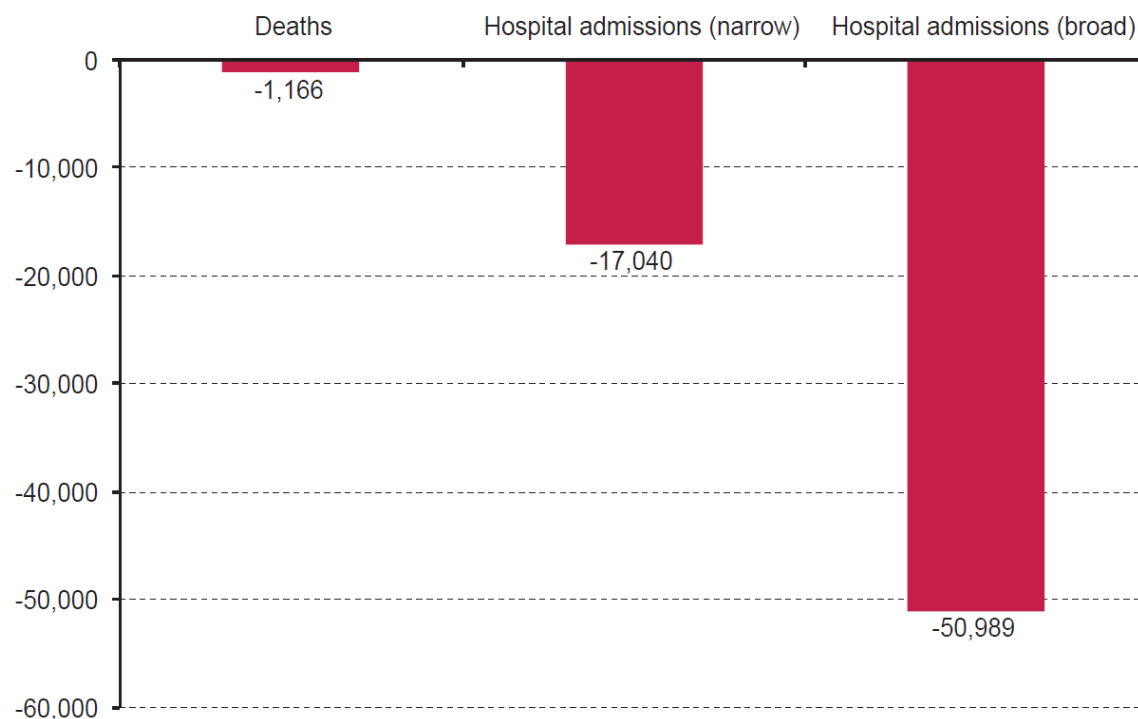
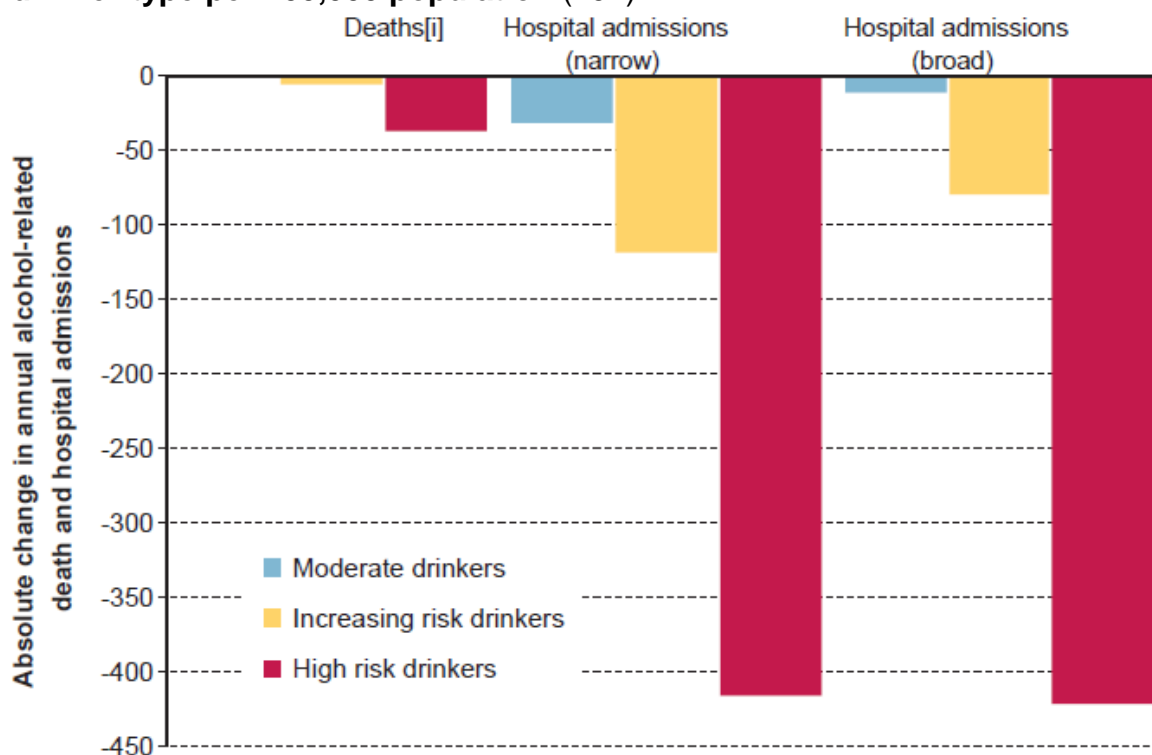


Figure 32: Estimated impact of 60 pence minimum unit price in England on alcohol-related deaths and alcohol-related hospital admissions (broad and narrow measure) by drinker-type per 100,000 population (197)



High-risk drinkers in the lowest socioeconomic group experience almost double the gains in terms of reduced mortality and hospital admissions, of any other population sub-group. For example, an older study which analysed the impact of a 50 pence MUP showed that this group experience around 27,500 fewer hospital admissions per year per 100,000 population compared to around 19,000 for increasing-risk drinkers in the lowest socioeconomic group, or around 7,000 for high-risk drinkers in the next lowest socioeconomic group.

Moderate drinkers, irrespective of socioeconomic status, are minimally affected by a 60 pence MUP, with estimates of increases in monthly spending of 61 pence. This is because the vast majority of the alcohol moderate drinkers consume is purchased well above a MUP (200). High-risk drinkers on low incomes, on the other hand, purchase more alcohol at less than the MUP and are therefore more likely to reduce their consumption were an MUP policy implemented (197). This group also incurs the most alcohol-related harm, so the reduction in consumption would coincide with substantial health gains, suggesting that MUP is a highly targeted measure. These results are confirmed by Australian modelling showing that a \$2 MUP has a greater impact on heavy drinkers and low-income households who consume larger quantities of alcohol (215).

A cross-sectional survey in England which used an example 50 pence MUP showed that the policy would only have a very small effect on people on low incomes unless their alcohol consumption is excessive (216), and similar surveys measuring the price of alcohol products in the off-trade show that products which are affected by a MUP tend to be best-sellers at shops serving deprived communities where alcohol-related ill-health and other inequalities are greatest (217).

A study comparing minimum pricing with volumetric taxation in Australia found that, while both policies have the potential to reduce heavy consumption of wine and beer without adversely affecting light and moderate consumers, a minimum price would offer the potential to achieve greater reductions in heavy consumption at a lower overall cost to consumers (218). This finding is “*robust to household composition, different tax pass-through rates, and implementing these two policy options simultaneously or separately.*”

In summary, empirical evidence and modelling studies have shown that setting a minimum price for alcohol can reduce alcohol-related harm while saving health-care costs.

The relative and combined impact of taxation and pricing policies

Recent research, commissioned by the Scottish Government, has shown that alcohol taxes would need to increase by a substantial 28% to match the reductions in alcohol-related deaths that an example 50 pence MUP is estimated to achieve, yet historically,

duty increases have rarely exceeded 5% (219). Such an increase in taxation would also be a comparatively less targeted measure.

While increases in taxation increase government revenue, under a minimum pricing policy it is the producers or retailers of alcohol who receive the additional revenue rather than the Exchequer. However, when minimum price policies are applied in conjunction with taxation, they have the potential to generate government revenues as they would change the existing tax base, the total receipts from the sales of alcohol (4). When a government alcohol monopoly exists, increased alcohol prices through minimum pricing leads to increased revenues. This is the case in Canada, where provinces have a government monopoly on the retail of alcohol and consequently provinces receive the additional revenue generated by an increase in the minimum price instead of alcohol producers or traders (209).

Commissioned by PHE, the School of Health and Health Related Research (ScHARR), University of Sheffield, modelled the impact of introducing alcohol taxation and pricing regulations individually, and on a combined basis (220). The following scenarios were modelled for their impact over a five-year period:

- a freeze in duty
- phased duty increases (annual duty increases in line with inflation +2%)
- a cut in duty (a one-off 2% duty cut followed by a four-year duty freeze)
- a 60 pence MUP policy (assuming duty remains constant in real terms)
- phased duty increases and a 60 pence MUP policy

Figure 33 shows the change in consumption at full effect of the different policy types and drinker group. The full effect duration will depend on the policy type, for example; the full impact of 60 pence MUP would be seen at the end of the final year, whereas the full effect of the phased duty would be seen after five years. Figure 34 shows the same results stratified by socioeconomic status. Duty-lowering policies lead to modest increases in alcohol consumption while phased duty increases lead to a modest reduction in drinking. The estimated reductions in consumption occur to the greatest extent among high-risk drinkers and the lowest socioeconomic groups. These groups are where the harms relating to alcohol are most heavily concentrated.

Figure 33: Change in consumption (units per year) at full effect by policy and drinker group (220)

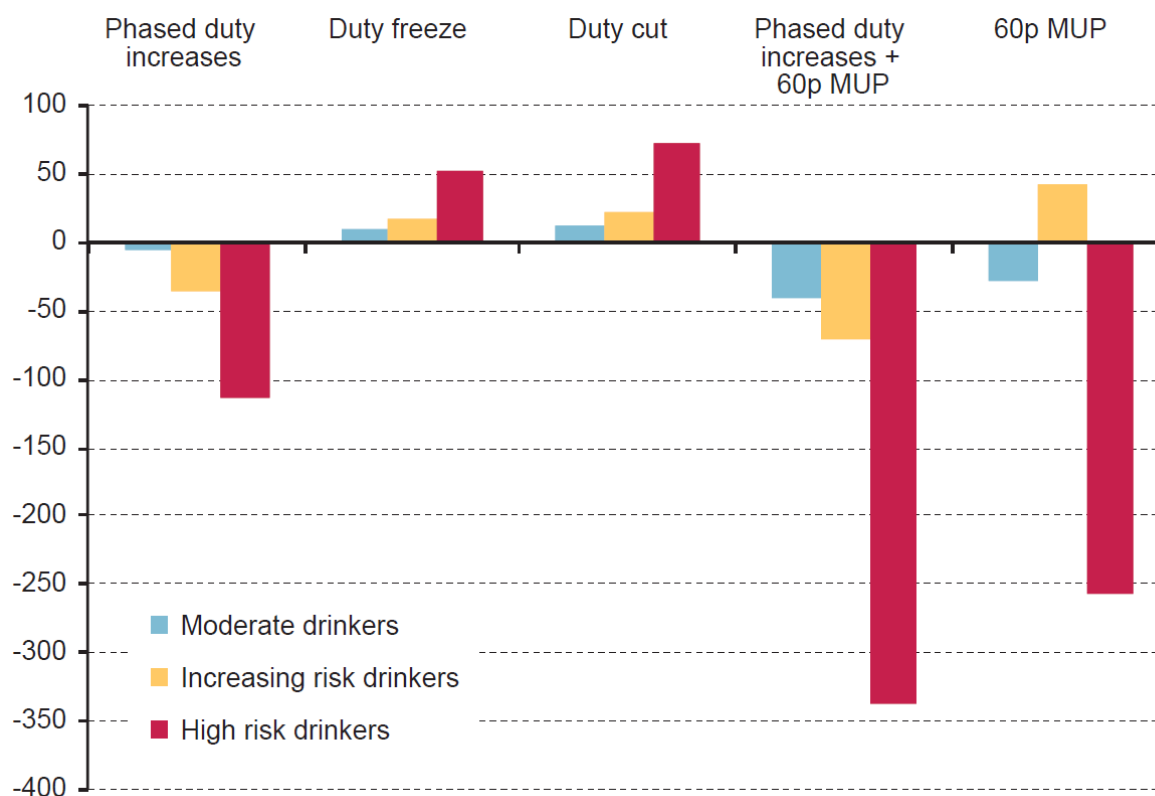
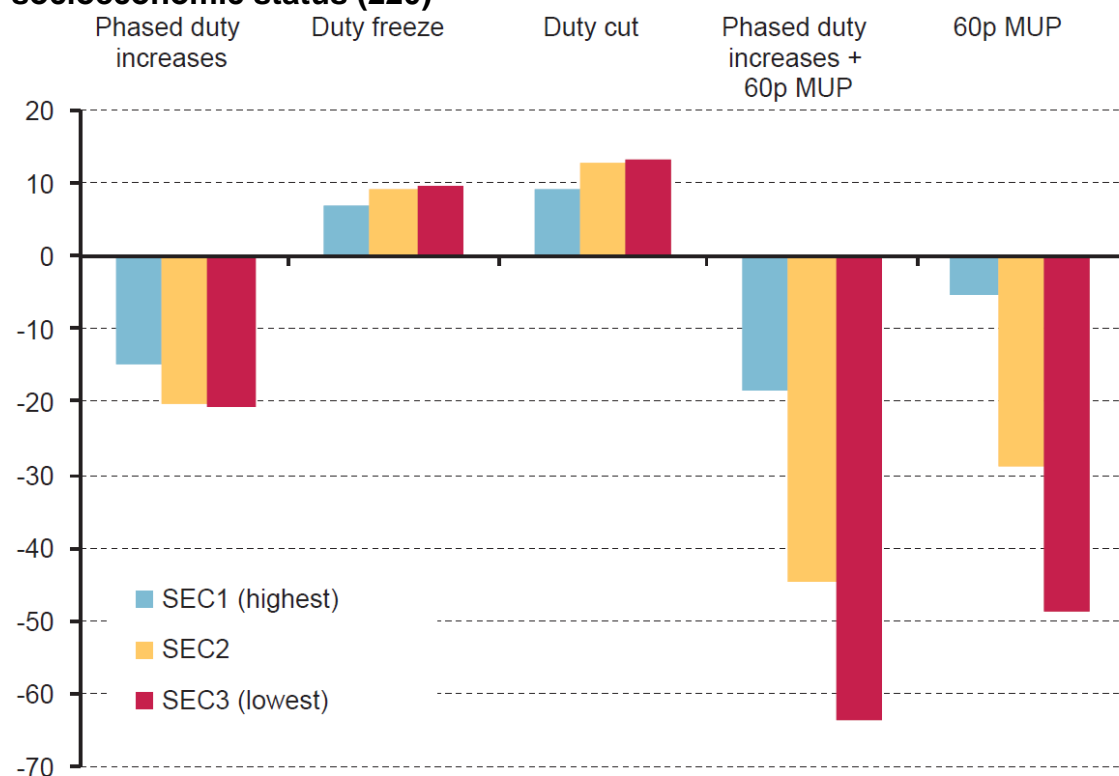


Figure 34: Change in consumption (units per year) at full effect by policy and socioeconomic status (220)



All price-increasing policies are estimated to lead to substantial reductions in alcohol-related deaths and hospital admissions, with the greatest impact for a policy combining phased duty increases and a 60 pence MUP. For example, a combination of MUP and phased duty increases reduces alcohol-related hospital admissions at the 20th year by about 28,000 compared to a reduction of about 17,000 for MUP only and about 11,000 for phased duty increases. The benefits from these combined policies are most accrued by high-risk drinkers and those in the lowest socioeconomic groups.

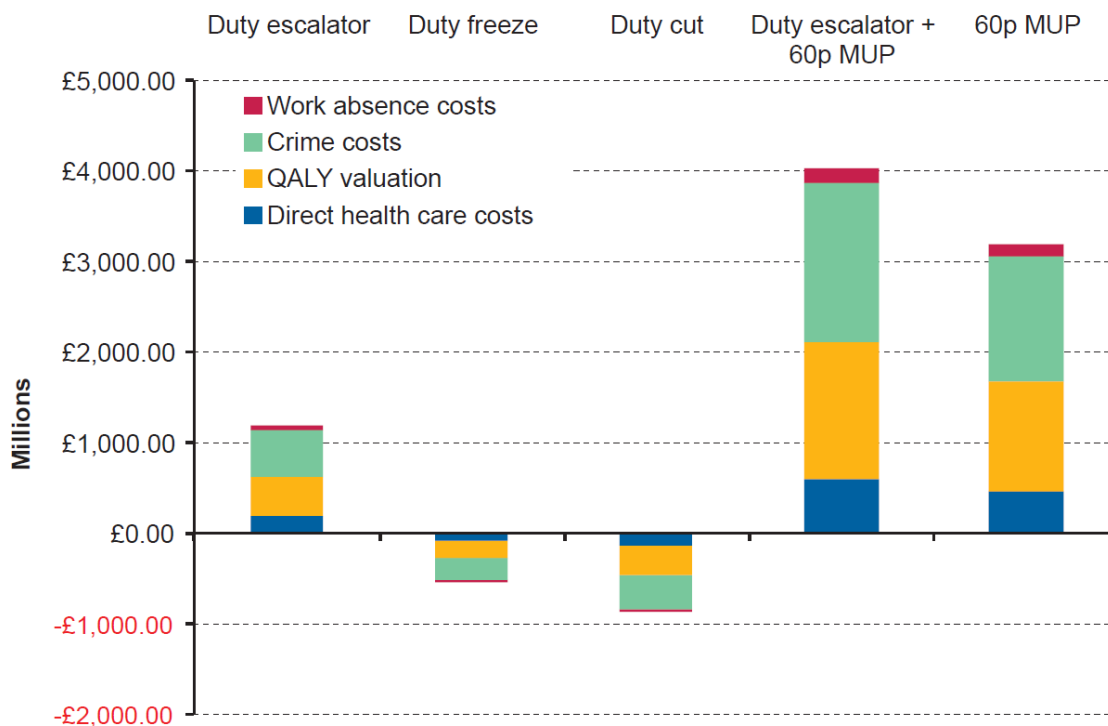
The combined effect of phased duty increases and 60 pence MUP only minimally increases spending for moderate drinkers, by an increase of about £1.40 per month. This increase is greater than for MUP or duty increases alone which results in increases of about 61 pence and 80 pence per month, respectively.

The modelling also estimated the impact of policies to the Exchequer with regards to duty receipts plus VAT. A duty freeze would lead to a loss to the Exchequer in excess of £1 billion compared to phased duty increases. Over a five year period, a 2% duty cut, followed by a four-year freeze, leads to an even greater loss of £2.2 billion. By contrast, phased duty increases would lead to an estimated gain to the Exchequer of £1.8 billion, increasing to £2.2 billion when implemented alongside a 60 pence MUP, which in isolation leads to a smaller gain of £380 million generated through additional VAT.

Figure 35 shows the breakdown of the cumulative value of reductions in alcohol-related harm over five years by outcome. Freezing duty is estimated to cost society over £540 million, while cutting duty would cost £870 million. A 2% phased duty increase (followed by a four-year freeze) would save £1.2 billion, a 60 pence MUP £3.2 billion and the two in combination over £4 billion. About 80% of these savings are estimated to arise from improved population health and reduced costs associated with alcohol-related crime.

Of all modelled policy options, the combination of a phased duty increase with a 60 pence MUP is estimated to lead to the greatest gains in alcohol-related health, reductions in crime and work absence costs and increases in Exchequer revenues.

Figure 35: The cumulative value of reductions in alcohol-related harm over 5 years by outcome (220)



Note: QALY valued at £60 000

Banning the sales of alcohol below the cost of taxation

Banning the sale of alcohol below-cost can be implemented in different ways depending on the definition of cost. The definition of cost can include the cost of production, warehousing, distribution and retail costs, VAT and excise duty. A ban on below-cost sales in some form is implemented in several EU member states (4,221).

In 2014, the UK government implemented a ban on below-cost sales, operationalised as a ban on the sale of alcohol for less than the cost of excise duty plus VAT. This is calculated by applying the current VAT rate (20%) to the excise duty payable on the product, which differs depending on ethanol content and beverage type. As such in 2015/16:

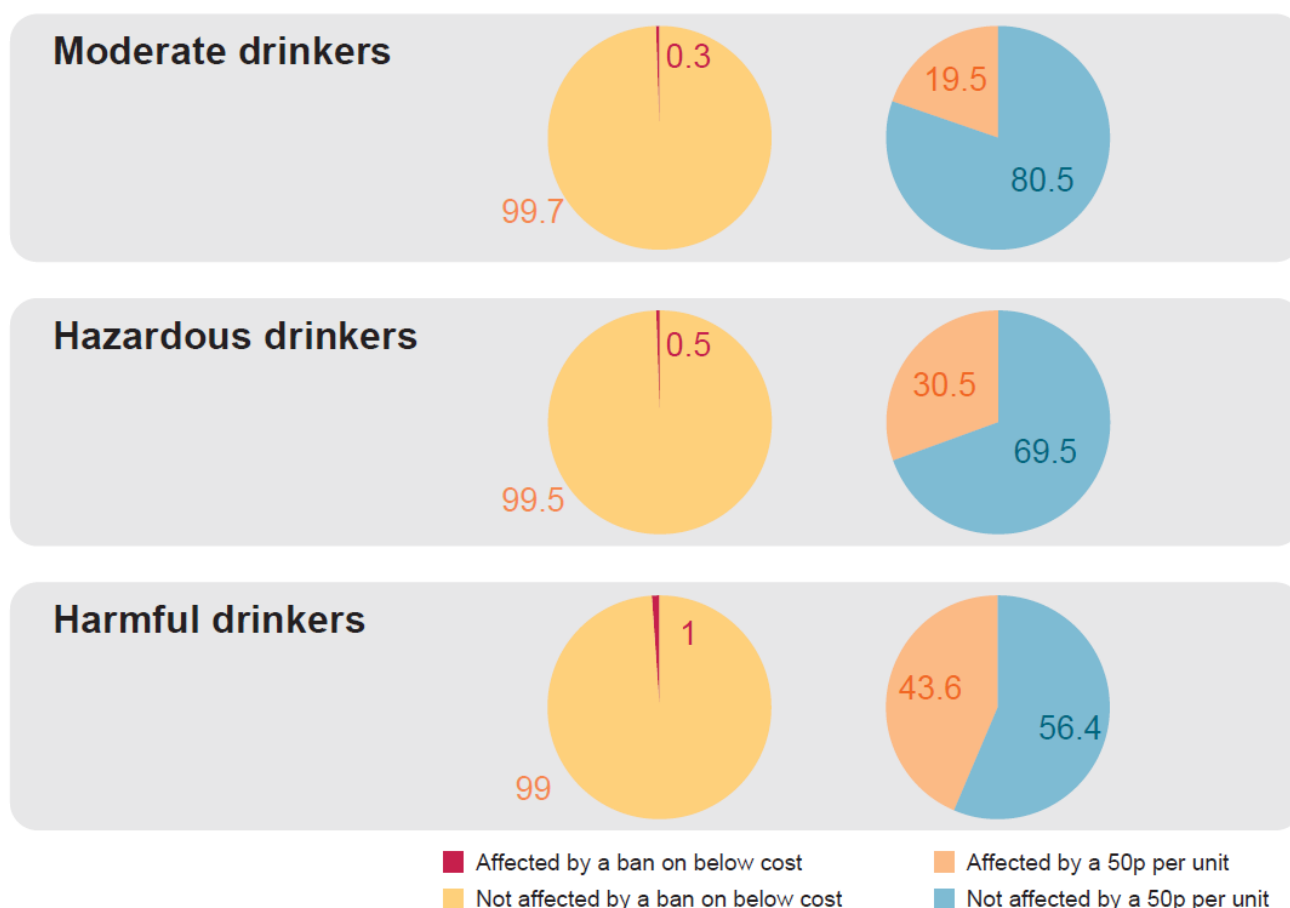
- a 440ml can of beer (4% ABV) cannot be sold for less than 39 pence
- a 750ml bottle of wine (12.5% ABV) cannot be sold for less than £2.50
- a 700ml bottle of spirits (37.5% ABV) cannot be sold for less than £8.72

The ban principally targets drinks with high duty rates and has little or no effect on those drinks with low-duty rates or a high price (198). In principle, the ban affects alcohol wherever it is sold, however in practice sales at these prices tend to occur in the off-trade, if at all.

England-based modelling, comparing the potential benefits of an example 50 pence MUP with the ban on below-cost selling, found that the latter was estimated to have very small impact on consumption and health-related harm, while MUP would have an estimated 40 to 50 times greater impact (222). The proportion of the market that was affected by these policies was a key driver of the impact of the interventions. Only 1.0% of units drunk by harmful drinkers were affected by a ban on below-cost sales compared to 43.6% of units under a 50 pence per unit MUP policy (Figure 36). Consequently, a ban on below-cost sales was estimated to reduce harmful drinkers' mean annual consumption by about 0.1%, equivalent to three units of alcohol per year. This compares to a reduction of over 5% or 200 units per year under a 50 pence MUP policy.

Given the small reductions in consumption resulting from a ban on below-cost sales, this policy was estimated to have a small effect on population health, preventing an estimated 14 deaths and 500 admissions to hospital per annum. This compares to 960 deaths and 35,100 hospital admissions per year, under a modelled 50 pence MUP policy. The majority of observed health benefits for a 50 pence MUP were estimated to occur in the 5.3% of people who are harmful drinkers, 90% of the estimated deaths saved per year occurred in this group.

Figure 36: The estimated proportion of alcohol units consumed that would be affected by price rises from proposed pricing policies (222)



Fieldwork in Newcastle has corroborated these findings, showing that among 2,045 price discounts, 26.2% result in alcohol being sold at below a 50 pence MUP, however only 1.4% of alcohol in the sample was sold at below-cost (223).²¹

Restrictions on price promotions

Within the EU, there is no standard or legal definition of what constitutes a price promotion (224). In England and Wales, as long as retailers do not sell alcohol at below-cost, they can apply alcohol sale promotions such as 'buy one, get one free' or offer discounts. In 2011, the Scottish Government implemented the Alcohol etc. (Scotland) Act 2010 which introduced a ban on quantity-based price discounts. This prevented off-trade retailers from selling multi-buy promotions such as 'buy one, get one free'. Straight discounting, for example 'half priced wine' remained permissible.

A cross-sectional survey of 509 Australians leaving off-licensed premises having purchased alcohol show that price promotions influence purchasing patterns (225). More than a third of customers who had purchased a product with an associated promotion reported that they purchased that particular type of alcohol because there was a price promotion attached to it. Two-fifths of those utilising price promotion reported that they purchased a specific quantity of alcohol because of an associated promotion. For example, participation in a beer price promotion was associated with an increase in the volume of alcohol purchased from an average of 161g of alcohol to 268g.

In on-trade settings, field studies have shown that price promotions of alcohol are associated with higher levels of intoxication²² in customers upon leaving licensed premises (226,227). Similar findings were observed in other fieldwork exploring the impact of 'happy hour' promotions, which showed that women, people under the age of 21 and students living on campuses were more likely to change their drinking behaviour in the presence of price promotions (228). This altered behaviour roughly doubled the odds of drink-driving and being involved in physical altercations.

Time-series analysis assessing the impact of the Scottish multi-buy ban showed that it was associated with a 3% decrease (95% CI=0.2,5.3%) in total off-trade alcohol sales as measured by retail sales data, largely driven by reduced off-trade wine sales (-4%, -2.6,5.4%) and pre-mixed beverages (-8.5%,-4.1,12.7%) (229).

However, a before-and-after study using self-reported alcohol purchases did not replicate this finding, but did suggest that purchasing patterns had changed following restrictions on price promotions such that alcohol was bought more frequently, albeit in

²¹ Defined as excise + VAT

²² Defined as achieving a blood alcohol concentration [BAC] of ≥ 80 mg alcohol per 100ml of blood

smaller quantities (230). The discrepancy may in part be due to inaccuracies of self-reported data and the use of a statistically weaker approach.

Modelling of a complete ban on off-trade discounting in England is estimated to reduce overall alcohol consumption by a small amount (2.8%), largely because these price promotions only affect a small proportion of total alcohol sales (231). Tighter restrictions on off-trade discounting have a greater impact, for example bans of discounts >30% (covering '3 for the price of 2' offers) and >20% (covering '5 for the price of 4') lead to overall consumption reductions similar to a 25 pence and 35 pence MUP policy respectively. Tight restrictions would impact on wine consumption the most, and banning discounts only for lower-priced alcohol would not be effective in reducing consumption.

Importantly, bans on price promotions are easily circumvented. For example, a bottle of wine that was previously sold for £4.99 and marketed as 'buy three for £10' is in effect being sold for £3.30, thereby limiting the effectiveness of these policies.

Taxation and price regulation									
Intervention	Nature	Grade	Limitation	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
A1. Taxation	4 meta analyses 5 reviews 6 modelling studies	High	Not identified	Increased tax is associated with a proportionate reduction in alcohol consumption and harms Impact starts in 1-2 years	All alcohol drinkers Can be targeted at beverage types	Cost-effective and cost-saving	Government budgetary measure (legislation is in place) Policy undermined if tax increases are not passed onto the consumers and are not adjusted for inflation	The health benefits are greater for heavy drinkers who experience the greatest harm	Increasing tax is a highly effective and cost-effective approach to health improvement
A2. Minimum pricing	4 natural experiments 8 modelling studies 1 observational study 1 field study	Moderate	Not identified	UK modelling shows improvements in health, crime, and productivity. Mortality substantially reduced in natural experiments of similar minimum pricing strategies in Canada Impact starts within 12 months	Applies only to alcohol which is cheap relative to its strength At levels discussed, moderate drinkers and the on-trade are minimally affected	Cost-effective and cost-saving	Requires primary legislation; low implementation costs for government The Court of Session in Scotland has ruled MUP is legal	Targeted at extreme and heavy drinkers. Greater reduction in health inequalities than taxation alone	Minimum prices effectively reduces health and other harms, is targeted at the heaviest drinkers who experience the greatest harm, and is cost effective

A3. The relative and combined impact of taxation and other pricing policies	2 modelling studies	Low	Not identified	Taxation + MUP improves health, crime, productivity and Exchequer revenue, to a greater extent than implementing either policy in isolation Impact starts in 12 months, full impact in 20 years	See A1. and A2.	See A1. And A2.	See A1. And A2.	Targeted at extreme and heavy drinkers. Greater reduction in health inequalities than taxation alone, but lower than the reduction achieved with a MUP	Combined taxation + MUP increases impact and improves cost-effectiveness compared with MUP alone
A4. Banning the sales of alcohol below the cost of taxation (duty+VAT)	1 modelling study 1 observational study	Low	Not identified	Little impact on population-level alcohol consumption and no health improvement	Applies only to heavily discounted alcohol (<1% of units in the market)	Not identified	Legislation is in place; low implementation costs for government	Not identified	The ban on selling alcohol below the cost of taxation had minimal impact
A5. Bans or restrictions on price promotions	2 natural experiments 1 modelling study	Moderate	Contradictory research findings. No evidence on market response (eg alternative pricing strategies)	Higher quality evidence suggests that restricting price promotions was associated with reductions in consumption, especially off-trade wine and premixed beverages	Applies to alcohol being sold as part of price promotions covered by policy	Not identified	Requires primary legislation; low implementation costs for government Can be undermined by lowering non-promotional prices	Not identified	Restrictions on price promotions may reduce consumption, but more evidence is needed

Regulating marketing

Introduction

Marketing is a commercial strategy with the goal of increasing sales of alcohol by increasing market size (new sales from consumers who would not have purchased or purchased less of a product) and market share (new sales from consumers who would have purchased rival products). It also aims to increase the frequency of purchase and drive brand preference. In order to achieve these aims, marketing uses four main components, often referred to as the four Ps:

- product
- promotion
- place of sale
- price

Publicly available data on the prevalence of alcohol marketing is scarce. However industry documents show that in 2014, Inbev, the leading global producers of beer, spent \$7 billion on marketing against global sales of \$47 billion (15%) (232). Similarly, in 2015, the leading spirits producer Diageo, spent £1.6 billion on marketing against sales of £10.8 billion (15%) (233). These figures include 'below-the-line' marketing such as point-of-sale or digital marketing, which forms an important, yet largely unmeasured, part of the marketing effort. Estimates from the US suggest that almost three-fifths (58%) of all alcohol marketing in 2005 was below-the-line (234).

In the UK, the Advertising Standards Authority (ASA) is responsible for all advertising standards and consumer complaints, both broadcast and non-broadcast. All alcohol advertisements must adhere to the UK Code of Non-Broadcast Advertising, Sales Promotion and Direct Marketing (CAP code) and the co-regulatory UK Code of Broadcast Advertising (BCAP code), that is set and overseen by the Office of Communications (Ofcom). The membership of CAP and BCAP includes industry bodies who are involved in setting the marketing rules. The drinks industry funded body, the Portman Group, regulates all other forms of marketing, including naming, packaging, and promotion of alcoholic drinks.

In terms of regulating alcohol marketing, there are effectively two domains:

- the degree of exposure to marketing messages
- the advertising content within the message

The current self-regulatory apparatus in England is largely directed at advertising content. For example, adverts should not link alcohol consumption with youth culture or

sexual success, and should not be shown during programmes with particular appeal to children. In contrast, current controls on the level of exposure of children to alcohol adverts are minimal. Alcohol advertising is excluded from programmes that are considered to be of 'particular appeal' to children. Ofcom defines a programme of 'particular appeal' to children as one that attracts an audience in which 10 to 15 year olds are over-represented by 20% in relation to their share of the total TV audience (235). The latest Ofcom analysis shows that children saw an average of 2.7 alcohol adverts per week on TV in 2007 rising to 3.2 in 2011.

Independent research found that UK adverts contain content that is considered to be appealing to children and 10 to 15 year olds were 11% more likely to see alcohol adverts on TV than adults (236). This exposure increases to 51% for adverts of alcopops. Furthermore, over half (56%) of adverts seen by children aged 4 to 15 years were aired before 9pm (235). Among those aged 16 to 24 years, exposure to alcohol advertising was 2% higher than among adults. Similar findings were seen in a European Commission report including data from nine European Union (EU) Member States (237).

Digital and social media has changed the nature of marketing, with alcohol companies increasingly moving into this area (238). Sophisticated web technologies, such as internet tracking ad-delivery systems, allow brands to market their products at specific audiences based on their consumption habits or lifestyle choices (239). 'Narrow cast' advertising towards viewing on tablets and phones can expose children and young people to marketing while bypassing parent's scrutiny.

The potential power and reach of digital marketing is evident. Eighty-six per cent of the UK adult population has regular access to the internet. Among people aged 16 to 24 years, this figure increases to 99% (240). Currently there is no publicly available data on levels of alcohol marketing online. However, social media case studies of a selection of alcohol brands show considerable media presence featuring marketer- and user-generated content (236,241).

This chapter presents the evidence for the impact of marketing on alcohol consumption in adults and children, and the evidence for the effectiveness of marketing regulation.

Alcohol marketing and consumption in the adult population

Advertising elasticity of demand measures the change in the amount of alcohol which is purchased or consumed with a change in the amount spent on advertising. A review reported that for every 10% increase in advertising expenditure, consumption of alcohol increased by 0.32% for all alcohol, 0.2% for beer, 0.07% for wine and 0.7% for spirits (176,242).

A major weakness of advertising elasticity measures is that they consider the relationship between advertising and consumption over short time periods and at the aggregate (national) level, considering all alcohol or drinkers together or separating out the broad categories of beer, wine and spirits. Yet advertising tends to occur at the brand-level where the marginal effect is small. The loss of variance from national aggregation of data leaves little to link with alcohol consumption. Furthermore, expenditure data is a blunt measure and cannot separate less or more attractive (or effective) advertising content. There is an ongoing methodological debate on how the effect of advertising can and should be measured.

Marketing and young people

A review of longitudinal studies including 38,000 adolescents concluded that exposure to alcohol advertising is associated with an increased likelihood that adolescents will start to drink and if they already do, they will drink more (243). Twelve of 13 studies included in the review found effects from exposure on subsequent alcohol use, including initiation of drinking, and heavier drinking among existing drinkers. For example, one study reported a 9% increased risk of starting to drink for every one hour of TV viewing (odds ratio [OR]=1.1, 95% confidence interval [CI]=1.0,1.2).

These findings support those of a similar review of longitudinal studies including 13,000 children and young people (244). Baseline non-drinkers were significantly more likely to become drinkers at follow-up with greater exposure to alcohol advertisements. All seven studies included in the review demonstrate significant effects across a range of different types of advertising and measures of alcohol consumption.

A 2015 update of these reviews strengthened and confirmed the previous finding that there is an association between marketing exposure among young people and alcohol consumption (245). Again, these findings appear across a variety of study designs, approaches and measures, which indicates a consistent effect. Many studies show this association after adjusting for potential confounding influences in the family, peers, group drinking norms and other cultural incentives to consume alcohol.

Most recently, a longitudinal study confirmed the relationship between exposure to marketing and adolescent alcohol consumption across varying cultural, regulatory and drinking environments (246). The study included over 9,000 children with a mean age of 14 years, from Germany, Italy, The Netherlands and Poland. The effect was not explained by children's previous experiences of drinking or exposure to non-alcohol related media.

A narrative review concluded that the relationship between alcohol marketing and alcohol consumption among children is also observed for digital marketing (245). Exposure to digital marketing was associated with intentions to purchase alcohol and

higher levels of consumption. Most major alcohol brands use a wide variety of marketing methods to promote alcohol brands online, both on branded websites and in social media. These include techniques which encourage engagement and interaction with a brand and offer potential for sharing and re-distribution of branded and pro-consumption messages. This blurs the boundaries between advertiser and consumer and often places the message beyond the scope of advertising regulations.

Much of the research examining the impact of advertising on youth alcohol consumption has not considered the specific brands which people drink. However underage consumption tends to concentrate among a small number of brands. Advertising elasticity studies which aggregate the few brands this group drink, with hundreds of brands they do not, may mask any true advertising effect (242). Cross-sectional surveys show that brands most frequently consumed by underage drinkers in the US, typically have the highest levels of magazine advertising exposure (247) and 72% of the leading US brands were consumed by females in the group most heavily exposed to advertising (those aged 18 to 20 years). Similar findings are seen in males (68% of brands are consumed by males aged 18 to 20 years and this group are most heavily exposed to advertising).

Cross-sectional surveys conducted in the US also show a relationship between brand-level TV advertising and brand-specific consumption in those aged 13 to 20 years (248). Compared to no brand-specific advertising exposure, brand-specific exposure was associated with an increased likelihood of brand-specific consumption (OR=3.0, 95% CI=2.6,3.5).

Overall, the evidence consistently shows a relationship between exposure to alcohol advertising and subsequent alcohol consumption in children and young people (243–245,247,248). While this relationship does not directly provide evidence that limiting alcohol marketing will change children's drinking, this evidence supports public health policies which seek to change social norms around youth drinking through stronger restrictions on marketing.

Marketing regulations

Given the relationship between exposure to alcohol advertising and underage drinking, policies which reduce the exposure of children to alcohol marketing will be particularly effective in reducing drinking in that group.

Marketing regulation can be embedded by law (statutory regulation), by voluntary codes of conduct (self-regulation), or by a combination of both (co-regulation). It can affect the entire population, such as advertising bans, or can apply to children, for example, age verification filters. Restrictions on marketing are becoming increasingly complicated as

the number of media platforms increase and digital and social media in particular presents new challenges.

More comprehensive alcohol control policies are inversely related to the prevalence of alcohol use in adolescents aged 15 to 17 years (249). Specifically, countries with stricter regulations on alcohol advertising are inversely related to the prevalence of heavy drinking and having had a first drink by the age of 13 years. Similarly, countries with greater advertising restrictions have lower rates of hazardous drinking in adults ages between 50 and 64 years ranging from 31% (29,32%) in countries with no restrictions to 14% (12,17%) in countries with the greatest restrictions (250). This association suggests that advertising regulations may be useful for reducing the public health burden caused by alcohol.

The following evidence summarises the effectiveness of policies which seek to regulate marketing. The likely impact of comprehensive marketing regulations can be drawn from the experience of tobacco control. Evidence suggests that reduced exposure to tobacco advertising and promotion significantly reduces exposure to pro-tobacco marketing influences⁹⁵, and is expected to benefit prevention and cessation efforts by reducing environmental cues to smoke⁹⁶.

The Loi Evin

In 1991, France passed the 'Loi Evin', a law to regulate the marketing of alcohol. The law acts on both the type of advertising media and the messages transmitted. The legislation permits alcohol advertising in media aimed at adults, but not children and ensures that promotional messages are factual and verifiable. Illegal advertisements can be brought before the courts and there are significant penalties for infringement. The basic principles supporting the law are clear, closed to interpretation and cannot be easily circumvented.

Outline of the Loi Evin:

- all drinks over 1.2% Alcohol By Volume (ABV) are considered to be alcoholic beverages
- places and media where advertising is authorised are defined
- no advertising should be targeted at young people
- no advertising is allowed on television or in cinemas
- no sponsorship of cultural or sport events is permitted
- advertising is permitted only in the press for adults, on billboards, on radio channels (under precise conditions), at special events or places such as wine fairs or wine museums
- when advertising is permitted, its content is controlled: messages and images should refer only to the qualities of the products such as degree, origin, composition, means

of production, patterns of consumption and a health message must be included on each advertisement to the effect that “l’abus d’alcool est dangereux pour la santé”: alcohol abuse is dangerous for health

Advertising bans

A UK study modelling the population impact of advertising on consumption, health, crime and the wider economy shows that eliminating exposure of TV-based advertising in those aged under 18 years results in an estimated reduction in total consumption of 0.3%, but the effects were much greater in those aged 11 to 18 years with equivalent reductions of 9% (231). The model suggested the reductions occurred particularly in the area of crime, with potentially 30,000 fewer offences, amounting to £28 million saved per annum. However, problems with measures of advertising elasticity should be acknowledged (see *Alcohol marketing and consumption in the adult population*).

A modelling study conducted in the US which used a cohort of 4 million people aged 20 in the year 2000, concluded that bans on alcohol advertising are one of the most effective policies for reducing alcohol-related years of life lost (YLL)²³ in young drinkers (251). A complete ban was estimated to reduce deaths from harmful drinking by over 7,500 (60% of the reduction would be seen in adults less than 50 years old) and reduce alcohol-related YLL by over 16%. Partial bans were less effective, reducing alcohol-related YLL by 4%.

Australian modelling suggests advertising bans are highly cost-effective using a cost-effectiveness threshold of \$50,000 Australian dollars (AuD) per disability adjusted life year (DALY) averted in 2003 prices (196). A comprehensive ban on alcohol advertising was estimated to avert almost 8,000 DALYs (CI=5,500,11,000) with a net cost of 12 million AuD (ranging from -37 to +7.4 million AuD per DALY averted) and an 85% probability of being cost-saving. The authors conclude that “[changes to taxation and] the banning of alcohol advertising should be the highest priority for investment due to the high probability of cost-savings.”

Recent Danish modelling supports the finding that population-wide alcohol advertising bans are likely to be highly effective in reducing the incidence, prevalence and mortality of alcohol-related harm and is cost-saving (252). Advertising bans targeting the whole population averted almost an estimated 2,853 DALYs (95% CI=2,287, 3,404) with a net cost of almost -€17 million (95% CI= -€22,-€13).

In 2014, a Cochrane review evaluated the effect of restricting or banning alcohol advertising compared to no restrictions and did not find evidence for or against recommending the implementation of alcohol advertising restrictions (253).

²³ Measured by age 80 years over the lifetime of the cohort

The review included four studies:

- one small randomised controlled trial (RCT) from The Netherlands
- three interrupted time series designs all carried out in Canada

All studies observed the adult population. However the relationship between advertising and alcohol consumption in adults is not well established.

The RCT reported that young men aged 18 to 29 years, exposed to movies with low-alcohol content drank fewer drinks than men exposed to movies with high-alcohol content (mean difference [MD]=0.65 drinks, 95% CI= -0.07,-1.2) or to commercials with a neutral content (MD = 0.73 drinks, 95% CI= -0.16,-1.30), however each study group was very small (20 participants).

The results of the time series studies were inconsistent. Pooled analysis of the two studies that evaluated the implementation of a ban showed a non-significant increase in population-level beer consumption (1.1%, 95% CI = -5.3, 7.5%). Lifting a ban resulted in a non-significant decrease of 11.1 kilolitres per month (95% CI= -27.6, 5.3) in the volume of all alcohol sales. Beer and wine sales significantly increased by 14.9 kilolitres per month (0.4, 29.4) and 1.2 kilolitres per month (-0.9, 3.2), respectively and spirits sales significantly decreased by 22.5 kilolitres (-36.8,-8.2). However, these provincial bans may not have truly lowered exposure to marketing since these provinces receive a considerable amount of cross-border US programming which had no restrictions on alcohol marketing.

Using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, all studies included in the Cochrane review were rated as very low-quality evidence due to a serious risk of bias, serious indirectness of the included population and serious level of imprecision. All included time series studies were published over 20 years ago which limits the utility of findings in the present day given the recent changes in alcohol marketing.

Industry self-regulation

As part of its 2009 investigation into the conduct of the UK alcohol industry, the House of Commons Health Select Committee obtained access to internal marketing documents from producers and their advertising agencies (254). Analyses of these documents reveal major shortcomings in the current self-regulatory codes covering alcohol advertising. The report of the Select Committee concluded that, contrary to their intended purpose, codes do not:

- protect young people from alcohol advertising
- prevent the promotion of drunkenness and excess
- prevent the linking of alcohol with social and sexual success

The Committee also concluded that codes do not address sponsorship, and the marketing documents show that sponsorship is being systematically used to undermine rules about linking alcohol with youth culture and sporting prowess. Furthermore, the codes are extremely weak at addressing new media, which are rapidly becoming the biggest channel for alcohol promotion.

The analysis also revealed that market research data on 15 to 16 year olds guides campaign development and deployment, despite this group being younger than the legal purchase age. Throughout the documents, there was a clear acknowledgement that particular products appeal to children, for example Lambrini (a sparkling perry) is referred to as a “*kids’ drink*”.

Overall, the report concludes that “...*the self-regulatory codes do not protect young people; they just hone the advertiser’s skills – either in camouflage or creativity*”.

A systematic review based on 17 papers has also concluded that the self-regulation of marketing by the alcohol industry is ineffective (180). A qualitative approach revealed five key ways in which industry efforts aim to influence alcohol advertising policy (255). These were:

- arguing against advertising regulation by emphasising industry responsibility and the effectiveness of self-regulation
- questioning the effectiveness of statutory regulation by stressing individual responsibility
- reinforcing arguments relating to industry responsibility through corporate social responsibility activities
- conveying arguments through manipulating the evidence base
- promoting ineffective voluntary codes and non-regulatory initiatives

These tactics are similar to the strategies used by the tobacco industry, particularly the use of obfuscating tactics such as misrepresenting research evidence and using third parties and front groups to lobby government. The authors argue that “*policymakers need to be aware of these [strategies] in order to understand how the alcohol industry may try to influence the policymaking process*” and “*the similarities [between the alcohol industry and tobacco industry] suggest that alcohol policy may benefit from reproducing efforts in tobacco control aimed at excluding corporate actors from the policy process and enhancing transparency*”.

Most recently, a systematic review has echoed these findings by demonstrating considerable violations of content guidelines within self-regulated alcohol marketing codes, suggesting that the self-regulatory systems that govern alcohol marketing practices are not meeting their intended goal of protecting vulnerable populations (256).

Protecting children from exposure to alcohol marketing

Given the relationship between exposure to alcohol advertising and consumption in children, a range of policy actions are available to reduce child exposure. The effectiveness of these policies largely depends on how much they prevent children from exposure to large volumes of alcohol advertising. This section reviews the available evidence on these mechanisms.

Age verification filters

Age verification filters aim to prevent children from accessing alcohol websites, by confirming the viewer is a certain age. Such mechanisms are inadequate in their current form and are easily circumvented.

An Australian study reported that 25 alcohol websites had poor systems for preventing entry of underage persons (257). Most websites had an entry page (88%), but 32% of sites did not request a full date of birth and simply presented a statement, for example, *“you must be aged 18 years or over to view this site”*, with a button click response of yes or no. Detailed age filters asking for a full date of birth and denying entry if the age was less than 18 years, were present in just over half (52%) of the sites. Two sites requested a full date of birth, but allowed access regardless of the age entered.

None of the sites prevented users from trying again with a different date of birth once access had been denied. Some allowed users to return straight back to the login page by clicking a link or by clicking ‘back’. The authors conclude that *“a regulatory approach combining government oversight and enforcement of industry-led practice standards is needed”*.

Age verification filters in online gambling provides best practice to restrict the online sale of alcohol (258). The report proposes that age verification can draw on numerous public datasets such as the electoral role, credit history, telephone directory or driving licence databases. In the UK, 85% of the adult population could be verified using these datasets.

9pm watershed bans on alcohol advertising

In the UK, more than half (56%) of all TV alcohol adverts seen by children aged 4 to 15 years are aired before 9pm (235). One way to limit the exposure of children to alcohol

advertising is by restricting the times during which alcohol adverts can air on TV or radio, often known as a watershed ban.

When The Netherlands introduced such a watershed ban, commercial operators responded by dramatically increasing alcohol advertising shown after 9pm from over 7,500 alcohol adverts to over 23,000 (259). Exposure of all ages increased as a result, but whereas exposure of adults increased by 52% and children aged 12 to 17 years by 62%, the exposure of younger children aged 6 to 11 years increased by only 5%.

A subsequent study compared TV alcohol incidence rate ratios (IRR) between the UK and The Netherlands between December 2010 and May 2011 (260). Dutch children aged six to 12 years had an IRR of 0.69 (adult IRR=1), less than UK children aged four to nine years (IRR 0.82) although the age ranges were different. Whereas older children in both The Netherlands (aged 12 to 19 years, IRR 1.29) and UK (aged 10 to 15 years, IRR 1.11) were exposed to more TV alcohol advertising than adults.

Watersheds bans appear to protect young children from exposure to TV alcohol advertising, but more effective measures are required to protect teenagers with later bed times.

Ban alcohol advertising in films with a certificate less than 18

The present review did not identify literature specifically evaluating the impact of banning alcohol advertising in films with a certificate less than 18. Nonetheless, given the relationship between child exposure to advertising and alcohol-related harm, a ban of advertising during these films would effectively prevent the exposure of children to alcohol advertising in the cinema.

Ban on alcohol sports sponsorship

A systematic review of seven observational and longitudinal studies including over 12,500 participants shows a positive link between exposure to alcohol sports sponsorship and increased alcohol consumption, among adult sportspeople and schoolchildren, though the strength of the relationship varies (261). All studies included in the review report positive associations between exposure to alcohol sports sponsorship and self-reported alcohol consumption:

- two studies show indirect exposure to alcohol sports sponsorship linked with increased levels of drinking among schoolchildren
- five studies show a link between direct alcohol sports sponsorship and hazardous drinking among adult sportspeople

Regulating marketing									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
B1. Advertising bans	2 reviews 3 modelling studies	Moderate	Inherent limitations in advertising elasticity studies Contradictory research findings	International modelling shows complete advertising bans are more effective at reducing alcohol-related morbidity and mortality than partial bans	Entire population (can be targeted at under 18 year olds)	Cost-effective and cost-saving	Evidence supports a statutory approach; low implementation costs for government Costs of enforcement can be divided between government and/or commercial operators	Can be designed and directed at those aged under 18 years	Complete advertising bans are a highly effective and cost-effective approach to health improvement
B2. Industry self-regulation of alcohol marketing	2 systematic reviews 1 qualitative study	Low	Not identified	The current self-regulatory systems that govern marketing are not meeting their intended purpose of restricting children from exposure to marketing in the UK	Entire population (can be targeted at under 18 year olds)	Not identified	Low implementation for costs for government; costs borne by commercial operators; evidence supports statutory approaches	Can increase health and social harm among young people	Industry self-regulation is unlikely to be effective Little evidence of beneficial effect
B3. Specific actions to protect children from exposure to alcohol marketing	1 modelling study 1 observational study 1 field study	Very Low	Research evaluated a poorly implemented intervention	'Watershed' bans decrease exposure of young children Age verification filters currently ineffective (easily circumvented)	Primarily under 18 year olds (interventions will also impact on the adult population)	Not identified	Low implementation for costs for government; costs borne by commercial operators and/or government; evidence supports statutory approaches Impact on older children undermined if commercial operators respond by increasing the number of adverts after the watershed	Can be designed and directed at those aged under 18 years	Reducing child exposure to alcohol marketing would theoretically impact alcohol consumption by children

Regulating availability

Introduction

This section reviews the research evidence for the public health impact of policies which regulate the availability of alcohol. Control policies in this area reflect the theory that if alcohol is less easy to obtain, alcohol consumption and harm will decrease.

Alcohol is a prominent commodity in the commercial marketplace. The physical availability of alcohol products is often regulated by governments, with restrictions imposed on who can sell alcohol, the days and times it can be sold and the legal minimum age to buy products. There is also an informal market made up of home-brewed alcohol and alcohol which is not duty paid. Alcohol also reaches consumers non-commercially, in social settings where drinks are provided by friends, family members and others. The informal market and social provision of alcohol is not subject to government regulation and is not included in the current review.

Any premise in the UK which sells alcohol must hold a licence from a local authority under the Licensing Act 2003. In England, Wales and Scotland the authority to sell alcohol has two parts: the premises licence, which authorises the use of any premises or parts of a premises for licensable activities and includes the times and conditions under which a venue can sell alcohol and the personal licence which authorises individuals to supply alcohol, or authorise the supply of alcohol, in accordance with a premises licence. Licensed premises can be categorised as 'on-trade', which includes restaurants, pubs or nightclubs, or 'off-trade', which includes supermarkets or corner shops.

Density of alcohol outlets

Alcohol outlet density (AOD) refers to the overall availability of alcohol in an area. The exact definition used in research varies, for example, it can be defined as the number of outlets per square mile or the distance to nearest outlet.

A considerable body of research examines the relationship between AOD, alcohol consumption and a range of alcohol-related harms. Most studies come from North America, Australia and New Zealand. This non-UK evidence has important implications when considering the English context because the impact of outlet density is closely tied to regional factors such as the proportion of on- and off-trade outlets, socioeconomic and demographic trends. Therefore, the evidence on the relationship between AOD, consumption and harm cannot be assumed to directly apply to local areas in England.

Areas with more deprivation tend to have greater AOD (53). Therefore, policies which seek to regulate the local availability of alcohol have the potential to reduce health inequalities, as they can be used when there is local concern about the impact of alcohol use in a community.

Reviews assessing the relationship between density, consumption and harm show mixed results. Broadly speaking, evidence for a relationship between higher AOD and problems associated with social disorder is strong, whereas the relationship between AOD and consumption is less clear, partly because demand can increase supply, as well as vice versa. Some reviews report strong associations between AOD, consumption and harm. Others report weaker or no associations. The research on the relationship between AOD and chronic health harms is still developing.

Importantly, alcohol outlets in a given area may not be the only, or most important, source of alcohol, particularly in societies where people commonly drive to out-of-town shopping centres or where drinking establishments in town centres are a key part of the drinking culture. Furthermore, many people purchase alcohol for others to drink, or buy alcohol online for home delivery. These sources of alcohol sales are important, and are largely unaccounted for in the scientific literature to date.

A systematic review of 44 cross-sectional and longitudinal studies suggested that AOD is related to alcohol consumption and alcohol-related harm (262) and this has been confirmed in a later review (263). Both reviews were derived predominantly from the international experience.

Taken together, the evidence suggests that higher levels of AOD are associated with:

- more frequent alcohol consumption
- increased overall alcohol consumption
- greater average levels of drinking among students
- alcohol-related violence
- self-reported injuries
- alcohol-related road traffic crashes (RTC)
- sexually transmitted infections (STI)
- child abuse and neglect
- suicide

However most of the studies in the reviews did not directly or objectively measure availability. The cross-sectional design means it is difficult to understand if greater outlet density causes, or is merely related to, these outcomes.

Similar findings are reported in other reviews in the US and overseas (152,153). For example, seven of nine time-series studies found positive associations between

changes in AOD and alcohol consumption and related harms, particularly interpersonal violence. Inconsistent relationships were reported for AOD and RTC. Strong relationships appear between AOD and IPV, particularly in socially disadvantaged neighbourhoods (264).

A more recent systematic review of 13 observational and longitudinal studies, mostly conducted in the US, showed mixed findings for the association between AOD and consumption (265). For off-premise outlets, eight of 13 studies found no significant association. However a higher density of off-premise outlets was associated with an increased likelihood of heavy drinking. For on-premise outlets, results were also mixed, but a higher density of on-premise outlets was associated with an increase in the likelihood of drinking and heavy drinking. The review presents some counterintuitive findings, such as the willingness of sellers of alcohol to serve underage customers, did not appear to be related to adolescent drinking.

In the UK, observational research in Scotland shows that higher AOD is associated with alcohol-related hospital admissions and mortality for all alcohol-related conditions in general, and for liver cirrhosis (266). This effect was stronger for off-trade compared to on-trade density, and was also stronger for mortality compared to hospitalisation. An interquartile range (IQR) increase in off-sales outlet density is associated with a higher incidence of all alcohol-related conditions in general (8% higher hospitalisation, 19% higher mortality) and cirrhosis (11% higher hospitalisation, 15% higher mortality). The most deprived areas showed the strongest relationships. Each percentage-point increase in income deprivation is associated with an average 4% increase in hospitalisation or mortality. For all outcomes the relationship was weaker in women than men. Strong relationships also appeared in underage drinkers, particularly females.

An observational study of 979 15 year olds in Scotland reported that proximity and density of on-premise outlets is not associated with weekly drinking (267). However, adolescents who live close (within 200m) to an off-sales outlet are more likely to drink frequently (odds ratio [OR]=2.0) as are adolescents living in areas with a number of nearby off-premise outlets (OR=1.6) suggesting that drinking behaviour in adolescents may be linked to the characteristics of the outlets near them.

Despite these findings, the evidence had limitations (268,269):

- most research categorises outlets as on- or off-trade but a large supermarket is very different to a small corner shop
- there is little exploration of types of availability such as availability away from home, online availability or interactions between availability, price and place
- the time at which alcohol is available is rarely measured, and this is important given that purchasing alcohol at 6am has different implications to purchasing it at 6pm

- research tends to rely on summary measures of density, such as the number of outlets per square mile
- there is less research evidence on the relationship between AOD and chronic health harms

One of the key limitations of the evidence in this section is its' reliance on cross-sectional studies which cannot demonstrate a causal relationship. Greater availability may cause greater consumption or emerge as a result of a greater demand for alcohol. A causal relationship may exist, but the current research methods are too mixed to be certain. These limitations are outlined in a recent review of more than 160 studies (269).

Although controlling the availability of alcohol is widely recognised as a key approach to reducing harm, translating the evidence into practice has proved challenging (268). In England and Wales, licensing authorities can use cumulative impact policies (CIP) to help limit the growth of groups of licensed premises in a problem area, thereby affecting the density of outlets. In 2013, there were 175 CIPs in England and Wales. Most recently, the *Modern Crime Prevention Strategy* put these policies on a statutory footing:

- to provide more cover and legal clarity for local authorities
- to advise businesses that wish to apply for licenses in cumulative impact areas

In 2012/13 in England and Wales, 91% of new applications for a premises licence were accepted, equivalent to almost 9,000 new premises (270). In areas with a CIP in place, this was lower, with 83% of new premises applications accepted.

Legislation requires that all licensing decisions examine evidence about specific outlets or local areas, and consider the licensing objectives. Within this structure, local authorities may struggle to present a health argument against a licensing decision. The evidence typically presents data at population-level, and cannot demonstrate causal links between individual outlets and harmful outcomes. Authorities seeking to use availability policies to tackle long-term health harms need clear, reliable evidence that applies to the current policy context, and identifies the link between measures of availability and a range of short- and long-term outcomes.

Hours and days of sale

A review of 14 natural experiments concluded that increasing the days on which alcohol is sold generally leads to increases in alcohol consumption and alcohol-related harm and vice versa (271). For example, Saturday opening in Sweden increased consumption by 3.5% and allowing Sunday sales in Scotland was associated with a small increase in average weekly consumption in heavy drinking men of 1.3 units which rose to 2.4 units among men aged 18 to 45 years. Overall consumption in the

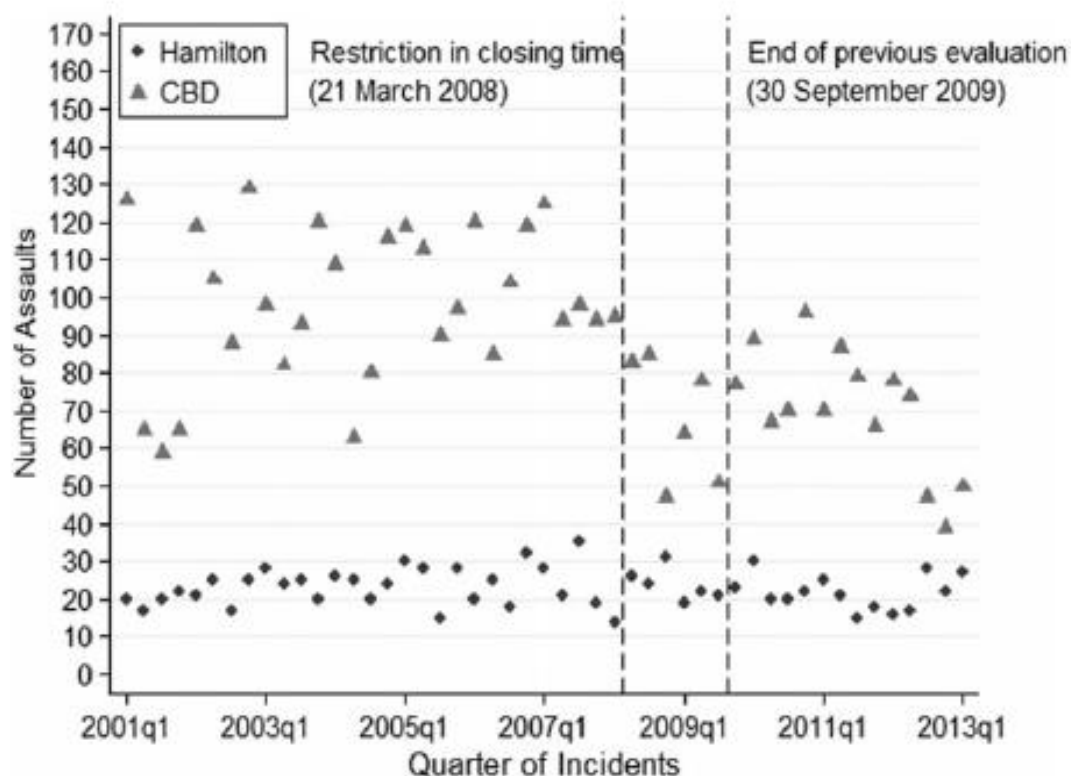
population did not change suggesting that increases in opening hours may facilitate the drinking of male heavy drinkers but not for other groups such as women or moderate drinkers.

A similar review of 14 natural experiments, predominantly international studies, concluded that changes in the opening hours of on-sales alcohol outlets are unlikely to affect alcohol consumption and related harm unless the change in opening times is greater than two hours in a day (272). Ten studies have provided consistent evidence that increasing opening hours by two hours or more increases alcohol-related harm, for example RTC and injury.

Most recently, a systematic review evaluating the impact of changes to trading hours of licensed premises concluded that the evidence of effectiveness is strong enough to consider restrictions, particularly on late-night operating hours, as a key approach to reducing late-night violence (273). This was predominantly based on a series of robust, well-designed Australian studies.

In March 2008 in the central business district of Newcastle in Australia, restrictions were imposed on 14 pubs which required them to close by 3.30am and disallow customers from entering the venue after 1.30am (274). From August 2010, pubs in Hamilton, the control site for the Newcastle study, were required to lock their doors to new customers after 1am on Saturdays and Sundays, permitting the service of alcohol to existing customers until 30 minutes before closing time, which remained unaltered and could be as late as 5am. One and a half years after implementation, this policy reduced police recorded assaults in the area from 99 per quarter before the restriction to 68 per quarter in the first post-change period; incident rate ratio (IRR) = 0.67 (95% confidence interval [CI] 0.55, 0.82), and 71 per quarter in the later post-change period (IRR=0.68, [0.55, 0.85]). In the same periods in Hamilton, assault counts were 23, 24 and 22 per quarter, respectively, suggesting no effect of the lockdown there. Figure 37 shows the number of police-recorded assaults per quarter between January 2001 and March 2013 in Newcastle and Hamilton. These findings are important because they reveal effects relating to a relatively small change in allowing customers into the venue in addition to restrictions in trading.

Figure 37: Number of assaults per quarter, January 2001 to March 2013, in the central business district (intervention areas) and Hamilton (control area) permission to reproduce from ((274))



The effectiveness of restricting the times or days on which alcohol can be sold can be undermined if alcohol is available at these times from a neighbouring area (272). Reducing access to retail outlets for specified periods of the week as well as reducing on-trade outlet opening hours targeting the most densely populated areas have the potential to be very cost-effective measures, provided they are fully enforced (4,180).

Increases in the hours of sale resulting from the Licensing Act 2003

In the mid-20th century, there was a move away from a regulatory focus of outlet density towards a more free market approach. Licensing was increasingly seen as an administrative process seeking to protect public order, amenity and public safety rather than a seen as a tool to reduce alcohol consumption or harm (268). This culminated in the Licensing Act 2003 which at its core posited that licensing authorities should principally act as mediators between stakeholders in a system primarily defined by market demand. The Act also removed statutory opening hours for licensed premises with the potential for up to 24 hour opening, seven days a week.

It was hypothesised that changing closing hours would stagger the times at which licensed premises closed and result in a reduction in alcohol-related violent crime. The existing literature has evaluated the impact of the Act on crime, hospital admissions and RTC.

Effect of extended closing hours (the Act) on crime

An interrupted time series study showed no evidence that the Act changed the overall volume of police recorded violence, robbery and crime in Manchester (275). However, the Act did affect the time in which violence occurred and weekend violence was shown to gradually and permanently shift to later parts of the night.

Research using trading records for over 600 licensed premises in Manchester confirmed these findings and also showed that the only significant predictor of change in rates of violence was an increase in outlet density (276). A 1% increase in outlet density was associated with increases in violence from 0.12% to 0.14% on weekdays and from 0.19% to 0.32% on weekends (see *Density of alcohol outlets*). All but one of the models became non-significant when the city centre was excluded from the analysis.

Effect of extended closing hours (the Act) on hospital admissions

Research drawing on the experience of local hospitals suggests that the impact of the Act on hospital admissions was mixed. This may be due to differences in methodology, outcomes, geographical areas, follow-up periods and hospitals.

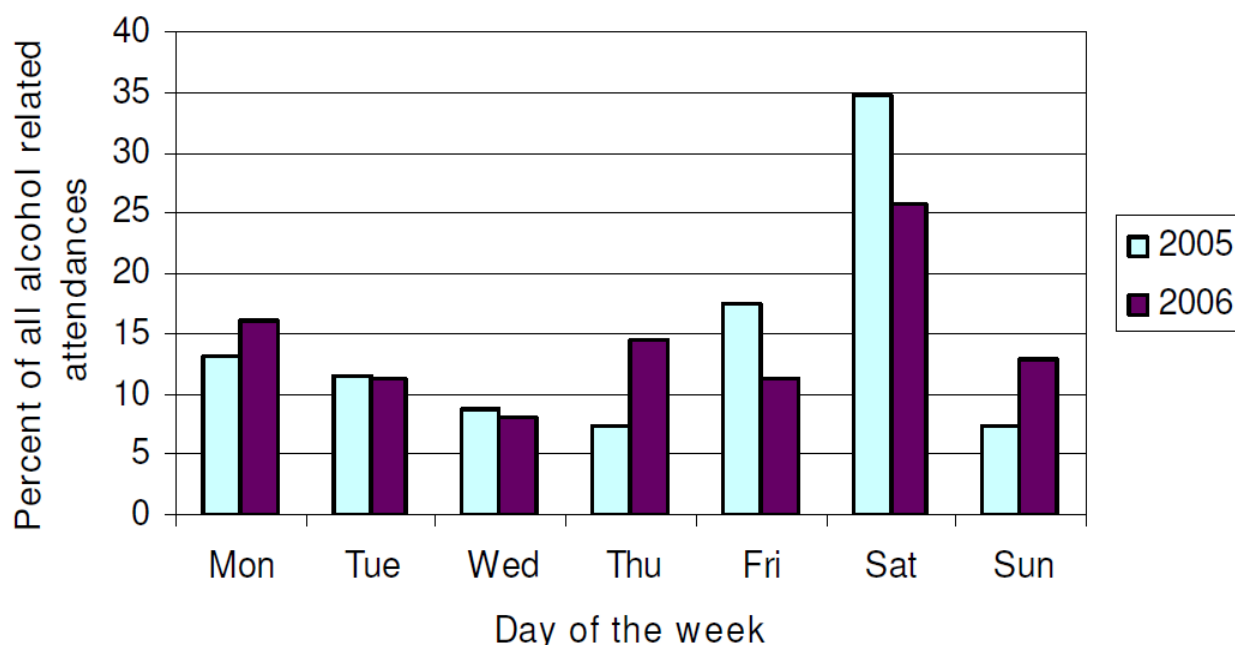
A retrospective analysis of hospital attendances at St Thomas' hospital in London, shows that overnight alcohol-related emergency attendances increased after the introduction of the Act (Table 7) (277).

Table 7: The number and percentage of hospital attendances before (March 2005) and after (March 2006) implementation of the Act (277)

	March 2005 Number (%)	March 2006 Number (%)	p value
Total number of attendances	2,736	3,135	-
Number of alcohol-related attendances	79 (2.9)	250 (8.0)	<0.001
Alcohol-related assault	27 (0.99)	62 (1.98)	0.002
Alcohol-related injury	44 (1.61)	129 (4.11)	<0.001
Alcohol-related hospital admission	24 (0.88)	71 (2.46)	<0.001

A similar retrospective study in an inner-city Birmingham emergency department shows that the introduction of the Act led to changes in the pattern of alcohol-related hospital attendances (Figure 38) (278). While the Act did not affect the number or day of presentations to hospital for an alcohol-related condition, it shifted admissions into early in the morning.

Figure 38: The distribution of alcohol-related attendances before (2005) and after (2006) implementation of the Act (permission to reproduce from (278))

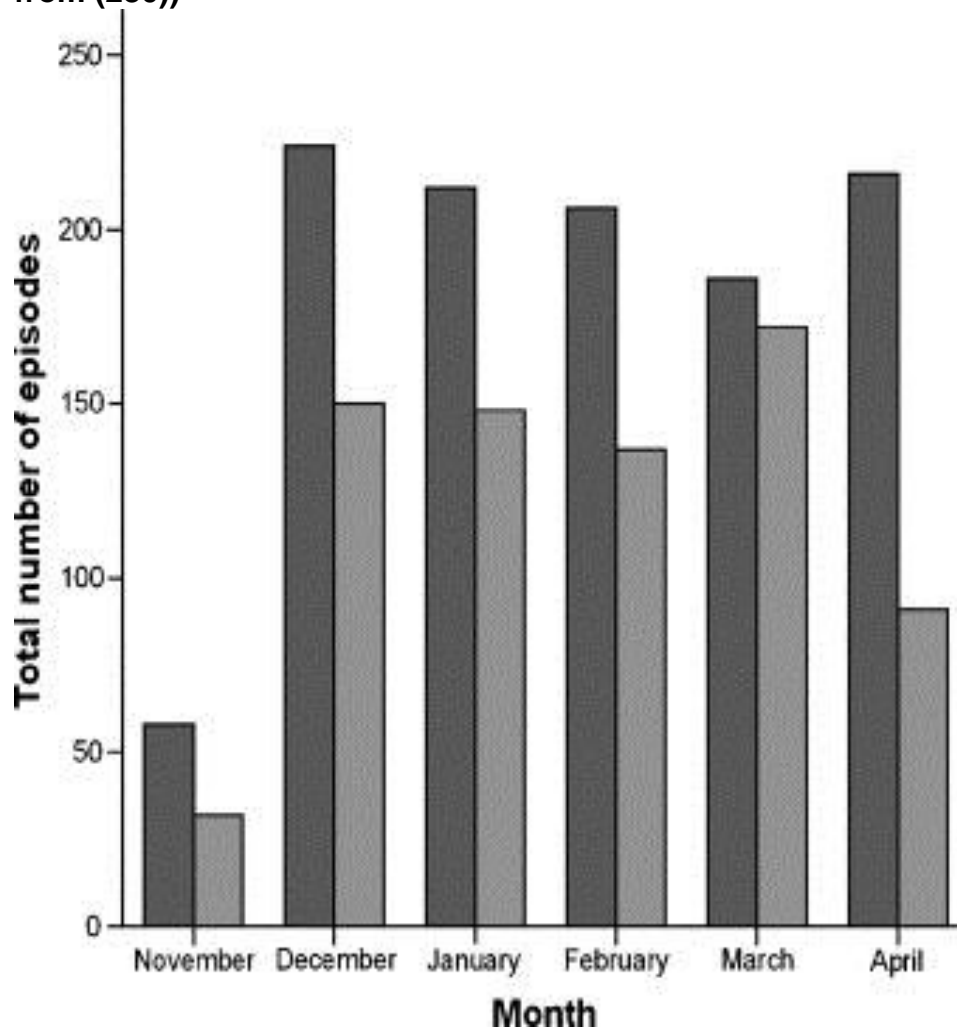


These findings were also seen in attendances for assault to a Cambridgeshire emergency department using a retrospective design (279). The mean annual number of assaults rose by 133 from 1,083 to 1,216 following the implementation of the Act. Similar to other studies, the peak time of presentation moved from a sharp peak between 01:00am and 01:59am to a broad peak between 01:00am and 3:59am.

A retrospective study in a London emergency department showed that the number of attendances for alcohol-related head and neck trauma reduced following implementation of the Act (280) (Figure 39). There were 1,102 attendances for alcohol-related head and neck trauma during the six months before the introduction of the Act and 730 attendances during the period after the Act.

A retrospective study of four emergency departments in South Yorkshire shows that the impact of the Act varied across hospitals (281). Between the period before and after the Act, alcohol-related attendances increased from 0.6 to 0.7% as a proportion of all attendances. Admissions increased by 0.4% at the Northern General Hospital, by 0.1% at Barnsley Hospital, decreased by 0.2% at Doncaster Royal Infirmary and did not significantly change at Rotherham General Hospital. Admissions remained at a peak time of 01:00am before and after implementation of the Act. The variability in findings was, in part, due to whether or not local premises falling within each hospital catchment area staggered their opening hours.

Figure 39: The number of cases that presented to the accident and emergency department in each month during the two periods. Dark bars = November 2004 to April 2005, light bars = November 2005 to April 2006 (permission to reproduce from (280))



Effect of staggered closing hours (the Act) on road traffic crashes

A retrospective study suggests the Act did not change the number of RTC relative to comparison groups in Scotland (282).

The Licensing (Scotland) Act 2005

The Licensing (Scotland) Act 2005 implemented in 2009 introduced two elements that allowed for strategic planning of alcohol availability in the interest of public health:

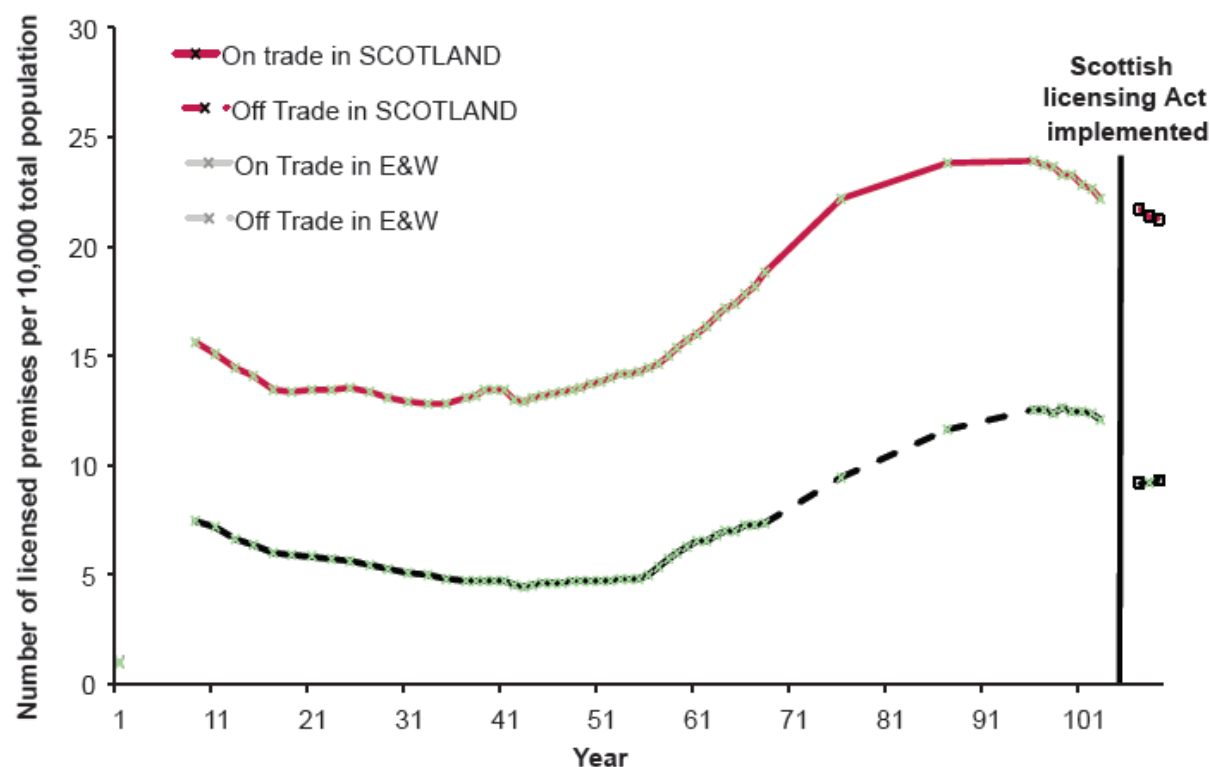
- the statement of licensing policy
- a statement on overprovision, where an area is considered to have too many late-night licensed premises

A mixed methods review published in 2016 concludes that there has been limited progress in the implementation of the public health provisions of the Act although local examples of good practice are emerging (283).

The aim of the Act was not to reduce availability per se but rather result in no increase in the availability of alcohol in areas of overprovision and a decrease in the longer term, a reduction in the number of licences applied for, particularly in overprovided areas and a reduction in alcohol availability via conditions placed on premises.

Available UK data to monitor the trends in availability is crude and only records if an outlet is on- or off-trade. Little detail exists beyond this which means a small restaurant that serves alcohol cannot be distinguished from a large vertical drinking establishment. Nonetheless, trends show that the number of licensed premises in Scotland increased from the 1960s, with peaks in on- and off-trade in the early 2000s and around 2005 respectively (Figure 40) (283). The trends in both regions from the 1960s are similar which suggests similar legislative and societal environments however the per capita growth of all premise types was greater in Scotland.

Figure 40: The number of licensed premises per capita, Scotland and England & Wales, on- and off-trade premises, 1905 to 2011, the year 2009 is identified by the solid horizontal line (283)



Between 2007 and 2011 there was a notable decrease in the number of off-trade premises in Scotland, but not in England and Wales. The decrease in on-trade premises

continued in all regions. However, it is not possible to determine if the decline in number of off-trade licensed premises in Scotland resulted from changes in the off-trade market, for example reductions in the number of smaller independent outlets or increases in licensed supermarkets, the effect of the economic downturn or the effective implementation of the Licensing Act (2005). Since the legislation was implemented (2009) there has been no change in the number of new licences refused, however there has been a decrease in the number of new licence applications (Figure 41).

Figure 41: The number of new premises licence applications granted and refused in Scotland, 2003 to 2013 (283)



The evaluation by Scottish government suggests the number of new licence applications dropped post-Act because requirements on licence holders in the new Act were more stringent, fewer new businesses were starting up because of the economic downturn and robust overprovision statements deterred new applications.

The similar level of refusals before and after the Act could reflect that licensing objectives and overprovision assessments were not being used by licensing board members to refuse new applications in overprovided areas, new applications in overprovided areas were being refused, but do not appear in the national statistics, because overprovided areas cover only a portion of Scotland or licensing conditions are being used to ensure that granting a license is consistent with the licensing objectives.

The evaluation concludes that while a number of positive developments have been made, such as the role of licensing standards officers, a number of areas of the Act have been less well implemented including:

- public health provisions: the public health provisions are still in the ‘bedding in’ phase. Relationships between licensing and public health actors are still in their infancy, with both needing to develop skills and confidence to operate in each other’s system
- transparency and accountability: there is a lack of any real accountability or transparency in the licensing system, which has implications for effective implementation and the spreading of good practice
- public access: there is limited involvement, and thus scrutiny, from the public in the licensing system
- local licensing forums: forums still have a limited role in relation to the public health provisions six years after the implementation of the Act
- the integrity of the system: high profile challenges by supermarkets of licensing board decisions have made licensing boards more cautious in utilising their discretionary powers in making licensing decisions
- impact on availability: there is insufficient licensing data to determine the impact of the Act on alcohol availability

Alcohol licensing systems (England and Wales)

The Licensing Act 2003 regulates the density of alcohol outlets using CIP and the hours and days of sale using conditions on a licence. England modelling linking licensed premise data to alcohol-related hospital admissions and crime data shows that more stringent local licensing policies are linked with a reduction in alcohol-related hospital admissions (284). More stringent licensing policies were considered to be those which had implemented a CIP or were known to refuse a licence.

Local areas with the most intensive licensing policies had an additional 5% reduction, or eight unique alcohol-related hospital admissions per 100,000 people fewer in 2015 compared with the anticipated outcomes if these local areas had no active licensing policy in place.

The responsibility deal pledge to “remove 1bn units of alcohol sold annually from the market by”...“improving consumer choice of lower alcohol products”

In March 2011, the government in England launched the Public Health Responsibility Deal (RD) as a public-private partnership involving voluntary agreements by businesses and public bodies to make health promoting changes in the areas of food, alcohol, physical activity, health at work and behaviour change (285). One of the specific alcohol pledges was to *“remove 1 billion units of alcohol sold through improving consumer choice of lower alcohol products”*.

In 2013, a Department of Health report evaluated the RD and concluded that between 2011 and 2013 the number of units of alcohol in the market reduced by 1.9 billion (286).

The report estimated that 1.3 billion of the reduction was due to reductions in the alcohol by volume (ABV) of alcohol products, which was 0.3 billion more than the target 1 billion reduction by the end of 2015 contained in the RD pledge.

Academic research has questioned the validity of these claims suggesting that the data used in the analysis was not fit for purpose, the report makes simplistic assumptions about consumer responses to the pledge and the report ignores confounding factors (287). For example, the analysis used alcohol tax data to provide information about the number of units in the market. However wine and ciders are taxed by volume of product irrespective of strength so tax data cannot inform the number of units in the market for wine or cider.

Furthermore, three important confounders were not controlled for:

- over the observed period there were changes in alcohol taxation which were not taken into account in this analysis
- important trends in consumption among subgroups were not considered
- changes in the average strength of alcohol sold was not taken in to account

Separating the effect of the pledge from these factors requires a careful and detailed statistical analysis which the original report does not provide.

Peer-reviewed research has assessed the extent to which activities pledged by signatories could have been brought about by the RD, as opposed to having happened anyway (288). Ninety-two per cent of signatories submitted progress reports in 2013 reducing to 75% in 2014. Most of these reports provided descriptive feedback rather than quantifiable performance metrics and around 14% of 2014 reports were identical to those presented in 2013. The majority of organisations (65%) signed pledges that involved actions to which they were already committed, regardless of the RD and 39% of the activity relating to the 'reducing the strength' pledge was said to have happened regardless of the RD. The majority of reported actions related to the launch (56%) and promotion (67%) of new lower-strength products, with 17% of the actions relating to reducing the production or promotion of alcohol products and 8% to actions to remove alcohol units from existing products. Five signatories did report removing alcohol units from existing products however it was not possible to estimate the cumulative units removed because there was too much variation in the way this was reported. The reported unit reduction achieved ranged from 1.6 million to 111 million units, although it was unclear whether or not this had been solely achieved during the period of, and as a result of, the RD.

Reducing the number of units in an existing product is different to launching a new low-strength product. The latter potentially increases the total number of alcohol products on

the market. It is possible people will then drink more as a result of increased product variety rather than switching from high-strength to low-strength products.

In conclusion, most alcohol pledge signatories appear to have committed to actions that they would have undertaken anyway, regardless of the RD. Irrespective of this, there is considerable scope to improve the clarity of progress reports and reduce the variability of metrics provided by RD pledge signatories. These findings have *“important implications for how public health policies are designed, monitored and evaluated”* (288).

Regulating availability									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
C1. Density of alcohol outlets	5 systematic reviews 2 critical reviews 3 observational studies	Low/Moderate	Mostly international evidence base	Strong relationship between greater outlet density and levels of social disorder; mixed findings on consumption, emerging evidence for chronic health harms	Licensed premises	Not identified	Using the evidence within the Licensing Act 2003 is challenging Administrative and enforcement costs borne by licensing authorities and police Undermined if alcohol is readily available from neighbouring areas	Can be implemented in areas with greater deprivation	Reducing the density of alcohol outlets may reduce social disorder and RTC
C2. Hours and days of sale	2 expert reviews 4 systematic reviews 8 natural experiments	Moderate	Mixed research findings internationally and within England	International evidence links hours of sale to alcohol consumption and harm, particularly for availability during late night hours in the on-trade English research suggests violence shifted later into the night and hospital admissions increased by a small amount in some areas	Licensed premises	Cost-effective	Using the evidence within the Licensing Act 2003 is challenging Costs borne by licensing authorities and police Undermined if alcohol is readily available from neighbouring areas	None identified	Reducing hours of sale may reduce alcohol-related harm

The Public Health Burden of Alcohol and the Effectiveness and Cost-Effectiveness of Alcohol Control Policies: An evidence review

C3. The responsibility deal pledge to “remove 1bn units of alcohol sold annually from the market by ”...“improving consumer choice of lower alcohol products”	1 critical review 2 observational studies	Very low	Over simplistic assumptions regarding consumer response and changes in duty	Most actions would have occurred regardless of the pledge, no demonstrable impact on harm	All alcohol drinkers	Not identified	Potential for new low alcohol products to expand the alcohol market overall	Not identified	Public-private partnerships are not shown to bring about effective changes which benefit public health
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Providing information and education

Introduction

The World Health Organization (WHO) recommends that public policy on alcohol should ensure that there is *“broad access to information and effective education and public awareness programmes among all levels of society about the full range of alcohol-related harm”* (289).

This chapter presents the evidence for the effectiveness of media campaigns, education programmes and information displayed on alcohol products. These disparate information policies and initiatives have one or more of the following aims (2):

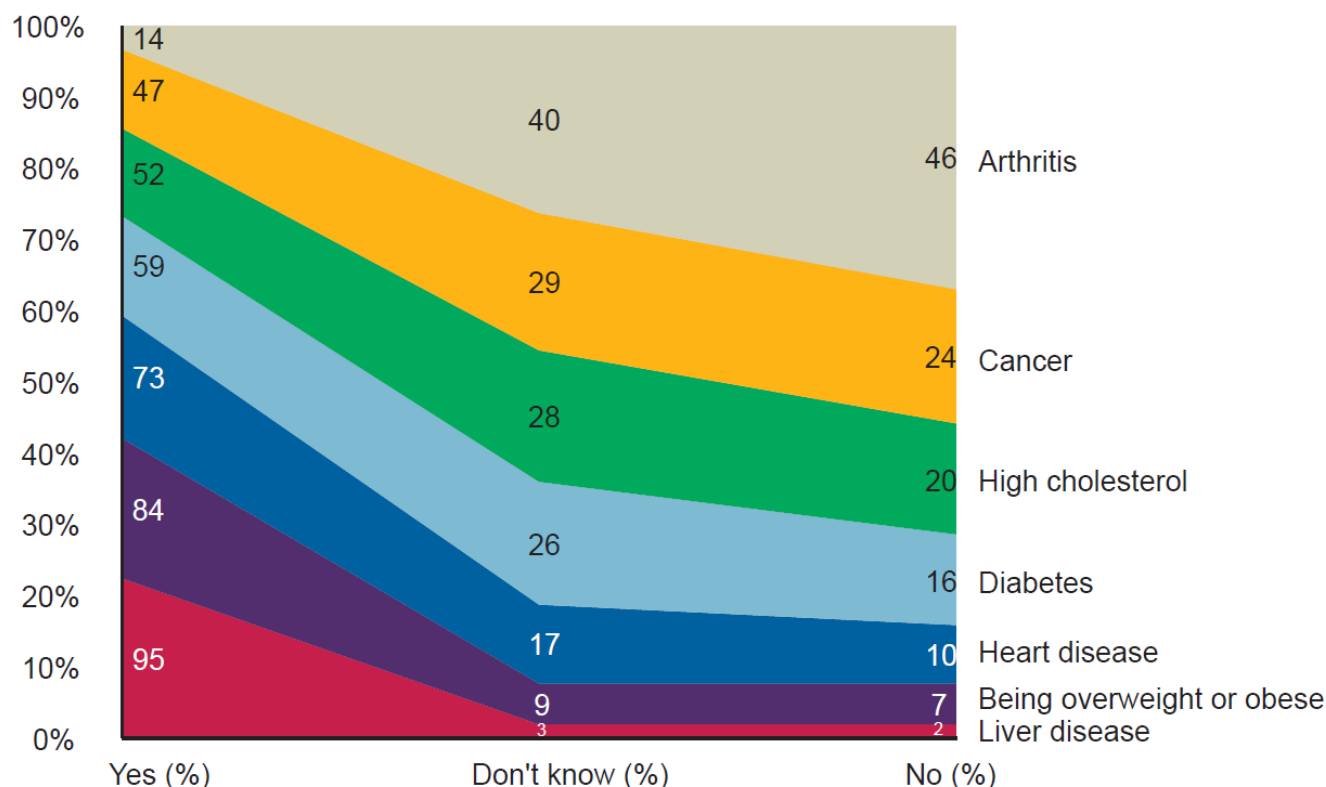
- to inform people of the risks of alcohol consumption
- to change consumers' intentions to drink or their drinking behaviour
- to lower the frequency or severity drinking-related problems
- to change public attitudes and elicit support for alcohol policies

Many of the policies in this section do not directly change health behaviour and therefore reduce the public health burden caused by alcohol. Nonetheless, providing information is an important component of a comprehensive policy approach. Alcohol consumers have a right to understand the risks associated with alcohol consumption and increasing awareness of the harms relating to alcohol can increase public support for effective alcohol control policies.

Public opinion is a potential barrier to implementing more stringent and effective policies, however providing information can influence public opinion and help overcome this barrier. Surveys show that people who are aware that alcohol is a risk factor for cancer are more likely to support a range of alcohol control policies including increases in alcohol tax and strict marketing regulations (290). The OECD has recognised that *“information and education campaigns can contribute to a package of measures to tackle harmful alcohol consumption by generating possible synergies with other measures”* (4).

UK surveys of around 2,000 participants show that while many respondents can correctly identify liver disease as a potential health outcome of alcohol consumption, fewer are able to freely recall cancer (Figure 42) (291). Levels of knowledge were particularly low for breast cancer. Providing information can therefore help to overcome this knowledge deficit.

Figure 42: The proportion of respondents who believe the health condition can 'result from drinking too much alcohol' (291)



It is possible that providing information or education may not lead to immediate or sustained changes in behaviour because it is overshadowed by our contemporary environment, in which there is widespread marketing of alcohol which “reinforce and exaggerate strong pro-alcohol social norms” (6,7).

Mass media campaigns which aim to change alcohol consumption

Mass media campaigns aim to reach relatively large sections of the population. Generally, campaigns aiming to reduce drink-driving have been effective (see *Mass-media campaigns to prevent drink-driving*). To date, reviews show that campaigns aiming to reduce alcohol intake have been less successful (293). The success of drink-driving campaigns may reflect the findings that campaigns are more effective at changing occasional behaviour, for example the uptake of a vaccination, rather than long-term, habitual behaviour, for example, food choices.

A review of reviews including two meta-analyses and one narrative review was inconclusive about the effectiveness of mass media campaigns for changing alcohol consumption or behaviour (8). Both meta-analyses reported positive results, but these beneficial effects were not clearly specified limiting confident conclusions. The third included review reported that just over half of the evaluated campaigns demonstrated

significant effects on alcohol use or initiation, with stronger effects observed in the short-term (six months) rather than longer-term (12 months).

Simple messages are commonly conveyed in industry marketing materials, for example, the “*Drink Responsibly*” messages printed on alcohol product adverts (294). These messages have been considered ineffective in changing drinking behaviour as the messages they contain are viewed as ambiguous. The OECD recognise that “*the delivery of education messages by private sponsors [is found to] have no significant public health effects*” (4). This view is echoed by the British Medical Association (292).

Alcohol Concern examined the presence and nature of “*Drink Responsibly*” messages appearing in leading supermarket magazines in the UK, published between July and December 2014 (294).²⁴ The sample of magazines contained a high volume of alcohol adverts and advertorials²⁵ ($n=68$ and $n=36$ respectively). A “*Drink Responsibly*” message was present in 36% of the entire sample, on 49% of adverts and in 11% of advertorials. Examples can be seen in Table 8.

Table 8: Alcohol brands and their responsible drinking messages (294)

Alcohol brand	Drink responsibly message
Bacardi	Live Passionately, Drink Responsibly
Diageo	Celebrate Life Responsibly
el Jimador	Be real. Drink Responsibly
Grey Goose	Sip Passionately, Drink Responsibly
Jack Daniels	Your friends at Jack Daniels remind you to Drink Responsibly
	Play with your Heart. Drink with Care
	Live Freely. Drink Responsibly
Jack Daniels	Make This Season a Winter to Remember. Drink Responsibly.

All “*Drink Responsibly*” messages were printed in a text size that was smaller than the tagline of the adverts or advertorial headlines. Alcohol Concern recommend that current “*Drink Responsibly*” messages found in alcohol advertising should be replaced with factual health warnings appropriate to the product being advertised and/or the publication or platform in which it will most frequently appear.

²⁴ Lifestyle magazines for the following supermarkets: Asda, Morrisons, Sainsburys, Tesco and Waitrose

²⁵ Advertorials are a newspaper or magazine advertisement giving information about a product in the style of an editorial or objective journalistic article

An experimental study of over 200 undergraduate students aimed to understand how responsible drinking messages affect actual drinking behaviour and showed that poster materials promoting responsible drinking are consistently associated with increased consumption during a laboratory setting taste preference task (295). Eye tracking data revealed that participants spent a minimal amount of time looking at the responsible drinking messages on each poster and instead spent more time looking at the positive imagery featured in these posters.

A population-based, mass media campaign in Australia was effective in raising awareness about the relationship between alcohol and cancer and knowledge of drinking guidelines in women aged 25 to 54 years (296). Compared with baseline, women's knowledge that drinking on a regular basis increases the risk of cancer increased at two follow-up periods, odds ratio (OR)=2.6 (95% confidence interval [CI]=1.6, 4.3) and OR=4.9 (95% CI=2.6, 9.7). Compared with baseline, knowledge of the recommended low risk drinking guidelines increased at one time period, OR=1.7 (95% CI=1.0, 2.8). Among women who drank alcohol, the proportion expressing intentions to reduce alcohol consumption increased between baseline and one of the follow-up periods, OR=2.4 (95% CI=1.1, 5.1), however no reductions in recent consumption were observed. The authors suggest that despite raising awareness, a single campaign is unlikely to reliably change behaviour, in a culture where pro-alcohol social norms and product marketing are common.

A recent evaluation of the 'Dry January' campaign which is a national campaign run in Britain which encourages temporary abstinence from alcohol for the month of January, shows that participation was associated with changes toward healthier drinking and increases in an individual's self-perceived capacity to refuse alcohol in social settings when other are drinking, for emotional regulation and opportunistic drinking (297). Over 850 participants took part and success in completing the abstinence challenge was predicted by a lower frequency of intoxication in the month prior to the campaign. Furthermore, participation in Dry January, whether successful in maintaining abstinence or not during the month, was related to reductions in self-reported alcohol consumption and increases in perceived confidence to refuse alcohol in other settings among all respondents at six month follow-up. The results suggested no rebound effects, whereby people drink heavily upon completing the period of abstinence as few participants reported increased alcohol consumption following a period of voluntary abstinence.

Alcohol education programmes

Alcohol education programmes generally aim to increase knowledge about the health and social harms associated with alcohol consumption, in addition to changing attitudes and drinking behaviour. However, little (lasting) evidence has been found in support of these programmes. Some promising evidence suggests that alcohol education

programmes that use social marketing or social norms approaches may be more effective, but research is still emerging.

School-based alcohol education programmes

Alcohol education programmes have one or more goals as follows: to increase knowledge about alcohol in adolescents, to delay the onset of first use of alcohol, to change adolescents' drinking belief, attitudes, and behaviours, to increase general social skills and self-esteem that influence drinking behaviour and to reduce high risk drinking and minimise the harm caused by drinking (2).

Although a widely implemented and supported intervention, a review of 11 reviews suggests that the effectiveness of school-based alcohol education programmes is inconclusive (8) and further modelling suggests it is not cost-effective in the short-term (4). The interventions included in the reviews varied in both setting and study design. Clear patterns separating effective from ineffective interventions could not be identified. Several studies of programmes that were previously appeared effective were not when replicated in a new setting, suggesting that school-based education programmes are highly population and setting specific.

A more recent review of 28 randomised controlled trials (RCTs) including around 40,000 adolescents with an average age of 13.6 years demonstrated a small favourable effect of school-based education programmes for studies that reported continuous outcomes such as frequency or quantity of alcohol use, but not categorical outcomes such as proportion of students who drank alcohol (298). The variability across the studies was high and there were no differences in the measured effectiveness across school level, programme intensity, age or gender.

A Cochrane review of 53 randomised trials evaluated the impact of universal school-based prevention programmes on alcohol use in students aged 18 years or younger (299). Overall the authors noted that the quality of trials was low. Less than 4% of trials adequately reported the methods used for randomisation and allocation concealment and incomplete data was adequately addressed in only 23% of trials. In five out of 11 alcohol-specific trials, there was no difference between the intervention and control groups at the follow-up from six months to three years post-randomisation. For example, one trial reported a mean number of drinking occasions in the intervention and control group of 2.06 (standard deviation [SD]=1.1) and 2.05 (1.0) respectively.

In the remaining six trials, there was some evidence that school-based programmes were more effective compared to a standard curriculum. For example, one trial reported that students in the intervention group experienced reduced risk of lifetime binge drinking at four and 12 months compared to standard curriculum.

Specific to the UK, two cluster RCTs were conducted to evaluate the effects of Drinkaware's school-based In:tuition intervention (300). One trial of the programme was for 10 to 11 year olds in primary schools and another for 12 to 13 year olds in secondary schools. Schools across the UK were randomly allocated to receive the intervention or to a business-as-usual control. There was no evidence of any impact, positive or negative, of the intervention on self-reported resistance skills or increased knowledge in 10 to 13 year olds. However, there were difficulties with participant recruitment, particularly in secondary schools and not all teachers delivered the entire programme.

Higher-education based education programmes

A review of four reviews of studies conducted in the US reported no effect of higher education programmes on alcohol consumption (8). Only one primary study included in the review reported a significant beneficial effect on drinking frequency. This effect was not replicated in a separate study suggesting the effect may have been due to chance. Overall, the current evidence suggests that higher-education based programmes are not effective.

Social marketing approaches

Social marketing uses marketing techniques to achieve a social or health goal and can be used in alcohol education. A review of six treatment only or treatment and control trials investigated the application of social marketing in alcohol prevention interventions and whether application of social marketing influences alcohol-related attitudes or behaviour (301). In all studies, the primary outcome was a change in risky behaviour, for example a reduction in drink-driving.

Two of six studies included in the review reported an effect. One campaign showed a direct effect of a social marketing campaign on drink-driving, riding with a drinking-driver and alcohol-related road traffic crash (RTC). The second campaign decreased the mean number of drinks consumed per week from 16.8 at pre-test to 12.6 at post-test. The other four campaigns included in the review only showed associations and no effects were found for some aspects. On balance, this review was not able to provide a firm conclusion about social marketing as a means of changing alcohol-related attitudes and behaviour.

Social norms approaches

Social norms refer to our perceptions and beliefs about what is normal or acceptable behaviour, and these beliefs influence our behaviour. With regards to alcohol consumption, it is common for people to believe that they drink less than their peers. Social norms interventions aim to correct misconceptions about levels of consumption in one's peer groups, usually by pointing out that one's peer's drinks less than one thinks.

A meta-analysis of 59 RCTs including around 40,000 students found no meaningful effects associated with social norms interventions on alcohol-related problems, frequency of drinking or drinking norms and a small effect on binge drinking among students (302). At four or more months of follow-up, small effects were found for web feedback and individual face-to-face feedback on measures of alcohol-related problems, binge drinking, quantity of alcohol consumed, frequency of alcohol consumed and peak blood alcohol concentration (BAC). However, given concerns about the quality of the evidence included in this review, including high levels of attrition and poor reporting of participant allocation to study group, these reported effects are unlikely to be important in practice.

Four of the five modes of delivery included in the review are not suitable for population-level implementation comprising:

- mailed normative feedback
- web/computer normative feedback
- individual face-to-face normative feedback
- group face-to-face normative feedback

Only the normative marketing campaign can be delivered at a population-level. When examining the effectiveness of this intervention, effects are not found for alcohol-related problems, frequency of drinking or drinking norms at four months.

Education and information in Scotland's alcohol strategy

Scotland's alcohol strategy aimed to change public knowledge and attitudes about alcohol, specifically using interventions such as education initiatives and indirectly by challenging the normalisation of alcohol and through the public and media discourse around the strategy and its components (283). The strategy used three key mechanisms:

- improved educational initiatives aimed at children and parents and workplace alcohol policies
- increased media coverage and public discourse generated by the strategy and clear government and public agency messages that the harm caused by alcohol is felt by individuals, families, communities and Scotland as a whole
- implicit messaging from interventions that raise awareness of the harm caused by alcohol and challenge the normalisation of alcohol, such as identification and brief advice (IBA) and restrictions on the display and promotion on alcohol in the off-trade

Overall, measures of knowledge and attitudes did not change in relation to understanding alcohol units, in perceptions of drunkenness, or the perceived social role of drinking (283). However, surveys show that there was an increased recognition that alcohol was harmful with 60% of respondents in 2013 identifying it as the drug which

causes the most harm up from 46% in 2004. These findings were not replicated among respondents living in the most socially deprived areas.

The proportion of young adults, aged 18 to 29 years, who agree it is acceptable to get drunk at the weekend reduced from 53% in 2004 to 40% in 2013, but there was little change for the whole population. Between 2010 and 2013 agreement that *“it was ok for someone my age to try alcohol”* fell from 82% to 77% among 15 year olds and from 52% to 42% among 13 year olds.

In 2013 41% of people were in support of minimum unit pricing compared to 35% who were opposed, with support highest among those who thought that alcohol caused *“a great deal of harm”* in Scotland.

Labelling

Labels on consumer products can provide information about content and use and can alert consumers to risks and harms. From the manufacturer's point of view, a label is also a means of conveying distinctive visual information for a brand to stimulate demand. Using labels to include information about the health risks and harms associated with alcohol can be implemented with relatively low-cost and will have a wide population reach.

Alcohol warning labels

Warning labels are labels with either text or pictures depicting the health risks associated with alcohol consumption. Warning labels on alcohol products are a relatively unused measure, with only 12 countries requiring some kind of health message to be displayed (303). States in the US tend to mandate warning labels on alcohol more than European countries and the European Union (EU) does not require any health warning on the possible consequences of alcohol consumption.

Despite being infrequently used, there is a high level of public support for alcohol labelling (304–306). An EU survey of 29 countries found that on average 77% of respondents 'totally agreed' or 'tended to agree' that warnings should be put on alcohol bottles and adverts, with the purpose of warning pregnant women and drivers of the risks of drinking alcohol. In the UK, this figure was much higher with 85% of respondents supporting labelling.

Two reviews have concluded that alcohol health warning labels raise awareness of the messages they contain but do not reduce alcohol consumption (304,307). However, the researchers point out that in the included research studies, the evaluated labels were poorly designed and implemented. Similar findings were observed in a review of 10 observational and longitudinal studies of adolescents (308).

The longstanding warning label which is mandated in US reads as follows:

“GOVERNMENT WARNING: according to the Surgeon General, (1) Women should not drink alcoholic beverages during pregnancy because of the risk of birth defects (2) Consumption of alcoholic beverages impairs your ability to drive a car or operate machinery and may cause health problems”.

A statistical modelling study of over 1,000 drinkers in the US responding to a national survey concluded that drinkers who were aware of the warning label were more likely to try and prevent others from drinking and driving (309).

Alcohol information labels

A focus group of 44 Australian students aged 18 and over, suggested that labels which provide information about the number of units in a drink are well recognised by consumers. However, this information was at times used by students to search for the cheapest products which contained the greatest number of units (310). Respondents also reported occasions when unit labels were used to make safer drinking choices, mainly around selecting lower strength products if the drinker intended to drive.

Australian surveys of over 550 adults shows that a ‘get the facts’ logo which features on alcohol products and directs consumers to a website containing information, is rarely recalled (311). No respondents freely recalled the logo however when prompted, recall increased to a quarter of all respondents. Young drinkers, binge drinkers and drinkers who consumed alcohol directly from the bottle were more likely to recall the logo when prompted. The logo directed website was only visited by 7% of all respondents.

The information label pledge in the ‘responsibility deal’

In the UK, alcohol information labels are the subject of a voluntary agreement between industry and government. In 2011, as part of the public health responsibility deal (RD) in England, some industry signatories pledged to ensure that 80% of alcohol products would have clear, legible labelling. This pledge consists of three required elements:

- information on alcohol units
- government consumption guidelines
- pregnancy warnings

Two further optional elements were a:

- reference to Drinkaware website
- responsibility statement: *“please drink responsibly”*

A survey of the top 156 selling UK alcohol products shows that the three required labelling elements were present on 86% of signatory products compared to 54% of non-signatory products (312). Similar findings were observed when evaluating the number of products which included all five labelling elements. Eighty-three per cent and 44% of signatory and non-signatory products had all five elements respectively.

Despite these positive findings, only 57% of the labelling of products met the Portman Group's own best practice. The Portman Group guidance encourages companies *"to use a font size no smaller than the main body of information on the label"* however more than half (60%) used a smaller font than the main label text. A font size of 10- or 11-point is optimal for legibility however the mean font size for products including unit guidelines was 8.2 points. In most cases (79%), the pregnancy warning appeared on the back of the product.

In the UK, beer is a product predominantly consumed by men and wine is predominantly consumed by women (182). However, the pregnancy logo which is primarily targeted at female drinkers was significantly smaller on wine bottles than on beer containers (5.1mm compared to 7.1mm).

Similar obfuscating tactics were observed in a previous evaluation of a voluntary agreement in 2007, where there was widespread non-compliance with only 2% of samples using the agreed format (313). The use of small fonts and small labels with poor tonal contrast, colours and backgrounds may have obscured many messages.

The form and content of alcohol labelling

There is a general consensus among experts that alcohol labels have been poorly implemented and this may, in part, explain the finding that labels are ineffective in changing drinking behaviour (304,307). Research has sought to identify what aspects of a label may increase their effectiveness (303). Five key elements are identified as follows:

- list of ingredients
- nutritional information (including calories)
- standard drink size and servings per container
- drinking guidelines/definition of 'moderate' intake
- health warnings

With regards to health warnings, expert opinion informed by the experience of tobacco, suggests alcohol warning labels should be designed and implemented as follows (314):

- develop research to identify 'direct' and 'evidence-based' health warnings
- increase the visibility of the warnings
- incorporate pictorial health warnings
- consider plain packaging for alcohol products

Drinking guidelines

The Chief Medical Officer (CMO) in England has recently reviewed the recommended drinking guidelines, therefore, this policy was not considered within the present evidence review.

Providing information and education									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
D1. Mass media campaigns which aim to change alcohol consumption	1 review of reviews 2 expert reviews 1 systematic review 2 cross-sectional studies 1 experimental study 1 field study	Low	Research outcomes poorly specified	Can increase knowledge and awareness, direct impacts on behaviour usually small and short-term Commercially sponsored messages have no health benefits	Entire population (can be targeted at specific groups)	Not cost-effective	Cost of development and deployment Policy can be undermined by pro-drinking marketing	Can be directed at inequality groups	(Non-industry sponsored) campaigns increase knowledge and awareness, little direct impact on behaviour, not cost-effective
D2. Social marketing approaches	1 systematic review	Low	Not identified	Mixed findings of impact on risky drinking and behaviour	Entire population (can be targeted at specific groups)	Not identified	Cost of development and deployment Policy can be undermined by pro-drinking marketing	Can be directed at inequality groups	No firm conclusions can be made
D3. Social norm approaches	1 meta-analysis	Very Low/Low	Failure to report allocation concealment High levels of attrition	Effects were small and inconsistent among students	Entire population (can be targeted at specific groups)	Not identified	Cost of development and deployment	Can be directed at inequality groups	No firm conclusions can be made
D4. Alcohol education programmes	1 expert review 1 review of reviews 2 systematic reviews 1 RCT	Very Low/Low	Contradictory research findings with methodological issues.	Evidence inconclusive. Small, short term beneficial effects have not been replicated	Under 18 year olds	Not cost-effective	Cost of development and deployment Implementation has proven difficult with many schools not able to deliver education programmes in their entirety	Designed and directed at those aged under 18 years	Little (lasting) evidence of effectiveness or cost-effectiveness

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D5. Labelling of alcoholic beverages	5 reviews 1 modelling study 2 surveys 1 focus group	Low	Research evaluated a poorly implemented intervention	Improvements in consumer knowledge and awareness, no impact on behaviour Voluntary implementation by commercial operators ineffective	All alcoholic beverages	Not identified	Evidence supports a statutory approach; low costs are borne by commercial operators	Not identified	Labels increase knowledge and awareness
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Managing the drinking environment

Introduction

Drinking environments can form a key element of the recreational lifestyle of many people. Licensed premises provide local employment, and economic investment and regeneration. However, these environments are associated with intense drinking and higher-levels of acute alcohol-related harm, including aggression, violence and antisocial behaviour (153,315,316).

In 2013/14, in England and Wales, almost a fifth of all violent incidents occurred in or around a pub or club (154). This violence is typically associated with young men drinking in urban centres on weekend nights.

Surveys and interviews of young drinkers in the North West of England highlight a phenomenon whereby customers in the night time economy drink substantial amounts of alcohol before going out, so they arrive at drinking environments already intoxicated (317,318). Self-reported motivations for drinking before going out include (319):

- to achieve drunkenness
- to reduce social anxiety
- to extend the night out
- to avoid paying for higher priced drinks at a bar, pub or club

The latter two motivations are particularly pertinent to the UK, where licensing legislation has lengthened nights out and where there are large differences in the price of alcohol between on- and off-trade sales. Most alcohol is now bought from shops and drunk at home. In 2012, 6.4 litres of alcohol per person was consumed off-trade compared to 3.2 litres on-trade (50). This price differential has added to the motivation to drink at home before arriving in night-life venues (320).

Later closing hours of licensed premises and cheap off-licensed alcohol create problems for the on-trade sector because customers can attend premises intoxicated from drinking at home. It is against the law to serve alcohol to those who are intoxicated, but research in the UK shows this law is routinely broken (321). Given that the on-trade represents a valuable asset to local communities, it is important to consider policies that aims to reduce the harms concentrated in night time economies. These include policies to address low price alcohol in the off-trade and discouraging drinking at home before going out, known as 'preloading'.

Excessive alcohol use damages health, while managing nightlife drunkenness and associated problems places huge demands on police, local authorities and health

services (317,322,323). Wider approaches to reducing alcohol-related harm will help reduce harm in drinking environments. However, the prevalence of harm in these settings merit a specific focus. Policies in this area generally aim to reduce antisocial behaviour, violence, drunkenness and the associated health, social care and crime costs. Approaches include multicomponent community interventions, server and customer interventions and policing and enforcement approaches.

Research designs evaluating policies which are implemented in the drinking environment vary greatly. Generally, community-based programmes that co-ordinate their measures, implemented through strong multi-agency partnership, have yielded the strongest evidence for effectiveness. Research conducted to date has tended to focus on the short-term acute consequences of alcohol intoxication, rather than the long-term health damages from repeated intoxication.

An important concept relevant to drinking environments, and largely absent from the research literature, is that of 'spill over'. Spill over describes harms, or benefits of interventions, that occur not only in the area of intervention, but in nearby locations where the drinkers spend time. For example, violence that occurs from drinking can occur in that licensed premise, but also in the drinker's home. Further, an effective intervention which prevents aggression violence in a licensed premise may also reduce violence in the drinker's home. If research considers this spill over, the harms of alcohol attributed to the night-time economy are probably larger, as are the benefits of any effective intervention.

Multicomponent community interventions

Community-based multi-component programmes aim to reduce alcohol-related harm in drinking environments by co-ordinating and strengthening local preventative activity. If effective, they can help reduce costs to health services, criminal justice agencies and other public services.

These programmes bring together local authorities, communities and representatives of the licensed trade to identify and address local problems through a range of actions. These typically include efforts to mobilise communities, such as media campaigns and community forums, changes in standards in drinking environments, such as server training and increased enforcement activity, such as targeted policing.

Evaluations of multicomponent programmes have generally shown server training is not an effective component. However, partnership working, enforcement and research and feedback mechanisms appear to be important components (324).

As part of a systematic review, the effectiveness of seven multicomponent community-based programmes from Sweden, Australia and the US, were evaluated in 19 published

studies (324). The quality of the findings was limited by methodological shortcomings of the included studies.

In Sweden, the Stockholm Prevents Alcohol and Drug Problems (STAD) programme, combined community mobilisation with server training and stricter enforcement of alcohol laws (325). An evaluation concluded that STAD was associated with fewer instances of bar servers selling alcohol to intoxicated customers, and fewer violent incidents. When components were analysed separately, community mobilisation was seen as effective at reducing assaults. The alcohol server training component alone was only effective in smaller areas, possibly due to the larger numbers of staff requiring training, and due to higher staff turnover in larger areas.

Stricter enforcement alone had no significant impact, however this component was difficult to define in the study. The analysis did not distinguish between different visits made at different types of licensed premises so it is possible that the significant effects of certain types of visits at certain types of premises were diluted by non-significant effects of visits at other kinds of premises.

A cost-effectiveness analysis of the STAD programme in Stockholm showed that the intervention saved €39 for every €1 invested (326). The overall cost of the programme was estimated at €796,000 and the average cost of a single violent crime was estimated to be €19,049, resulting in an overall saving of €31.3 million relating to savings to:

- the judicial system (78%)
- production losses (15%)
- health care issues (5%)
- other damages (2%)

While the health care savings were relatively low, the intervention was associated with substantial Quality Adjusted Life Years (QALY) gains (236) for society as a whole.

The STAD project was rolled out nationally and with increasing participation of the programme components, there were greater reductions in crime (325). Each extension of the programme, by one component, was associated with a 3.1% (95% confidence interval [CI] = 0.4%, 5.8%) relative decrease in the expected number of assaults per 100,000 inhabitants aged 15 years or older. This equates to absolute decreases of almost 7 cases per 100,000 inhabitants for each additional programme component. A summative evaluation of the STAD programme in Stockholm between 1996 and 2008, showed positive spill over effects, as measured by reductions in annual police recorded crime per 100,000 inhabitants (327):

- in the intervention area by 1.8% (0.8,4.4%)
- in nearby local areas by 5.8% (0.1,11.5%)
- total reduction for all areas was 7.6% (2.2,13.2%)

This suggests that a person who was less intoxicated, and therefore less likely to be involved in violent assaults in the intervention area, was also less likely to be involved in violent assaults as they returned home.

A similar programme in Finland developed a number of key elements including:

- local structures for community organisation: local co-operation between alcohol licensing authorities, the police, prevention workers, the alcohol serving industry, community leaders, the university and the media
- law enforcement with sanctions: during the first year of the study, the authorities agreed to increase levels of enforcement and give mild sanctions in the intervention area
- server training: premises in the intervention area were given half a day's training of serving practices
- campaigns: to influence the social norms and values related to alcohol service and consumption

The project evaluation suggests it reduced sales of alcohol (refusals to serve) for people who are intoxicated (328). Changes in refusals for the intervention and control areas are shown in Table 9. The most important element of the intervention was the effective licensing control.

Table 9: Refusal rate and total number of licensed premises by different category of premises before and after the interventions, (2004 and 2006) (328)

Category of premises	Refusal rate % (n)			Refusal rate % (n)		
	Intervention			Control		
	2004	2006	Change from 2004-2006 [i]	2004	2006	Change from 2004-2006 [i]
Overall	23 (47)	42 (52)	19	36 (47)	27 (48)	-9
Town centre bars and pubs	42 (19)	55 (22)	13	33 (21)	23 (22)	-10
Nightclubs	7 (14)	8 (12)	1	11 (9)	0 (8)	-11
Suburban bars and pubs	14 (14)	50 (18)	36	53 (17)	44 (18)	-11

Refusal rates varied according to the type of licensed premises. The downtown bars and pubs had the highest rates of refusal and the biggest increase in refusal rates was

for suburban bars and pubs in the intervention area, increasing from 14% before the intervention to 50% after it. Refusal rates also decreased in all premise types in the control area.

The Australian Dealing with Alcohol-Related Problems in the Night-time Area (DANTE) project used a multicomponent approach to tackle alcohol-related emergency department attendances between 2005 and 2009 (329). DANTE included the following components:

- night watch radio programmes which connects security staff via radio
- identification (ID) scanners to detect fake ID
- a local campaign involving celebrities who endorse safe drinking patterns
- maximum police visibility during high-risk hours
- improved radio contact between police and licensees
- undercover police at licensed venues

A time series analysis showed that the local campaign and ID scanner elements were associated with a rise in injury rates at emergency departments. However the researchers suggest that the correlation between the local campaign and hospital attendances is misleading because the campaign was run on an ad-hoc basis without supporting information provided. Furthermore, increases in hospital admission are likely to reflect the underlying trend of increases in admissions over this period rather than a link to ID scanners. Overall, the DANTE project was found to be ineffective at reducing alcohol-related hospital admissions. The analysis did not include improved radio contact or police presence due to data issues.

A violence reduction intervention in Wales, the All-Wales Licensed Premises Intervention (AWLPI), was delivered by environmental health practitioners with the aim of reducing alcohol-related violence in and around licensed premises (330). The intervention consisted of:

- an audit carried out at the start of the study to identify known risks for violence
- follow-up audit to enforce change for premises where serious risks were identified
- structured advice on how risks can be addressed in premises
- online materials providing educational videos and related materials

A randomised controlled trial (RCT) evaluating the impact of the intervention demonstrated an increase in police recorded crime compared to control areas. However the results were underpowered because there were not enough premises recruited to either arm of the trial.

Carrying out an audit at the start of the study, to identify known risks for violence, was less effective than normal practice (hazard ratio [HR]=1.3, 95% CI 1.2, 1.5) and not

cost-effective. Almost all eligible intervention premises (99%) received the initial risk audit with nearly 40% requiring a follow-up visit meaning that risk had been identified, however fewer than 10% received one. This lack of follow-up visits could suggest implementation failure for an important mechanism of action and could in part account for the counterintuitive findings. There were also concerns as to the accuracy of police data for assessing violence in licensed premises. It is also possible that intervention premises may have received greater attention from statutory agencies, and therefore identified more violence than control premises.

Multicomponent community approaches in England have proved effective in addressing alcohol-related problems in the night time environment (331). Liverpool's Drink Less, Enjoy More intervention incorporated:

- community mobilisation
- enforcement of the law
- server training

The programme was a collaboration between Liverpool City Council Public Health and Alcohol and Tobacco Unit teams and Merseyside Police. It aimed to prevent sales of alcohol to drunk people, increase public knowledge on the law regarding such sales, and promote responsible drinking. Evaluation of the programme was carried out using surveys of night life users and bar staff and alcohol test purchase attempts.

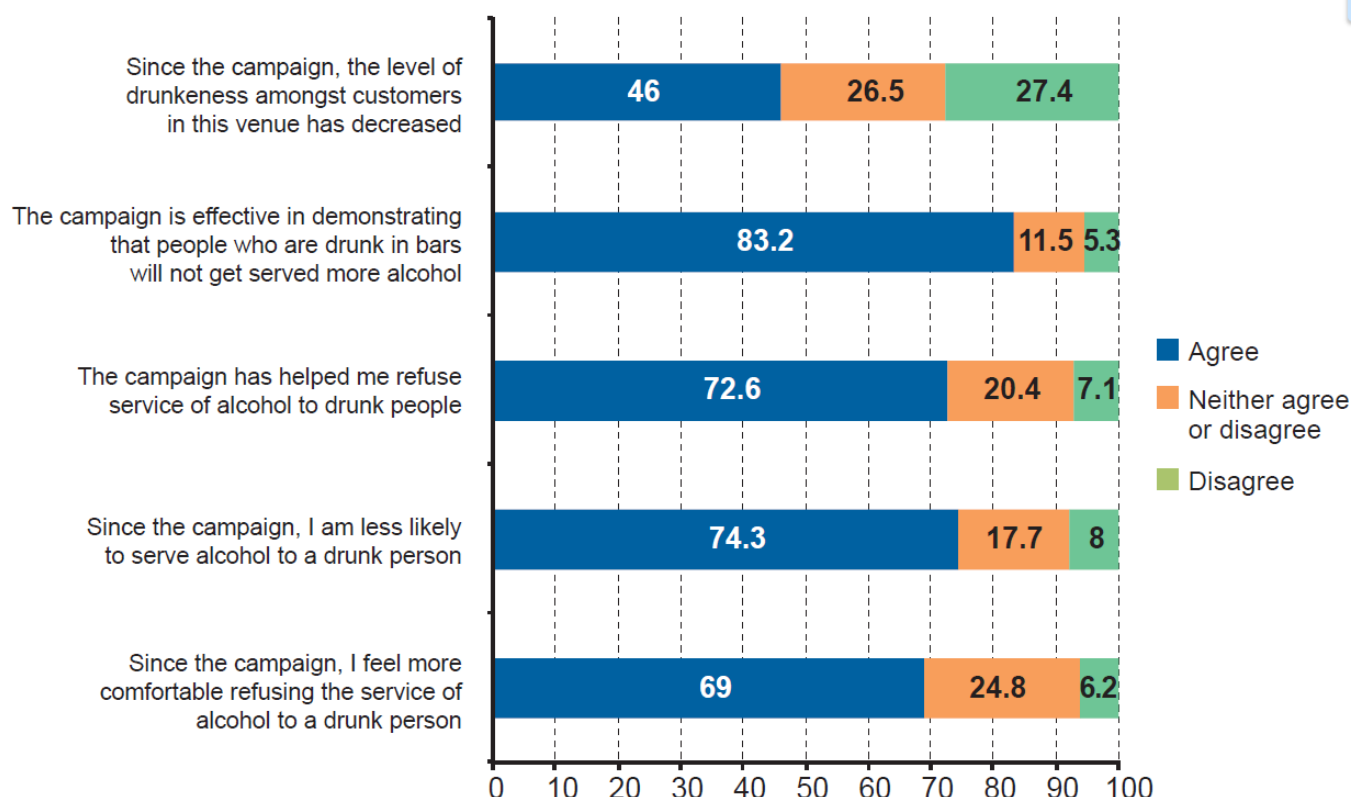
Nearly four in ten (38%) night life users reported awareness of the intervention. Improved awareness of the law about serving people who are drunk, is a critical first step in improving compliance. In this regard, the proportion correctly reporting that it is illegal to serve alcohol to someone who appears to be intoxicated increased from 45% to 65%, before and after the intervention.

Among surveyed bar staff, over half (55%) were aware of the intervention, of which many reported positive outcomes relating to the intervention (Figure 43).

Results from alcohol test purchasing, where an actor who was portraying extreme drunkenness tried to buy an alcoholic drink, showed refusal rates increased from 16% before the intervention to 74% after the intervention. This change suggests that the intervention affected not only on self-reported likelihood of serving people who are intoxicated, but on actual serving practices.

Busy city centres typically employ large numbers of bar staff, often with a high staff turnover. Finding the most feasible way to train all staff within the available resources is an important requirement to the success of such programmes.

Figure 43: Bar staff views on the impact of the Drink Less, Enjoy More intervention (331)



Server interventions

Given the high prevalence of alcohol-related harm in licensed premises, servers of alcohol are ideally placed to carry out interventions in these settings. These can include server training, or liability to deter sales of alcohol to underage or intoxicated customers. Challenge 25 is a voluntary scheme that is run in England and encourages anyone who is over the age of 18, but looks less than 25 years, to carry identification when they want to buy alcohol. Challenge 25 builds on the Challenge 21 campaign introduced by the British Beer and Pub Association, who represent the beer and pub sector, in 2005. It is now run by the Retail of Alcohol Standards Group, which represents alcohol retailers. Challenge 25 was made mandatory in Scotland by the Licensing (Scotland) Act 2010.

Licensed premises are also useful locations to encourage the uptake of designated drivers in customers (see *Designated drivers*).

Server training

UK research shows that the law preventing the sale of alcohol to people who are intoxicated is routinely broken, yet prosecutions are rare (321). In Liverpool, almost 84%

of 73 alcohol purchase attempts at pubs, bars and nightclubs, by actors who were pretending to be drunk, resulted in a sale. Sales were more likely to be refused in venues with a greater provision of seats and where the majority of staff were 25 years or older. Service was more likely in bars with door supervisors than no supervisors (95% and 69% served respectively). Providing drink to those who are already intoxicated increases the risk of acute and long-term health and social harms and consequently, the burden placed on public services and society.

Server training programmes aim to reduce sales of alcohol to those who are intoxicated or underage by (2):

- changing attitudes
- increasing knowledge
- increasing skills to refuse service
- improving serving practice

A review of seven studies concludes that server training is effective if implemented as part of a wider multicomponent approach alongside community mobilisation and law enforcement (324). However, it is less effective as a standalone intervention. Overall, research shows mixed results suggesting that server training can increase staff knowledge about alcohol issues and can improve staff practice, but the impact on alcohol use and related harms is generally small (8,332).

Web-based server training represents a way to train large numbers of staff, however an experimental study suggests web-based training is associated with only small improvements in participants' knowledge, attitudes and self-efficacy immediately after completing a course (333). The average number of correct items, out of a total of 15, increased from nine at baseline to 12 at post-test. This study only measured changes in knowledge and behaviour and not subsequent on-the-job behaviour.

Server liability

Server liability laws hold the owner or server at any licensed premise where a customer consumed his or her last drink, responsible for the harms caused by the customer. It is hypothesised that if servers perceive a high likelihood of incurring penalties by overserving, they will be more likely to avoid doing so. Server liability laws have only been implemented in North America. Research shows that the strength of server liability law is associated with per capita beer consumption (334). States with strong server liability laws had, on average, lower per capita consumption of beer than states with weak laws.

Server liability effectively reduces alcohol-related road traffic crash (RTC) fatalities (335). In a review of 11 longitudinal studies evaluating server liability laws which were

implemented between 1983 and 1995, median reductions of 6% were observed for alcohol-related RTC fatalities and 5% for all RTC fatalities. Among underage drinkers, reductions in all-cause RTC fatalities were between 2% and 13%. Server liability laws were also found to be significantly associated with reductions in rates of homicide and alcohol-related illness.

Server liability laws can also foster environments which encourage responsible serving practices where responsible serving is the norm. However, their implementation may be expensive and inefficient (335). To bring a legal action against a server of alcohol, there must be proof of service to an intoxicated customer, and harm to someone as a result of this illegal service.

Replacing glassware with safer alternatives

Glassware and bottles in licensed premises are a major cause of injury to customers and staff. Based on a random sample of around 1,300 compensation applications, between 1996 and 1998, the Criminal Injuries Compensation Authority, an executive agency of the Ministry of Justice, awarded £4.08 million to victims of assaults in licensed premises in the UK (165). Glass and bottle assaults accounted for 28% of the total cost, equivalent to £1.15 million. Injuries caused by glass assaults were more costly than bottle assaults with the mean cost of almost 750 injuries from glass assaults being around £2,350, compared with just over £2,000 for 540 injuries from bottles.

Policies which replace glassware with safer alternatives such as toughened or polycarbonate glass have been proposed as a means of reducing the severity and frequency of glass-related assaults. Polycarbonate glassware is virtually unbreakable, shatterproof and hard wearing. In practice, many pubs and clubs already use safer glass alternatives on a permanent basis or on certain occasions such as and large sporting events. Alternative glassware is included as an example of good practice in the supporting guidance for licensing condition (336).

In England, an experimental study evaluated replacing glassware with polycarbonate, and showed some beneficial effects (337). Between three and five licensed venues were recruited from three Lancashire towns and observed over a three month period. Glass breakages decreased from an average of 17 per venue per week to zero following implementation of polycarbonate glass. No reductions were seen in non-polycarbonate venues. The proportion of customers in polycarbonate venues reporting having cut themselves on broken glass in the past three months decreased from 11% pre-trial to 6% post-trial. Non-significant increases were seen in non-polycarbonate venues, from 11% to 13%.

There were no significant changes in either type of venue in the proportion of customers who had been involved in fights, or threatened or assaulted with a glass or bottle in the

past three months. Police data showed no significant changes in the number of glass-related incidents occurring in study towns during the trial period compared to the same period in the previous year. Given the low numbers of violent incidents recorded by participating venues pre- and post-trial, changes in police data were not expected.

This study had limitations. The number of participating venues was small, and four venues did not collect data continuously during the study. Two polycarbonate venues did not use polycarbonate consistently and most polycarbonate venues continued to serve bottles.

Scottish research has also assessed the impact of a city-centre glassware ban (338). Exemptions to the ban enabled three of eight premises to continue to serve alcoholic drinks in glass vessels. Such exemptions were thought to be associated with violent behaviour that was likely to cause harm, as revealed by qualitative research. Disorder in all-plastic venues was observed to incur less injury risk. Customers also reported feeling safer in these nightclubs than in others though there was some complaint about the use of plastic glasses. Older patrons tended to be more pro-glass or anti-plastic than younger patrons.

The authors conclude that *“this research demonstrated the potential of such policy to reduce the severity of alcohol-related violence in the night-time economy. It is recommended that future bans of this nature be tailored towards the elimination of all types of glassware from such premises”*.

Removing the sale of high strength alcohol

Initiatives designed to tackle the problems associated with street drinking have removed the sale of low-priced, high strength alcohol products, through voluntary agreements with local retailers. Suffolk was the first area to adopt the approach in 2012 and since then, a number of other areas have followed. The models used vary across different local areas, but tend to target alcohol products stronger than 6.5% alcohol by volume (ABV).

Manchester removed the sale of super strength alcohol using a voluntary commitment with alcohol retailers, police, a local authority and public health (339). The approach:

- invited off-licensed premises in a clearly defined ‘Action Zone’ to voluntarily stop selling high strength beers, lagers and ciders (6.5% ABV or above)
- offered proactive support to alcohol retail staff in the Action Zone with ‘Responsible Alcohol Sales’ training sessions provided free of charge as well as complementary signage/notices
- engaged retailers at an individual premises-level to encourage participation, answer questions

- reinforced the existing Designated Public Place Orders (DPPOs) (which restrict on-the-street drinking) both at point-of-sale as well as in the community through high-visibility, joint patrols
- monitored retailers through informal multi-agency visits and routine licensing visits

The initiative recruited 23 off-licensed premises and compared outcome measures to comparison areas over a 12 month period. After six months, 78% of premises were participating in some way, increasing to 91% at nine months.

Larger decreases in alcohol-related crime were seen in the intervention area compared to control area at six months, compared to the previous year with reductions of 41% and 15% respectively. For the 12 month period, alcohol-related crime in the intervention area fell by 32% compared to the previous year. Recorded alcohol-related anti-social behaviour dropped by 15% compared to the previous year, although antisocial behaviour rose by 13%.

While the report made no reference to the cost of implementation, the authors acknowledged the scheme was *“reliant on”...“ the ability to deploy resources if needed from the local neighbourhood teams, other Responsible Authorities, partners in the Community Safety Partnership and local trade associations”*.

Policing and enforcement approaches

Interventions to reduce alcohol-related harm in drinking environments frequently use targeted policing and strict enforcement of licensing legislation to deter crime, detect and punish offenders and coerce improved practice in drinking environments.

A review of eight studies on the effectiveness of policing and enforcement activity showed reductions in alcohol-related harm in the short term (324). One high quality time series study included in the review combined training and enforcement checks on underage drinking, and showed improvements in underage drinking in the short term. Some studies found higher levels of alcohol-related problems following policing and enforcement activity, although this may be due to better detection and reporting of such problems. Importantly, policing nightlife is very expensive and the cost of these resources is often overlooked when evaluating their effectiveness.

Public drinking bans

Policies can enforce bans on drinking in specific locations, known in England as DPPOs under section 13 of the Criminal Justice and Police Act 2001. These policies are implemented to address crime and disorder in public places that is caused by alcohol and do not aim to reduce alcohol consumption per se.

Review-level evidence of 16 evaluations across 13 locations in the UK, New Zealand and Australia identified that bans on street drinking often (18):

- negatively impact on marginalised groups, particularly the homeless and the young
- result in displacement, often to more covert and less safe places
- are inconsistently enforced
- improve perceptions of safety and amenity
- are supported by police, traders and older people

The present review was not able to ascertain if street drinking bans reduce public drinking, reduce alcohol-related crime or harm or are understood and adhered to. This is in part due to the methodological limitations of evaluations reviewed. All evaluations included in the review had methodological limitations, and none were published in peer-reviewed journals.

Managing the drinking environment									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
E1. Multicomponent community programmes	1 systematic review 1 RCT 3 natural experiments 1 experimental study 1 survey 1 health economic analysis	Low/ Moderate	Not identified	Small reductions in alcohol-related violence with benefits seen in neighbouring areas	Drinkers in and around the night-time environment	Cost-saving and cost-effective	Can be implemented at scale Costs borne by local authorities, licensing authorities, police and commercial operators	Can be implemented in areas with greater deprivation	Small reductions in acute harms, cost-effective, cost-saving and can be scaled up
E2. Server training	1 review of reviews 2 systematic reviews 1 experimental study	Very Low/Low	Most outcomes measure self-reported behaviour	Mixed results, at best a small impact on violence or propensity to serve	Customers in on- and off-trade premises	Not identified	Low implementation costs for government Training costs borne by commercial operators	Can prevent the sale of alcohol to underage consumers	Impact is small and the research is characterised by self-reported measurements
E3. Server liability	1 systematic review	Moderate	Entirely international evidence base	Small reductions in RTC fatalities, homicide and poor health	Customers and servers in on and off-trade premises	Not identified	Requires primary legislation, possible legal issues around burden of proof Legal costs borne by servers	Can prevent the sale of alcohol to underage consumers	Impacts are small and predominantly focus on acute harms

E4. Replacing glassware with safer alternatives	1 experimental study 1 field study	Very Low	Small sample size (number of observations)	Small number of observations, some evidence for reduced violent injuries	Customers in on-trade premises	Not identified	Low implementation costs for government Costs borne by commercial operators	The health benefits may be greatest for young men	Replacing glassware with safer alternatives is based on sound principle and may reduce injuries
E5. Voluntary removal of the sale of high strength alcohol	1 experimental study	Very Low	Small sample size (number of observations)	Infrequently evaluated with an association between intervention and small reductions in alcohol-related crime and anti-social behaviour	Customers in off-trade premises	Not identified	Policy can be undermined if high strength alcohol is readily available from neighbouring areas	Can be implemented in areas with greater deprivation	Voluntary removals of high strength alcohol may reduce acute alcohol-related harm but easily undermined
E6. Policing and enforcement approaches	1 systematic review	Low/Mod erate	Inconsistent findings: may result from increased detection	Some beneficial effects on sales to underage or intoxicated customers, effects small and short term	Drinkers and servers in and around the night-time economy	Not identified	Costs of enforcement borne by police	Can prevent the sale of alcohol to underage consumers	Resource intensive interventions with possible short term reductions in acute harm
E7. Public drinking bans	1 systematic review	Very Low	All studies included in the review were from grey literature	Harmful impact on marginalised groups, small increases in perception of public safety, no impact on consumption and harm	Drinkers consuming alcohol in prohibited public spaces	Not identified	Legislation is in place Costs of enforcement borne by police Public drinking bans are infrequently enforced	Can displace marginalised groups to new, less safe, areas	Negatively impact marginalised groups, such as the homeless with little benefit

Reducing drink-driving

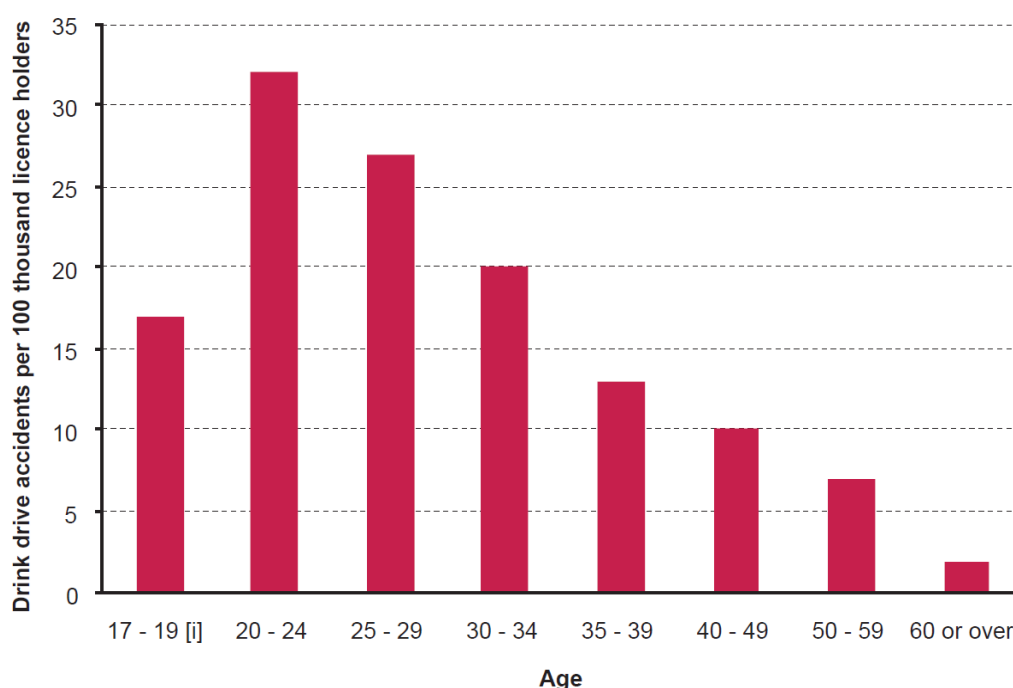
Introduction

Preventing drink-driving is a key component of national alcohol policy. In 2014/15, surveys in England and Wales estimated that 6% of all drivers reported drinking and driving, rising to 9% in those aged 25 to 29 years (340). Despite significant declines in alcohol-related road traffic crashes (RTCs) on Britain's roads, in 2014 there were over 5,600 alcohol-related crashes and over 8,000 casualties, of which 240 people were killed and over 1,000 people were seriously injured (340). Males account for 70% of those killed or seriously injured on the road, and 25% of those killed or seriously injured are aged between 25 and 39 years.

In England, road and pedestrian traffic crashes are the leading cause of alcohol-related death among those aged 16 to 24 years (73). Young drivers in the UK are disproportionately involved in alcohol-related RTC, accounting for less than 2% of licence holders, but being involved in 12% of fatal and serious crashes (Figure 44).

These statistics are based on coroners' reports and police breath testing data which are not complete. Some drivers leave the scene or are too seriously injured to provide a breath sample. Furthermore, coroners will only record fatalities within 12 hours of a crash. Finally, drivers involved in a crash who have consumed alcohol but are not over the limit, are not counted, even though alcohol may have contributed to their crash.

Figure 44: The estimated number of alcohol-related crashes per 100,000 licence holders by age group, Great Britain 2013 (341)



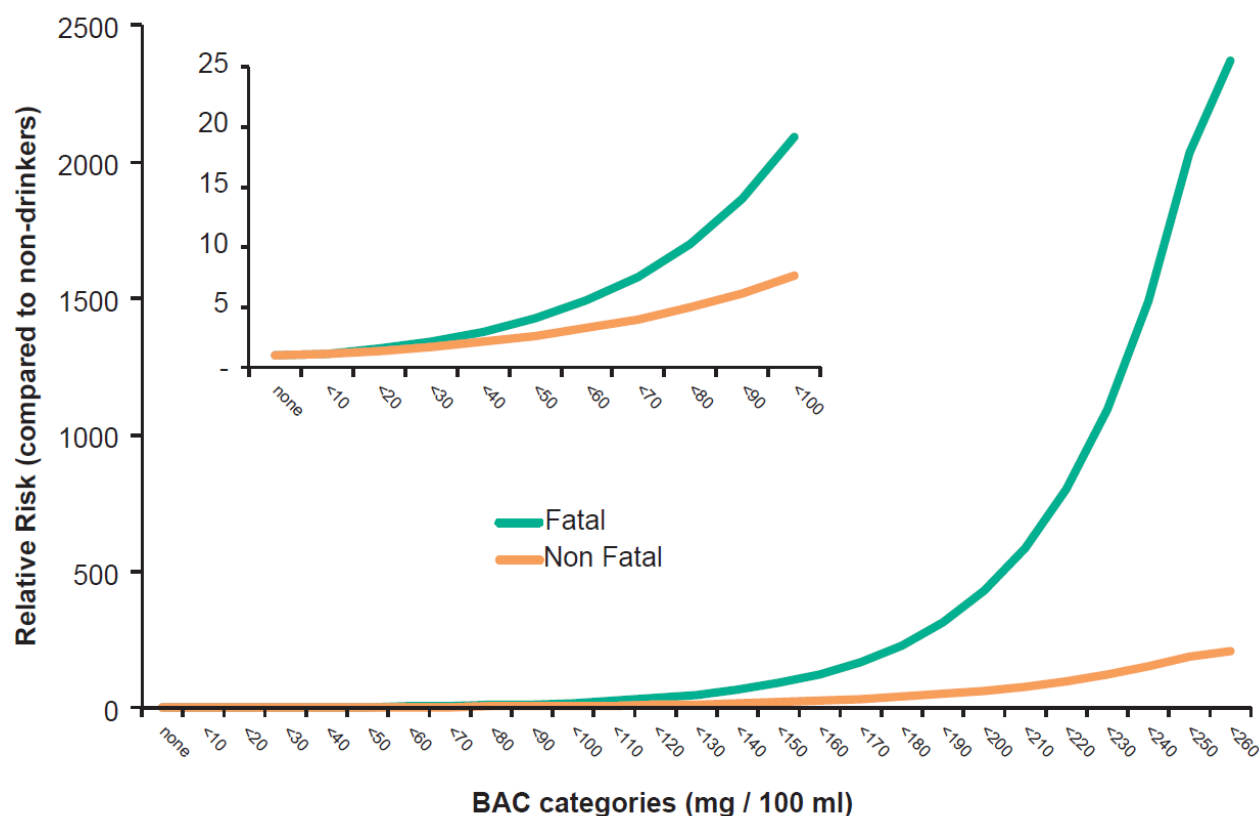
This chapter examines the relationship between drinking alcohol and the ability to drive and the evidence for a range of policies which aim to reduce the harm caused by drinking and driving.

Alcohol and driving performance

There is a direct relationship between the quantity of alcohol drunk and the ability to function safely behind the wheel (342). A meta-analysis of five observational studies has shown that compared to zero consumption, the risk of dying in a RTC is higher at all levels of alcohol consumption (343). Specifically, for a rise in blood alcohol concentration (BAC) of 0.02% per 100ml of blood, there is a 75% and 24% increase in risk of fatal and non-fatal injury.

At the current English drink-driving limit (80mg per 100ml of blood) the odds (95% confidence interval [CI]) of dying from a RTC are 13 times higher (95% CI=11,15) than for zero consumption. Observational studies including nearly 3,000 crashes have shown that the risk of RTC begins at a BAC of 40mg per 100ml of blood (21). Data from England and Wales suggests that the risk may start at lower levels (Figure 45) (344).

Figure 45: The relative risk of being involved in a fatal or non-fatal road traffic crash in England and Wales, by blood alcohol concentration (344)



Driving while under the influence of alcohol also harms other people. Retrospective analysis of US data showed that where a child was injured in an alcohol-related crash,

they were being driven by a drinking-driver in 66% of cases, varying from 58% to 71% between 1991 and 1996 (345,346).

The costs of drink-driving are substantial. For example, modelling in New Zealand has shown that RTCs likely to be alcohol-related cost an estimated 1.2 billion New Zealand dollars (NZD) in 1996 (347). This figure equates to almost two-fifths of the total crash costs. Importantly, the study found that half of the alcohol-related crash costs were paid by those who were not at fault.

In Great Britain, the economic cost of RTC where at least one driver was over the legal limit was estimated to be £754 million in 2014 (348). This figure does not include accidents which resulted in damages only.

Blood alcohol concentration limits

The purpose of setting a legal limit on drivers' BAC is to reduce death and injury on the roads. All OECD countries have policies in place to prevent people from driving after drinking alcohol, though legislation varies. In some countries legal limits are set lower for different population groups such as young people or commercial drivers. For example, Ireland has a standard drink-driving limit of 50mg per 100ml of blood for the general population and 20mg per 100ml of blood for young and commercial drivers. Typical BAC limits in most European Union (EU) countries for the general population are 50mg per 100ml of blood or lower (Table 10). There is strong evidence that setting and lowering a legal drink-driving limit reduces road traffic casualties, with the strength of effectiveness reflecting the degree of enforcement.

A meta-analysis of natural experiments in 19 states in the US between 1982 and 2000 concluded that lowering the legal limit from 100mg per 100ml to 80mg (the current English legal limit) reduces levels of alcohol-related fatal RTCs by 15% (349). In the first three months of 1965, after the UK introduced a legal drink-driving limit of 80mg per 100ml of blood, total traffic fatalities decreased by 23% and total injuries decreased by 11% (350). In the first year after implementation, the proportion of fatally injured drivers who had a BAC of >80mg per 100ml of blood decreased from 32% to 20% suggesting that the beneficial impact of BAC limits are observed soon after implementation.

Table 10: Legal blood alcohol concentration limits across Europe and driver types (351)

	Standard (mg of alcohol per 100ml of blood)	Commercial drivers (mg of alcohol per 100ml of blood)	Novice drivers (mg of alcohol per 100ml of blood)
Austria	50mg	10mg	10mg
Belgium	50mg	20mg	20mg
Bulgaria	50mg	50mg	50mg
Croatia	50mg	0mg	0mg
Cyprus	20mg	20mg	20mg
Czech Republic	0mg	0mg	0mg
Denmark	50mg	50mg	50mg
Estonia	20mg	20mg	20mg
Finland	50mg	50mg	50mg
France	50mg	50mg (20mg bus drivers)	20mg
Germany	50mg	0mg	0mg
Greece	50mg	20mg	20mg
Hungary	0mg	0mg	0mg
Ireland	50mg	20mg	20mg
Italy	50mg	0mg	0mg
Latvia	50mg	50mg	20mg
Lithuania	40mg	0mg	0mg
Luxembourg	50mg	20mg	20mg
Malta	80mg	80mg	80mg
The Netherlands	50mg	50mg	20mg
Poland	20mg	20mg	20mg
Portugal	50mg	20mg	20mg
Romania	0mg	0mg	0mg
Slovakia	0mg	0mg	0mg
Slovenia	50mg	0mg	0mg
Spain	50mg	30mg	30mg
Sweden	20mg	20mg	20mg
UK [i]	80mg	80mg	80mg
Switzerland	50mg	0mg	0mg

Pertinent to the English situation, several countries have evaluated the impact of lowering the legal limit from 80mg per 100ml of blood to 50mg per 100ml of blood or less with follow-up periods ranging from <1 year to over 10 years (Table 11) (352). These studies point to a reduction of serious crashes in these countries by 7% to 14% and fatal crashes by 8% to 36%. Many studies show significant driver impairment at levels of 50mg or less. For example, drivers with a BAC of 50mg have a 38% higher risk of crashing than drivers with a BAC of zero. Scotland has recently acted on this

evidence and lowered their drink drive limit to 50mg per 100ml of blood in line with most other European countries. No formal evaluation of this policy has been published.

A recent review in Great Britain has estimated that lowering the legal drink-driving limit from 80mg to 50mg per 100ml of blood, at the beginning of 2010 would, over the four years 2010 to 2013, save around 25 lives and prevent around 95 people from being seriously injured each year (342).

Table 11: Studies evaluating the effect of lowering the legal blood alcohol concentration limit to 50mg of alcohol per 100ml of blood (352)

Study	Results
Noordzij (1994)	Percentage of drivers with BACs > 50mg from roadside surveys decreased from more than 15% in the years before the 50mg limit to 2% in the first year and then levelled off at 12% for 10 years after the law change.
Mercier-Guyon (1998)	Alcohol-related RTC fatalities decreased from 100 before the limit was lowered to 64 (a reduction of 36%) in 1997 right after the law change in the French Province where the study was conducted.
Bartl and Esberger (2000)	Found 10% decrease in alcohol-related RTCs. Lowering the legal BAC-limit from 80mg to 50mg in combination with intense police enforcement and reporting in the media leads to a positive short-term effect.
Henstridge, Homel and Mackay (1995)	Queensland experienced an 18% reduction in fatal crashes and a 14% reduction in serious crashes associated with lowering the BAC limit to 50mg. New South Wales showed an 8% reduction in fatal cases, a 7% reduction in serious crashes and an 11% reduction in single-vehicle-night-time crashes associated with lowering the BAC limit to 50mg.
Smith (1988)	8% reduction in night-time serious injury crashes and a 6% reduction in night-time property damage crashes associated with lowering the limit from 80mg to 50mg. This finding was partly the result of increased enforcement.

Reducing the legal BAC limits is equally effective at reducing drink-driving across all drivers, including those who drive with the highest BACs (350). In 2010, the Department for Transport commissioned Sir Peter North to carry out a review of the evidence for drink-driving policy which recommended lowering the legal drink-driving limit from 80mg to 50mg per 100ml of blood, with a lower limit (20mg per 100ml of blood) for commercial drivers, for example buses or taxis (9). This finding was shared by a NICE review. Reducing the legal BAC limit is one of the 10 suggested actions in the World Health Organization (WHO) European action plan to reduce the harmful use of alcohol, endorsed by the UK (353).

A number of factors can influence the effectiveness of drink-driving laws (350,352). These include:

- high publicity or public education efforts
- the perceived risk of being caught
- high levels of police enforcement
- severity and speed of punishment for breaking the law
- breath testing
- cultural differences

To maximise the effectiveness of the drink-driving law, the public must:

- be aware of the law
- perceive that the law is enforced
- perceive that they will be detected and punished for breaking the law

Breath testing

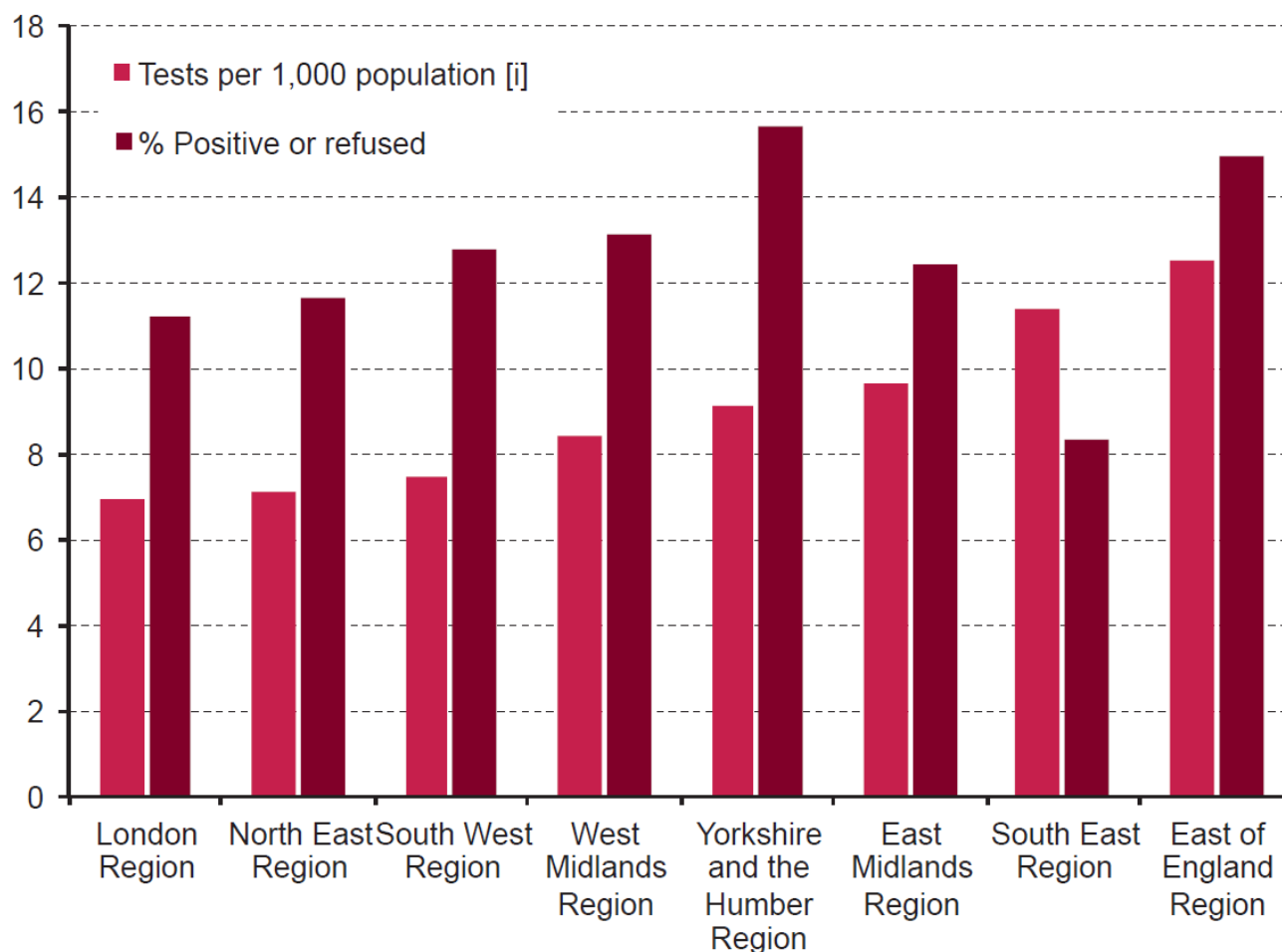
In order to enforce drink-driving limits and deter drink-driving, the police can test drivers for levels of alcohol consumption. Breath alcohol levels of 35 µg per 100 ml of breath are equivalent to 50mg of alcohol per 100ml of blood. There are two main approaches to breath testing where drivers are tested at predetermined checkpoints:

- selective breath testing, where police must have suspicion of impairment, based on observation in order to request a breath test
- random breath testing, where all stopped drivers are given a breath test

Under current legislation, the police have a general power under *Section 163* of the *Road Traffic Act 1988* to stop any vehicle at any time, but to carry out a breath test, police must have reasonable suspicion that the driver either has alcohol in their body, been involved in an accident, or committed a traffic offence. In 2014, police carried out over 600,000 breath tests, of which 11% screened positive for alcohol or were refused (354).

In England and Wales, the proportion of positive (or refused) breath tests has gradually fallen from 20% in 2003 to 11% in 2009, after which it stabilised and now remains at around 10% to 12% year-on-year (354). Across England, there is large regional variation in the number of tests carried out ranging from four per 1,000 population in Avon and Somerset, to 24 per 1,000 population in Suffolk. Figure 46 shows the number of breath tests carried out per 1,000 people and the percentage of failed (or refused) tests by region in England in 2014.

Figure 46: The number of breath tests carried per 1,000 population and the percentage of failed (or refused) tests by region, 2014 (354)



A systematic review of 23 natural experiments shows that breath testing reduces all crashes by around 20% for selective testing and 18% for random testing (355). Results for all crash types are shown in Table 12. Despite random breath testing being better at detecting drinking-drivers, it was no more effective at reducing crashes compared to selective breath testing. No studies directly compared random and selective breath testing, so comparisons should be made with caution.

Similar findings were reported in a systematic review of 15 natural experiments (356). Breath testing was associated with a median reduction (interquartile interval [IQI]) of 9% (4%,17%) in alcohol-related crash fatalities.

Table 12: The effects of breath testing on road traffic crash outcomes: summary effects (355)

	Random breath testing	Selective breath testing
Outcome	Median change (range) [i]	Median change (range) [i]
Fatal injury crashes	-22% (13,36%)	26% and 20% decrease
Fatal and nonfatal injury crashes	-16% (11,20%)	-20% (5,23%)
Other crashes	26% and 15% decrease	-24% (13,35%)
All crashes	-18% (13,22%)	-20% (13,27%)

Five studies in the review conducted a cost-benefit analysis of breath testing at checkpoints. Three studies evaluated random breath testing and two studies evaluated selective breath testing. All showed that the economic benefits of the interventions were greater than the costs, with benefit-cost ratios ranging from 2:1 to 57:1. Costs included the costs of operation and management, the driver's time and media advertising and publicity. Benefits included potential averted crash costs such as healthcare and ambulance costs, police and court expenditures, property damage and productivity losses, revenues generated by the programme such as, police fines and towing fees and the monetary value of averted deaths. Not all studies included the same components which in part explain the differences in estimates.

A meta-analysis of 40 natural experiments shows that breath testing at checkpoints reduces crashes involving alcohol by 17% at a minimum (357). All crashes, independent of alcohol involvement, were reduced by 10% to 15%. Breath testing in Australia proved more effective than other countries, and using additional media, such as campaigns, did not result in greater reductions in RTC than areas that did not. These results suggest that paid media are not a necessary component of an effective breath testing programme and improvements in road safety can be made by, for example, increasing the intensity of enforcement.

While breathalysing requires police resource, it can help officers detect law violations that would otherwise be missed, such as driving without a valid licence. In the UK the police do not currently have the power to carry out random breath testing of drivers, and can only do so if they have reasonable suspicion that a driver may have been drinking. The North Review recommends that the government amend the Road Traffic Act 1988 to give police a general and unrestricted power to stop and breathalyse any driver (344), a recommendation which is supported by the National Police Chiefs Council (357).

Graduated driver licensing

In England, road and pedestrian traffic crashes are the leading cause of alcohol-related death among those aged 16 to 24 years (73) and in England and Wales, young people aged 20 to 24 years are more likely to self-report drinking and driving than their adult

counterparts (35,358). Graduated driver licences (GDL) aim to reduce the burden of RTC experienced by young and novice drivers by putting restrictions on this group which expire over time. Restrictions usually include night-time driving curfews, passenger restrictions and lower drink-driving limits. The 'ideal' GDL programme has three stages (359):

- the initial stage which requires that an adult with a valid licence be present at all times and should last for a mandatory time period
- the intermediate stage which allows the new driver to drive alone but with restrictions, for example no night-time driving, limitations on extra passengers or restrictions on legal BAC
- the final stage where young drivers obtain their full licence and are free to drive independently under the usual laws and regulations

A 2004 Cochrane review of 13 natural experiments reported a median reduction in per population crash rates among 16 year olds of GDL implementation of 31%, ranging from 26% to 41%, during the first year (360). A more recent Cochrane review of 34 natural experiments published in 2011, showed a median decrease of 16%, ranging from 8% to 27%, for the same measure (361). While the results from across the studies are consistent, the majority of the studies were in North America where the driving age is lower.

More relevant to England are findings from a retrospective analysis of RTC data in Great Britain for the years 2000 to 2009 (362). Two possible GDL programmes were considered:

- a strict GDL programme where no driving is allowed between 9pm and 6am unless supervised by a passenger aged over 25 years, or at any time while carrying any passengers aged 15 to 24 years
- a less strict GDL programme where no driving is allowed between 10pm and 5am unless supervised by a passenger aged over 25 years or at any time while carrying two or more 15 to 19 year old passengers

These programmes were assumed to apply for a three year period from learner to full licence, from ages 17 to 19 years. The proportion of casualties occurring in conditions covered by GDL programmes are outlined in Table 13. Estimates of the number of casualties prevented by the most restrictive GDL programme depended on the assumed programme compliance and were between almost 60 and over 200 deaths per year and between just over 400 and almost 1,600 serious casualties each year. A strict GDL programme could prevent nearly half (47%) of all injuries in young driver crashes, compared to preventing 27% in a less strict programme.

Table 13: The proportion of young driver casualties injured in crashes by severity type occurring under restrictions covered by graduated licensing programmes (362)

	Total	Fatal	Serious	Slight
Young people injured in crashes occurring under conditions covered by a strict programme	46.8%	65.9%	55.4%	45.6%
Young people injured in crashes occurring under conditions covered by a less strict programme	26.8%	46.9%	36.8%	25.5%

The savings from preventing deaths and injuries from the model were estimated to be between £212 million and £849 million per year depending on the assumed rates of compliance. At a minimum, assuming a less strict GDL programme with only 25% compliance, savings were estimated at £137 million per annum.

The data collection system in Great Britain doesn't allow researchers to model what proportion of casualties would change by implementing a zero or 20mg BAC limit. However this additional component is likely to increase the proportion of casualties covered by a GDL programme. A systematic review summarised the evidence for establishing lower BAC limits for younger drivers drawing mostly on US evidence and legal limits of 20mg or zero tolerance (352). The review showed that setting lower BAC limits for young drivers, overwhelmingly reduced RTC in this group.

It has been suggested that GDL programmes may restrict civil liberties or limit economic and education opportunities for young drivers, particularly in rural areas (362). The Royal Society for the Prevention of Accidents has also expressed concerns about the 'cliff edge' effect of GDL programmes whereby drivers reach an age threshold and believe they can drink more and drive legally (344) however there is no empirical evidence to support this claim. Furthermore, there may be difficulties with enforcement given that all passengers in a young driver's car will be required to carry identification. Nonetheless, GDL programmes have been successfully implemented across Europe which are highly effective in reducing the harms experienced by young drivers. Furthermore, single components of GDL programmes such as a lower drink-driving limit remain effective and adopting any component of a GDL programme will have a beneficial effect (361). Future research should determine the relative effectiveness of the different components of GDL programmes.

Immediate licence revocation

Immediate licence revocation refers to a process whereby in the event of a drink-driving arrest, a driver's licence is revoked immediately without the need for judicial process. The use of a judicial system can result in delays of months between arrest and loss of

licence. Immediate revocation reduces delays to a few days or even hours. Due to the immediate nature of this punishment, immediate revocation has a powerful deterrent effect (363). Most of the research evaluating the impact of immediate licence revocation comes from North America.

A meta-analysis of natural experiments from 46 states in the US using between one and two decades of long-term follow-up data, concluded that immediate licence revocation effectively reduces alcohol-related fatal crashes by 5%, equivalent to 800 lives saved per year (363). The reductions were similar across all levels of alcohol consumption as follows:

- -5% in crashes where drivers had BAC between 10mg to 70mg per 100ml of blood
- -7% in crashes where drivers had BAC between 80mg to 140mg per 100ml of blood
- -4% in crashes where drivers had a BAC greater than 150mg per 100ml of blood

In contrast, post-conviction licence revocation had no discernible effects.

Similar findings were seen in a single natural experiment in Ontario, Canada which showed reductions of nearly 15% in the number of fatally injured drivers (364). No corresponding effect was observed in the control provinces. A separate natural experiment in Ontario showed immediate licence revocation reduced drink-driving by 65% (365).

Tackling drink-driving reoffending

Some drivers with drink-driving convictions continue to drink-drive, and are re-arrested or involved in further RTC. In Great Britain in 2013/14, surveys show that of those who reported driving over the limit, around 1.4% do so once or twice a month, or more frequently (35).

The following section describes two approaches aimed at preventing drink-driving reoffending: alcohol ignition interlock devices and preventive education programmes.

Alcohol ignition interlock devices

An ignition interlock is a device installed in a vehicle which measures the amount of alcohol someone has consumed using breath testing. Before the driver can start the engine, the driver must blow into the device. If the breath test shows that the person has consumed a certain level of alcohol, the engine will not start. At random times after the engine has started, the device will require an additional breath sample which has to be within the allowed limits. If the driver does not provide an additional sample or the sample is over the limit, the device logs the event, warns the driver and then sounds an

alarm, for example flashing lights, horn honking, until the ignition is switched off or the driver provides a valid breath sample.

A Cochrane review of 11 controlled trials concluded that there is a general trend in both first time and repeat offenders towards lower reoffending rates when an ignition interlock device is installed (366). For example, a randomised controlled trial (RCT) reported relative risks (RR) of 0.36 (95% CI=0.21,0.63); however, none of the trials provided evidence of effectiveness of interlocks once the device was removed. This suggests that ignition interlocks do not change long-term behaviour, and are only effective while installed.

An update to the Cochrane review including 15 controlled trials and observational studies showed consistent large reductions in re-arrest rates following installation of an interlock device (367). For example, two studies in New Mexico indicated that interlocks are associated with a 65% lower risk of reoffending among repeat offenders and a 61% lower risk among first time offenders. Following removal of the device, re-arrest rates returned to levels similar to the comparison groups.

An Australian cost-benefit analysis estimated that ignition interlocks could prevent between approximately 100 to 400 road fatalities and approximately 600 to 2,500 serious injuries per year, with a range in benefit-cost ratios of 0.6:1 to 3.4:1 depending on the effectiveness level, discount rate and economic life of the vehicle figure applied (368).

Interlocks require substantial administrative resources and intensive supervision (367). However, they represent an important alternative to licence suspension for drivers and their families.

Preventive education programmes targeting drink-driving offenders

Preventative education programmes targeting drink-driving offenders are typically delivered after a person receives a conviction. Generally, these programmes focus on increasing the awareness of the impact of alcohol on driving, as well as providing information and advice for changing behaviour.

In Great Britain, if you have been convicted of a drink-driving offence and are banned from driving, a magistrate may offer you a place in a drink-driving rehabilitation course. Taking part in this course within an allocated time period reduces the length of the driving ban.

A systematic review of six experimental studies suggests preventive education programmes are effective in reducing drink-driving reoffending (369). Of the six studies included in the review, five demonstrated a reduction in drink-driving after completing an

education programme. For example, at six months follow-up, one study observed reoffending rates of 26% and 32% for treatment and control groups respectively. A second study showed that after two years, almost 5% of the treatment group had reoffended compared to just over 10% of the comparison group.

Despite these findings, there was a lack of high-quality evidence. All programmes evaluated included extra components such as motivational enhancement, or the development of an avoidance plan. These components make it difficult to make conclusions regarding the independent effect of preventive education programmes.

Designated drivers

The general aim of designated drivers is to reduce the prevalence of drink-driving by encouraging people who have consumed alcohol to travel with a driver who has abstained or has a BAC below the legal limit.

A systematic review assessed two approaches to promoting the use of designated driver programmes including population-based campaigns and incentive programmes carried out in licensed premises (370). All studies included in the review collected self-reported measures about the use of a designated driver. Only one population-based campaign was identified which was run for three months in a small Australian city. Telephone surveys indicated a 13% increase in people always selecting a designated driver and these people were also more likely to report awareness of the campaign. However, there was no significant change in self-reported drinking and driving or riding with a drink-driver. Similar results have been observed more recently in an Australian programme (371).

Eight incentive programmes were identified in the review and showed mixed effectiveness. Inexplicably, one study showed that at post-test, an incentive programme led to an increase in the proportion of customers reporting “always” and “never” having selected a designated driver. Similar conclusions have been made in an Italian designated-driver incentive programme (372). However more promising results appear in a small sample study conducted in the US (373).

Mass-media campaigns to prevent drink-driving

Mass media includes, for example, newspapers and other printed material, radio, TV and billboards, and can be used to encourage drivers not to drink, or to publicise changes in the drink-driving law. In the UK, the Department for Transport carries out mass media campaigns to prevent drink-driving (374).

A review of eight natural experiments with follow-up periods ranging from seven weeks to 11 years, shows that mass media campaigns contribute to a reduction in drink-driving

and alcohol-related RTC (375). The median decrease in alcohol-related RTC associated with driving campaigns was 13% (interquartile range [IQR]: 6% to 14%). Most campaigns used paid advertising and were implemented in countries that had existing drink-driving prevention activities.

Mass media campaigns to reduce the prevalence of drink-driving are cost-effective, despite the high costs of development and implementation (375). For example, in 1997, an Australian campaign reported costs of roughly \$40,000 US dollars (USD) per month with estimated savings of over \$8 million per month.

More recently, a review of 19 experimental and observational studies replicated these findings (376). The results distinguished between campaigns that did and did not have additional enforcement efforts, such as breathalysing drivers. Campaigns run with no simultaneous enforcement showed a median decrease in alcohol-related fatal crashes of 15% (range 0% to 29%) and campaigns with increased enforcement showed a decrease of 9% (range 15% to 36%). All individual studies suggested a decrease in drink-driving measures associated with mass media campaigns. However, pooled analysis of these studies did not observe a reduction in alcohol-related RTC outcomes, $RR=1.00$ (95% $CI=0.9,1.1$). This result is likely to be due to large differences in the methods used in the mass media campaigns, follow-up periods and outcome measures.

Mass media campaigns can have other positive impacts aside from reducing the prevalence of drink-driving. Mass media can play an 'agenda setting' role, by influencing public perceptions of drink-driving (375). As the media increases the public's understanding of the problem, public support for actions to address it may also increase.

Currently it is not clear if campaigns which highlight the legal deterrence of drink-driving are more or less effective than those which highlight the health and social consequences (375). Studies systematically evaluating the impact of different campaigns may help to clarify these issues.

Reducing drink-driving									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
F1. BAC limits	1 meta-analysis 4 reviews (2 systematic)	High	Not identified	Small reductions in drinking driving and related crashes resulting from reducing BAC limits from 80mg to 50mg Effects seen within one year	All drivers	Not identified	Legislation is in place Policy can be undermined if not enforced	Affects all drinking drivers equally	Lowering the drink-driving limit would reduce RTC, casualties and fatalities, by a small amount
F2. Breath testing	1 meta-analysis 2 systematic reviews	High	Not identified	Breath testing drivers (selective or random testing) reduces drink-driving and RTC, casualties and fatalities	All drivers	Both random and selective breath testing shown to be cost saving and cost-effective	Legislation is in place for selective breath testing, primary legislation is required for random breath testing Costs of enforcement borne by the police	Not identified	Breath testing drivers is an effective and cost-effective way of reducing drink-driving, RTC, casualties and fatalities
F3. Graduated driver licensing	3 systematic reviews 1 retrospective analysis	High	The retrospective analysis was not able to take account of the lower legal BAC component of a graduated driver licensing programme	Graduated driver licensing programmes reduce drink-driving and the associated RTC, casualties and fatalities Effects are seen within the first year of implementation	Novice drivers	Cost-effective	Requires primary legislation; costs of enforcement borne by the police and courts Undermined if drivers reach an age threshold and believe they can drink more May restrict civil liberties or economic and education opportunities for young drivers, particularly in rural areas	The health benefits of graduated driver licensing programmes are greatest for young, predominantly male, drivers	Effective in reducing RTC, casualties and fatalities in novice drivers. Cost-effective but requires resources

F4. Immediate licence revocation	1 meta-analysis 2 natural experiments	High	Entirely international evidence base	Modest reduction in drink-driving and casualties and fatalities compared to current process	All drivers	Not identified	Requires primary legislation Low implementation costs for government Costs of enforcement borne by the police and courts	Not identified	Immediate licence revocation is effective in North America, transferability may be limited
F5. Alcohol ignition interlock devices	2 systematic reviews 1 health economic analysis	High	Not identified	Ignition interlocks reduce reoffending in first time and repeat offenders by a modest amount	Drink-driving offenders	Results depend on the level of effectiveness	Administrative and enforcement costs divided between offender and/or government Following removal of the device, reoffending rates return to those prior to installation	Not identified	Alcohol ignition interlock effectively reduce drink-driving reoffending while installed and can be cost-effective
F6. Preventive education programmes targeting drink-driving offenders	1 systematic review	Low	Research was not able to exclude confounders	Small variable reductions in reoffending findings variable, independent effect unclear	Drink-driving offenders	Not identified	Costs borne by government	Not identified	Preventive education programmes may reduce reoffending
F7. Designated driver programmes	1 systematic review 1 experimental study	Low	Most outcomes measure self-reported behaviour	Small impact on behavioural intentions no impact on behaviour (drink-driving or passenger of a drink-driver)	All alcohol drinkers/ drivers	Not identified	Cost of development and deployment	Not identified	Firm conclusions cannot be made, on balance, may reduce the propensity to drink-drive or agree to be a passenger of a drink-driver
F8. Mass media campaigns to prevent drink-driving	2 systematic reviews	Moderate/High	Not identified	Modest reductions in drink-driving and alcohol-related RTC	Entire population	Not identified	Cost of development and deployment Policy can be undermined by pro-drinking marketing	Can be directed at inequality groups	Mass media campaigns are effective in reducing drink-driving and the associated crashes, casualties and fatalities

Brief interventions and treatment

Introduction

Interventions and treatment delivered to individuals are not necessarily considered an alcohol control policy in their own right, but services to help people misusing alcohol or with alcohol-related problems form an important part of a comprehensive policy.

There is a pathway of actions starting with brief alcohol interventions which aim to raise awareness of the risks associated with alcohol consumption and help individuals reduce their drinking. People who are drinking harmfully or are dependent on alcohol may benefit from structured treatment. Together, these interventions help to raise awareness of hazardous, harmful and dependent drinking patterns, increase motivation to change behaviour and reduce overall alcohol consumption.

NICE publishes national guidance and advice to improve health and social care in England based on the most recent evidence and scientific consensus. NICE has published three key guidance documents which define the pathway and interventions for individuals with alcohol use disorders:

- preventing the development of hazardous and harmful drinking (185)
- diagnosis, assessment and management of harmful drinking and alcohol dependence (377)
- diagnosis and clinical management of alcohol-related physical complications (378)

The National Drug Treatment Monitoring System (NDTMS) collects treatment activity data from services (379). For the financial year 2015/16, a total of 144,908 individuals exhibiting problematic or dependent drinking received treatment. Of these, 85,035 were treated for alcohol treatment only and 59,873 for alcohol problems alongside other substances.

Identification and brief advice

There are currently over 10 million people in England who are drinking at levels above the CMO's low-risk drinking guidelines (40). Many of these people could benefit from an alcohol brief intervention, often referred to as alcohol screening and brief interventions or identification and brief advice (IBA) (40).

In a diverse range of healthcare and welfare settings, IBA involves the administration of a short screening questionnaire about current drinking patterns, followed by personalised advice and information. Most IBA is delivered in a single, brief session

while other programmes incorporate follow-ups after the screening and initial contact. IBA typically incorporates some or all of the following elements (380):

- feedback on the person's alcohol use and any related harm
- clarification as to what constitutes low-risk consumption
- information on the harms associated with risky alcohol use
- benefits of reducing intake
- motivational enhancement to support change
- analysis of high-risk situations for drinking
- coping strategies and the development of a personal plan to reduce consumption

Although the exact content of IBA may vary between studies, core features are that they are delivered by generalist health care workers, services target a population of drinkers that do not tend to be seeking help for alcohol problems and services aim for reductions in alcohol consumption and related harm.

NICE encourages and recommends that all appropriate healthcare professionals should deliver IBA as part of Making Every Contact Count, an initiative within the NHS to encourage healthcare professionals to raise and address lifestyle issues with their patients. Specific actions include offering IBA as part of the NHS *Health Check* programme and also upon new patient registration to a general practitioner (GP) practice. While full levels of delivery are unknown, each year:

- more than 1.5 million adults are estimated to receive the NHS Health Check (381)
- a further 1.5 million people receive IBA as a result newly registering with a GP (381)
- the Alcohol Toolkit suggests that as many as 650,000 patients, equivalent to 6.5% of hazardous/harmful drinkers, recall receiving advice in primary care to reducing their drinking in the past year (382)

This section outlines the very large body of evidence for the effectiveness of IBA across a range of health and social care settings.

Brief interventions in primary health care settings

Primary health care (PHC) is the most extensively studied setting for the implementation and evaluation of IBA. A review of seven systematic reviews, six of which were meta-analyses, evaluated the effectiveness of IBA in PHC on reducing two outcomes: alcohol consumption per week and the number of participants reporting levels of consumption below established risk levels (383).

Four of the seven included reviews concluded that IBA was effective in reducing the prevalence of excessive drinkers when compared with other strategies. Reductions in alcohol consumption in the IBA group ranged from 19g to 51g of pure alcohol per week

relative to comparison groups. One high-quality study reported a mean reduction of 38g of pure alcohol per week. Short interventions between five and 15 minutes, were often as effective as longer interventions. The results did not differ based on the participants' gender or the type of professional who carried out the intervention.

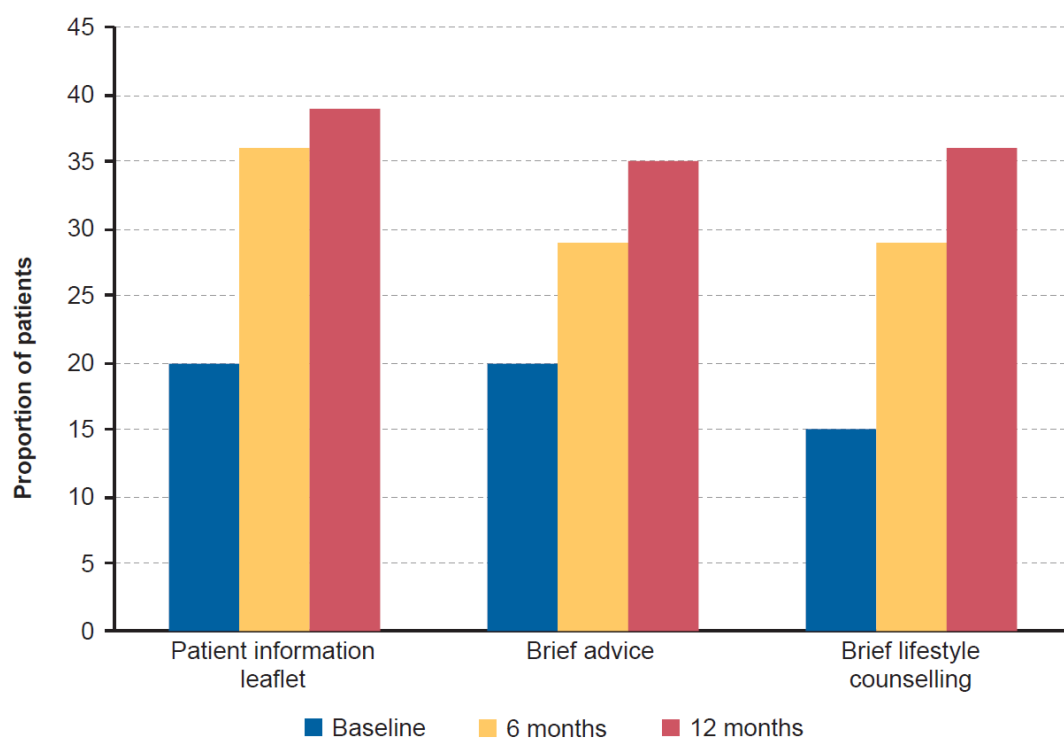
In England, a pragmatic randomised cluster trial including almost 3,000 patients evaluated the effectiveness of different IBA strategies at reducing hazardous or harmful drinking in PHC (384). Thirty per cent of participants screened positive for hazardous or harmful drinking and 84% received IBA. Participants were randomly allocated to one of three interventions following positive screening:

- a patient information leaflet (control group)
- a patient information leaflet and an additional five minutes of structured brief advice
- a patient information leaflet, five minutes of structured brief advice and additional 20 minutes of brief lifestyle counselling

The primary outcome was a negative Alcohol Use Disorders Identification Test (AUDIT) score, indicated by a score of less than eight, at six and 12 months follow-up.

Negative AUDIT status increased across all three intervention groups, with no differences in AUDIT negative status between the interventions (Figure 1). Evidence for providing patients with more than simple feedback on their screening outcome backed up with an information leaflet was lacking.

Figure 47: Proportion of patients scoring <8 on AUDIT by intervention type (384)



These findings corroborate those of a previous Cochrane Review which concluded that *“data indicate that IBA in primary care contexts results in significant reductions in weekly consumption”* (380).

The review did not show significant reductions in alcohol consumption for women although the authors suggest this was partly due to low numbers of female participant (see *The effectiveness of identification and brief advice by gender*). A more recent review observed similar results, reporting reductions in consumption of 3.6 drinks per week (2.4, 4.8) from baseline associated with brief interventions (385).

A meta-analysis compared the effect of IBA in PHC settings across European and non-European countries including over 8,000 participants (386). At six and 12 months follow-up, benefits of IBA were observed, with a mean difference (MD) of 22.0g per week (6.6, 37.4) and 30.9 per week (15.2, 46.5) respectively. These outcomes were robust across European and non-European studies implying the effectiveness of IBA is not country-specific.

A review of 23 studies reported strong evidence that IBA in PHC is a cost-effective option for reducing alcohol misuse (387). Almost all studies included in the review reported IBA to be cost-effective or to have low costs relative to the potential health gain, despite significant variability in the duration of the IBA sessions observed, the methods used and the outcomes measured. For example, one Canadian cost-benefit analysis of ‘moderate quality’ reported that the introduction of IBA would reduce alcohol-attributable costs by \$602 million Canadian dollars per year.

Modelling of identification and brief advice in primary healthcare in England

PHE commissioned the University of Sheffield to model the potential impact of implementing IBA in PHC in England across different delivery scenarios (197). Delivering IBAs to every patient at their next registration with a new general practice over 20 years (cumulative changes) following policy implementation is estimated to lead to:

- almost 2,400 fewer alcohol-attributable deaths
- almost 125,000 fewer hospital admissions (broad measure)²⁶
- net savings to the NHS estimated at £282 million

Those in the lowest socioeconomic groups are estimated to experience the greatest absolute reduction in health harms, around 1,000 fewer deaths compared to around 800

²⁶ The ‘broad measure’ includes hospital admissions where an alcohol-related disease, injury or condition was the primary reason for admission or a secondary diagnosis. The broad measure is a better measure of the total burden alcohol has on community and health services.

in the highest socioeconomic group, but the lowest relative reduction (-1.6% compared to 2.3%) because they have a higher baseline level of alcohol-attributable harm.

The NHS health check is a vascular risk reduction program targeted at adults aged 40 to 74 years without certain pre-existing conditions, such as hypertension. Three million adults are invited each year for the check and the offer is repeated every five years. Delivering IBAs over a single five-year NHS Health Checks cycle is estimated to lead to (197):

- almost 1,900 fewer alcohol-attributable deaths
- almost 86,000 fewer hospital admissions over 20 years (broad measure)
- net savings to the NHS estimated at £262 million

While the absolute gains are greater in the highest socioeconomic group, around 750 fewer deaths compared to around 630 in the lowest group, after adjusting for population sizes, the greatest relative gains are in the lowest socioeconomic group. For example 140 quality-adjusted life years (QALYs) gained per 100,000 population compared to 110 in the highest socioeconomic group.

Identification and brief advice in the emergency department setting

Alcohol misuse is common in people attending emergency departments (EDs), therefore may represent an important setting for the delivery of IBA (388).

A pragmatic multicentre cluster randomised controlled trial (RCT) delivered in nine EDs including almost 6,000 patients tested the suitability of ED settings for IBA in England (388). Participants were randomly allocated into either a patient information leaflet group, five minutes of brief advice or referral to an alcohol health worker who provided 20 minutes of brief lifestyle counselling. The primary outcome measure was AUDIT negative score defined as a score of less than eight at six and 12 months follow-up.

There were no differences between interventions for AUDIT status or any other outcome measures at either follow-up period. The proportion of AUDIT negative at six months was:

- 28% for the patient leaflet group
- 35% for the brief advice group
- 40% in the brief lifestyle counselling group

The adjusted odds ratio (OR) (95% confidence interval [CI]) comparing brief advice to patient information leaflet was 1.1 (0.3, 3.7) and comparing brief lifestyle counselling to patient information leaflet was 0.7 (0.3, 4.9).

Originally, the study had intended for the interventions to be delivered by ED staff, with the exception of brief lifestyle counselling. In practice, however there was low participation and the research team delivered the intervention themselves in six of nine EDs. Additionally, the majority of ineligible patients (26%) were not able to take part because they were not alert and oriented, which has a bearing on the timing of brief interventions in this setting.

Even with follow-up rates comparable to previous ED trials, the study achieved lower follow-up rates than planned. Original targets were to follow-up 75% of participants, however recruitment only achieved 70% follow-up at six months and 67% at 12 months which reduced the statistical power to detect an effect.

Despite these findings, a meta-analysis of IBA in ED settings reported mean reductions in weekly alcohol consumption of 18g of alcohol per week (-6.2, 29.7) at six months follow-up, which was maintained at 12 months (MD=18.2g per week) (9.7, 26.7) (386). The findings did not differ for European or non-European studies suggesting the finding is robust across countries and cultures.

A more recent meta-analysis of 33 RCTs of IBA in EDs which included almost 14,500 patients suggested small beneficial effects of IBA (389).²⁷ Six out of nine comparisons revealed small effects in favour of IBA, with the largest standardised mean difference (SMD) at 0.19 (0.08, 0.31).

Identification and brief advice in criminal justice settings

Evidence shows a clear association between alcohol consumption and criminal offending (see Alcohol, crime and disorder). Therefore, the criminal justice setting (CJS) may represent an important opportunity for alcohol intervention work that could reduce alcohol consumption and offending behaviour.

A pragmatic multicentre factorial cluster randomised trial in England randomly allocated offenders in the probation setting to one of three interventions (390):

- feedback on screening outcome and a client information leaflet
- five minutes of structured brief advice
- 20 minutes of brief lifestyle counselling

Primary outcomes were AUDIT score at six and 12 months and secondary outcomes were experience of alcohol-related problems, health utility, service utilisation, readiness to change and conviction rates.

²⁷ Review contained some of the same references as included in Elzerbi et al. (2105)

Negative AUDIT status, defined as a score of less than eight, increased in all three groups between baseline and six months (Table 1). All intervention groups showed a reduction in AUDIT score, but there were no differences between participants in the brief advice compared to client information leaflet groups, OR=0.8 (0.4, 1.6) or brief lifestyle counselling compared to client information leaflet groups: OR=0.7 (0.3, 1.5). At 12 months, there were no differences in AUDIT negative status between the three groups.

Table 14: % AUDIT negative score (<8) by intervention at baseline, six months and 12 months (390)

% of group	Client information leaflet	Brief advice	Brief lifestyle counselling
Baseline	17.7	12.4	9.9
6 months	29.1	23.6	19.8
12 months	33.3	33.3	26.3

No differences were observed for quality of life, alcohol-related problems, readiness to change or satisfaction with care at either follow-up period. However, participants who were randomised to brief advice and brief lifestyle counselling were less likely to be convicted at 12 months follow-up compared to those in the client information leaflet group (Table 2). The OR (95% CI) of receiving a conviction was lower in the brief advice OR=0.5 (0.3, 0.8) and brief lifestyle counselling OR=0.5 (0.3, 0.9) groups compared with the client information leaflet group.

Table 15: Proportions reconvicted at 12 month follow-up (390)

	% reconvicted
Client information leaflet	50%
Brief advice	36%
Brief lifestyle counselling	38%

The reduction in recidivism in the more intensive intervention groups was reported in the absence of significant differences in drinking status between the groups. The more intensive interventions promoted awareness of the risks relating to excessive alcohol use which including the risk of offending while under the influence. It is possible that this

played a part in the reported findings, however further investigation is needed to establish whether this is a real effect and to explore possible explanations or mechanisms.

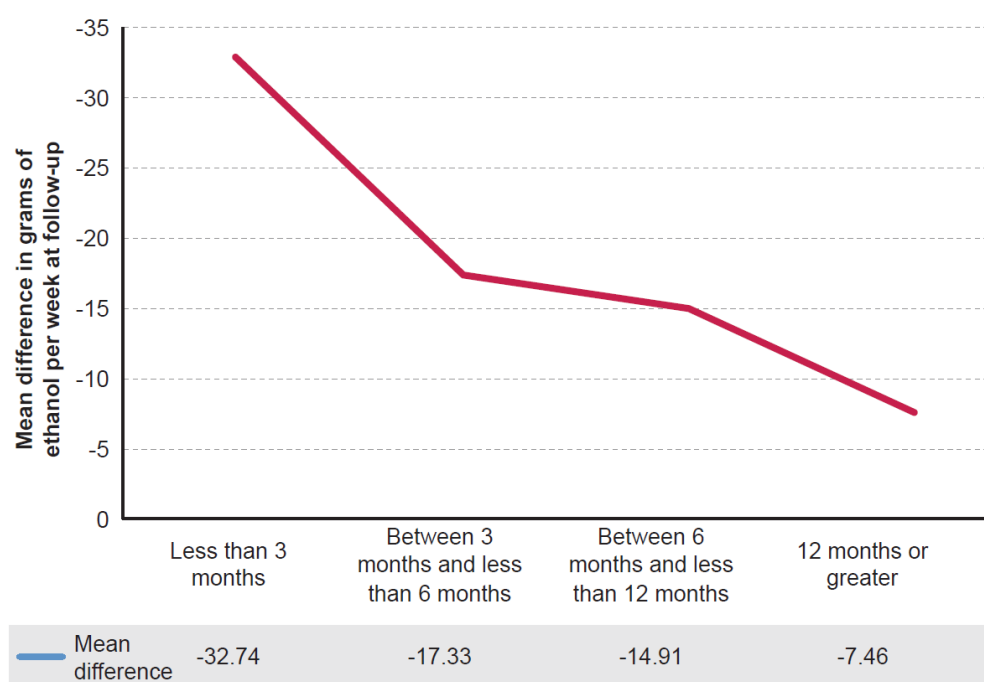
Electronic identification and brief advice

The widespread use of computers, the internet and smartphones has led to the development of electronic systems to deliver IBA. Electronic IBA (eIBA) potentially offers greater flexibility and anonymity for the individual, can reach a larger population than traditional face-to-face and may offer a more cost-effective alternative (391).

A meta-analysis of 23 studies compared alcohol consumption defined as grams of alcohol per week between eIBA and control defined as care as usual, assessment only and no intervention (391). Most studies were conducted in the US and focused on student populations. Results reported mean differences in weekly alcohol consumption between those receiving an eIBA compared to controls at up to three months, three to less than six months and from greater than six months to <12 months follow-up (Figure 2). No differences were observed at 12 months. The overall mean difference in weekly alcohol consumption between intervention and control was 16.6g, equivalent to about two standard drinks in the UK.

Large attrition rates are common in eIBA studies with studies in the review reporting rates of up to 55%. People more committed to reducing their alcohol consumption may remain in the trial which may inflate positive alcohol outcomes.

Figure 48: Mean difference in grams of ethanol per week at follow-up post intervention with 95% confidence intervals (391)



Identification and brief advice in adolescents

Given the effectiveness of IBA across a range of settings, researchers have aimed to understand if IBA is effective in an adolescent sample.

A brief review of reviews and recent trials explored the evidence-base for IBA in those aged 10 to 21 years to determine age appropriate screening tools, the effectiveness of IBA and the relative effectiveness of different settings (392).

A number of screening methods used for adolescent samples were identified by the brief review. Within the UK context, 51 studies identified as part of a NICE review suggested that among adolescents, questionnaires perform better than blood markers or breath alcohol concentration and the AUDIT had greater sensitivity and specificity than other questionnaires. The review reported that among adolescents, there is limited evidence that eIBA effectively reduces alcohol consumption compared with minimal or no intervention controls. Motivational interviewing (MI) appeared to be effective in adolescents when it was delivered across a series of sessions, rather than as a one-off intervention.

IBA in an ED setting has proven efficacy in adolescents however most research has been carried out in a PHC setting. In summary, the brief review suggests that *“despite an increasing interest in applying IBA to an adolescent population, there are no clear indications of which target population, setting, screening tool or intervention approach can be recommended. The relationship between age, alcohol consumption and harm is complex and further research is required in order to establish guidelines for consumption and thresholds of harm for different age groups”*.

Brief interventions in pharmacy settings

In recent years, UK community pharmacy practice has developed to include extended roles for pharmacy staff such as sexual health screening and smoking cessation. As such, the UK Department of Health recommended that pharmacy-based IBA should be piloted and evaluated as part of the developing public health function on community pharmacies.

A parallel group RCT in 16 community pharmacies in one London borough assessed the effectiveness of IBA in reducing hazardous and harmful drinking in pharmacy settings (393). Over 400 participants were randomly allocated to either IBA or a leaflet only condition and were followed up at three months. The two primary outcomes were change in total AUDIT scores and the proportion of participants scoring negative on AUDIT, defined as a score of less than eight. Secondary outcomes were also measured including the three subscale scores of the AUDIT for consumption, problems and

dependence, and health status as measured by the EuroQuol five dimensions test (EQ-5D), a standardised tool for measuring health.

Compared to the leaflet only group, there were no reductions in total AUDIT score for the intervention group at three months, MD=0.6, (0.5, 1.6), or the likelihood of a negative AUDIT score MD=0.9 (0.5, 1.5). There were no concerns with the methodological rigour of this study however it is possible that the pharmacists were undertrained in the delivery of IBA, receiving only a single 3.5 hour training session.

These findings confirmed those of a previous literature review which found little empirical support for the effectiveness of IBA for reducing hazardous or harmful alcohol consumption in community pharmacies (394).

Identification and brief advice in sexual health clinics

Given the relationship between alcohol consumption and risky sexual behaviour (see *Unsafe sex*), sexual health clinics have been explored as a potential setting to deliver IBA.

A pragmatic RCT reported that among people attending sexual health clinics in London, IBA does not lead to reductions in alcohol consumption, and therefore does not represent an effective or cost-effective use of resources in this setting (395). Over 800 participants aged 19 years or over were randomly allocated to either brief advice, or a leaflet condition, and average weekly alcohol consumption during the previous 90 days was measured at six months after randomisation. Levels of unprotected sex were also observed.

Compared to the leaflet condition, the adjusted MD in alcohol consumption at six months for those in the IBA group was borderline significant at 2.3 units per week (0.03, 4.7). There were no differences in self-reported levels of unprotected sex, 53% and 59% in the IBA and leaflet group respectively.

While IBA was relatively inexpensive to deliver, costing less than £13 per participant, when other costs and QALY outcomes were taken into account, it did not appear to be a cost-effective use of resources.²⁸

Identification and brief advice in the workplace

Non-medical settings may be a valuable point of contact for drinkers who would benefit from IBA but may not necessarily present to PHC settings.

²⁸ However, further analysis suggested that given a willingness to pay of £5 for a weekly unit reduction in alcohol consumption, IBA would have a greater than 50% chance of being cost-effective

An updated systematic review of nine RCTs explored the effectiveness of IBA in the workplace setting (396). All but one of the studies included in the review reported reductions in alcohol consumption resulting from IBA in at least some of their primary outcomes. For example, the studies included in the review reported a reduction in alcohol consumption from 24.8g to 12.1g alcohol per day, a reduction in drinking days per week from 2.4 days to 2.0 days per week, and a reduction of maximum drinks per drinking occasion from 7.6 drinks to 4.8 drinks. Only one study included in the review found no superiority effects of IBA over control, and reductions in alcohol consumption were seen for both groups.

The employment sector from which participants were recruited was varied and included organisations based in the transportation, food and retail or manufacturing sectors. While all companies were large, employing about 1,000 employees or more, the type of employees recruited in these studies varied and it is not clear for which type of employee IBA in the workplace may be most beneficial. Furthermore, many studies included in this review had low participation and high-drop-out rates suggesting there may be issues with the acceptability or feasibility of IBA in the workplace.

The review identified a number of potential barriers to implementing IBA in the workplace, mostly focusing on the individual-level obstacles experienced by employers seeking to deliver IBA in the workplace and employees who might benefit from IBA. Primarily, employees may be anxious about participating in IBA delivered at their workplace because of the potentially negative consequences of self-disclosing heavy or risky drinking to their employer.

The effectiveness of identification and brief advice by gender

There have been mixed findings regarding the effectiveness of IBA across genders. In a review including seven reviews, four reviews reported the effectiveness of IBA for reducing alcohol consumption by gender (383). Two studies reported similar effectiveness for both men and women (397,398), one study reported that IBA was effective in men but not in women (380), while the final study reported that IBA was effective in women but not in men (399). These findings may reflect insufficient statistical power to detect significant effects.

Barriers to implementing identification and brief advice

Research has identified a number of barriers to implementing IBA including time, training, lack of financial incentives, feeling awkward asking questions about alcohol, belief that patients would not act on advice and a focus by healthcare professionals on dependence and not hazardous drinking (400). Incentives that help overcome these barriers include easy access to support services to refer patients with substantial problems, training, financial incentives, easily accessible screening and counselling

materials and proven success of brief interventions (400). Most of the ways to overcome potential barriers to implementation have been identified in a primary care setting, but are shared by other health and social care professionals from other settings.

A programme of IBA was introduced in Scotland in selected NHS settings in 2008, and widened to other NHS and non-NHS settings in 2012 (283). Funding, training, co-ordination and a performance target were introduced as part of this programme. These helped embed delivery and over half a million interventions have been delivered over seven years, exceeding the performance target and reaching an estimated 43% of potential beneficiaries.

Treatment for alcohol dependence

Alcohol dependence is characterised by craving, tolerance, a preoccupation with alcohol and continued drinking despite harmful consequences, for example, liver disease or depression caused by drinking (401). Alcohol dependence can present in a mild, moderate or a severe form and can also be complicated by other health or mental health issues or social concerns such as homelessness or involvement in the criminal justice system (140).

The appropriate course of treatment will depend on the patient's drinking patterns and treatment goals. Not all patients will aim for abstinence. Where appropriate, some patients may aim for controlled drinking. Treatment should meet the individual needs of each patient. While each level of dependence requires a different response, in general, the treatment for harmful drinking and dependence needs to address:

- assessment and engagement
- care planning and case management
- withdrawal management
- addressing physical and psychiatric co-morbidity
- psychosocial interventions
- pharmacotherapy for relapse prevention
- recovery, aftercare & reintegration

A vast body of research has been carried out which evaluates the effectiveness and cost-effectiveness of treatment for alcohol dependence in different settings, for example community, criminal justice, residential and inpatient settings. Treatment approaches are broadly categorised as pharmacological, or psychological. In practice, these treatments are often delivered in combination and can be delivered via a stepped care approach whereby patients receive interventions sequentially based on their level of need at different stages of care (402). This approach has been shown to be both effective and cost-effective in primary care settings.

This section briefly summarises the findings detailed in the NICE guidance. For brevity our summary of the guidance focuses on the percentage of days abstinent as an outcome measure, as advocated by Babor (403). Where this was not used in the primary research, other measures most relevant to capturing changes in alcohol consumption are reported. The main comparator summarised here is control or treatment-as-usual. On occasion, interventions have not been compared to a control or treatment-as-usual and are instead compared only to active comparators. The outcomes reported in this summary are stated in the text. A number of follow-up periods are used throughout the primary research included within NICE. Where multiple follow-up periods have been measured, attention has been paid to the earliest follow-up period. Where long-term outcomes vary wildly from short-term outcomes, this is identified in the text.

Research considerations

There are a number of important considerations when assessing the effectiveness and cost-effectiveness of treatment for alcohol dependence. Those with greater needs and complexity are less likely to have successful treatment outcomes compared to their less complex counterparts (140). Randomly allocating these disparate individuals into different arms of a RCT inevitably biases the findings. This can be overcome by using stringent inclusion criteria or participant matching, however, this has meant that much research uses relatively homogenous populations with the same (and often single) diagnosis. This varies substantially from what occurs in clinical practice and makes the generalisation of research findings into normal therapeutic practice more difficult. Efficacy and effectiveness trials can be carried out to ascertain whether a treatment works in study settings and in clinical practice.

Efficacy studies are well controlled clinical trials focusing on well-defined problems. In contrast effectiveness studies deal with actual clinical practice with all of its scientific shortcomings. Efficacy studies have good internal validity enabling the identification of factors that are beneficial to patient groups, but low external validity meaning that the findings cannot be easily generalised to typical clinical practice. Effectiveness studies are the opposite and have high external validity but can lack internal validity. Confidence in the effectiveness of a treatment should be greatest for studies that have both proven efficacy and effectiveness.

The difficulty of measuring the effectiveness and cost-effectiveness of alcohol treatment is also compounded by the finding that a substantial proportion of alcohol dependent individuals recover without treatment (404). This stable remission is seen among physically dependent individuals who exhibit a high number of dependence criteria. Nonetheless, a longitudinal study spanning three years reported that compared to individuals who obtained help, those who did not were less likely to achieve remission and subsequently were more likely to relapse (405). Lower levels of alcohol

consumption, higher self-efficacy and less reliance on avoidance coping at baseline predicted three-year remission for both treatment-seeking and non-treatment seeking individuals. This effect was especially pronounced for individuals who remitted without help.

Most research assessing the effectiveness and cost-effectiveness of alcohol treatment uses self-reported outcomes of drinking frequency and quantity. While there are inevitable limitations to self-reported measures, the use of biochemical tests and reports collected from the drinkers' family and associates have not been shown to sufficiently increase measurement accuracy to warrant their routine use (406). Instead, research typically uses interview procedures designed to increase the validity of self-reported information.

Finally, in addition to the treatment itself, the skills and personal quality of the person delivering the treatment can be an important predictor of treatment success (407). It is difficult to quantify the relative importance of these two factors in producing treatment effectiveness. Nonetheless, the quality of the person delivering the treatment is unlikely to be sufficient to account for the majority of the variance in a measured outcome.

Psychological and psychosocial interventions

This section outlines the evidence for the main psychological interventions as reported by NICE (377). Structured psychological interventions are talking therapies which typically use the interaction between the patient and the treatment provider, such as a therapist, counsellor or worker. There are a wide range of studied interventions such as behavioural, cognitive and motivational approaches.

Motivational enhancement therapy

Motivational enhancement therapy (MET) is patient-centred and uses motivational methods and strategies to improve patient's ability to cope. NICE identified eight RCTs including over 4,200 participants, of which three RCTs including 433 participants compared MET to a control (377). Compared to control, MET was more effective at reducing the average number of drinks per day at one month follow-up SMD= -0.67 (-1.20, -0.15). The quality of this evidence was moderate.

Motivational interventions were cost-effective compared with no active treatment with an incremental cost-effectiveness ratio (ICER) ranging from approximately AUS\$80 (£60) per QALY for the simple intervention to approximately AUS\$280 (£180) per QALY for the extended intervention (377). Compared to no further counselling after initial assessment, MET was cost-effective with an ICER of approximately AUS\$3400 (just under £2,500) per QALY.

A study comparing the cost-effectiveness of MET and social behavioural network therapy (SBNT) in a population comprising people who would normally seek treatment for alcohol misuse at UK treatment sites reported that at 12 months, the MET group had an ICER of £18,230 in comparison with SBNT and MET had a 58% probability of being more cost-effective than SBNT, however the difference in cost-effectiveness was not significant (377).

12-step facilitation

Twelve-step facilitation (TSF) is an active engagement strategy designed to increase the likelihood of a dependent alcohol user becoming affiliated with and actively involved in 12-step self-help groups, thereby promoting abstinence. TSF is based on the 12-steps concept of Alcoholics Anonymous (AA) that alcohol dependence is a spiritual and medical disease. Participants are actively encouraged to commit to, and participate in, AA meetings. Lifelong membership is encouraged.

NICE identified six RCTs including over 2,550 participants, all of which compared TSF to an active comparator (377). Two studies compared standard to intensive TSF. Compared to standard TSF, intensive TSF was more effective at increasing the percentage days abstinence at three months, SMD= -0.4 (-0.79,-0.00). The quality of this evidence was moderate. Over a three year period, the mean monthly costs for TSF were approximately US\$230. This compares to approximately US\$180 for MET and US\$190 for cognitive behavioural therapy (CBT), suggesting that MET has the largest potential for healthcare savings.

Cognitive behavioural therapy

Derived from the cognitive behavioural model of affective disorders, CBT is where the patient works collaboratively with a therapist to achieve specific treatment goals. These goals may include recognising the impact of behavioural and/or thinking patterns on feeling states and encouraging alternative cognitive and or behavioural coping skills and strategies to reduce the severity of target symptoms and problems. CBT is based on the belief that thought distortions and maladaptive behaviours play a role in the development and maintenance of psychological disorders and that symptoms and associated distress can be reduced by teaching new information-processing skills and coping mechanisms.

NICE identified 20 RCTs including almost 4,000 participants, of which three RCTs including 450 participants compared CBT to treatment-as-usual or control (377). There was no difference between control and CBT for reducing the number of days on which any alcohol was used, SMD= -0.31 (-0.64, 0.03) however CBT was better than control at reducing heavy drinking episodes defined as the number of days participants

consumed more than four drinks, SMD= -0.7 (-1.3, -0.11). The quality of this evidence was moderate.

Behavioural therapies

Behavioural interventions use behavioural theories of conditioning to help achieve abstinence from drinking by creating negative experiences or events in the presence of alcohol, and positive experiences or events in its absence. Behaviour therapy focuses on either just behaviours or in combination with thoughts and feelings that might be causing them. This therapy tends to look more at specific, learned behaviours and how the environment influences those behaviours.

NICE identified six RCTs including over 500 participants, of which two RCTs including about 130 participants compared behavioural therapies to control or treatment-as-usual (377). There was no difference between behavioural therapies and control or treatment-as-usual in increasing abstinent days per week post-treatment SMD= -0.37 (-0.79, 0.04), however behavioural therapies were more effective than control in reducing the amount of alcohol consumed SMD= -0.97, (-1.4, -0.54). These therapies also demonstrated net savings compared to standard care. The quality of this evidence was moderate.

Contingency management

Contingency management uses a system of reinforcement designed to make the continual use of alcohol less attractive and abstinence more attractive. Four main incentives are used including voucher-based reinforcement, prize-based reinforcement, cash incentives and clinical privileges.

NICE identified three RCTs including 355 participants, of which one RCT including 139 participants compared contingency management to control (377). Based on a single study, compared to control, contingency management was more effective at increasing the percentage days abstinence SMD= -0.8 (-1.18, -0.42). The quality of this evidence was moderate.

Social network and environmental therapy

Social network and environment-based therapies use the individual's social environment as a way to help achieve abstinence or controlled drinking. These therapies include SBNT and the community reinforcement approach. SBNT uses a range of cognitive and behavioural strategies to help clients build social networks supportive of change which involve the patient and members of the patient's networks, such as family and friends. In the community reinforcement approach, emphasis is

placed on maintaining abstinence through the development of activities that do not promote alcohol use.

NICE identified three RCTs including over 1,050 participants, of which one RCT including over 200 participants compared social network and environment-based therapies to control (377). Social network and environment-based therapies were more effective at increasing the percentage days abstinence (SMD = -0.76, -1.08, 0.43) compared to control. The quality of this evidence was moderate. The study also showed that SBNT was associated with social and economic benefits.

Couples therapy

Couples-based interventions involve the spouse or partner expressing active support for the person who misuses alcohol in reducing alcohol use. Couples are helped to improve their relationship through more effective communication skills and encouraged to increase positive behavioural changes.

NICE identified eight RCTs including over 600 participants, of which seven RCTs including 486 participants compared couples therapy to other active interventions (377). No differences were observed between couples therapy and other active interventions in the percentage of days abstinent at two months follow-up SMD=-0.42 (-1.14, 0.29). However, at six month follow-up, couples therapy was better at increasing the percentage of days abstinent SMD= -0.47 (-0.77, -0.18). The quality of this evidence was moderate.

Counselling

Counselling is a systematic process which gives individuals an opportunity to explore, discover and clarify ways of living more resourcefully, with a greater sense of well-being. NICE identified five RCTs including 630 participants, of which one RCT including 80 participants compared counselling to control (377). No difference was observed between the counselling group and control SMD= 1.07 (0.83, 1.38). The quality of this evidence was moderate.

Short-term psychodynamic therapy

Short-term psychodynamic therapy is derived from a psychodynamic/psychoanalytic model in which:

- the therapist and patient explore and gain insight into conflicts, and how these are represented in current situations and relationships, including the therapeutic relationship

- patients are given an opportunity to explore feelings, and conscious and unconscious conflicts originating in the past, with the technical focus on interpreting and working through conflicts
- therapy is non-directive and patients are not taught specific skills such as thought monitoring, re-evaluation or problem solving

NICE identified one RCT including 49 participants which compared short-term psychodynamic therapy to other active interventions (377). Compared to other active interventions, short-term psychodynamic therapy was more effective at increasing the number of days abstinent at 15 months follow-up SMD= -0.64 (-1.24, -0.03). The quality of this evidence was moderate.

Multi-modal treatment

Multi-modal treatment for alcohol misuse involves a combination of a number of interventions that have been developed and evaluated as stand-alone interventions for alcohol misuse. Components can include motivational aspects such as MET, 12-step facilitation, AA or self-help group participation or group counselling. The intention is that by combining a number of effective interventions the combined treatment will be greater than any one individual treatment. It sees individuals as products of interplay among genetic endowment, physical environment, and social learning history.

NICE identified two RCTs including over 400 participants which compared multi-modal treatment to other active interventions (377). No difference was observed between multi-modal interventions and other active controls in reducing the number of days drinking post-treatment SMD= -0.41, (-0.85, 0.04). The quality of this evidence was low.

Self-help based treatment

A self-help intervention is where a healthcare professional would facilitate the use of self-help material by introducing, monitoring and reviewing the outcome of such treatment. These interventions are designed to modify drinking behaviour and make use of a range of materials such as books, web pages or a self-help manual.

NICE identified one RCT including over 90 participants which compared guided to non-guided self-help based treatment (377). Guided self-help was more effective than non-guided self-help at reducing the number of standard drinks consumed per week at nine months follow-up SMD= -0.54 (-1.06, -0.02). The quality of this evidence was moderate.

Psychoeducational interventions

Psychoeducational interventions involve an interaction between an information provider and patient. The primary aim is to offer information about the condition that highlights

the health and lifestyle risks of excessive alcohol consumption, as well as providing support and management strategies.

NICE identified five RCTs including over 1,300 participants all of which compared psychoeducational interventions with other active interventions (377). No differences were observed between psychoeducational interventions and other active interventions in the percentage of days abstinent post-treatment SMD= 0.03 (-0.32, 0.38). The quality of this evidence was moderate.

Summary of psychological and psychosocial interventions

NICE judges that the following interventions are effective:

- behavioural couples therapy
- cognitive behavioural therapy
- motivational enhancement therapy
- social behaviour and networks therapy
- behavioural therapies which apply principles of positive reinforcement

Mutual aid that uses peer support is also seen as forming an important component to support recovery.

NICE judges that there is very limited evidence that is typically low to moderate quality for the following interventions:

- general counselling
- psychodynamic therapy
- multi-modal treatment
- self-help based treatment
- psychoeducational interventions
- mindfulness meditation

Pharmacological interventions

Pharmacological treatments are recognised as an adjunct to psychosocial treatment and are used to prevent relapse and reduce alcohol consumption (377). NICE guidance details the utility and efficacy of pharmacological interventions in the treatment of alcohol misuse with a focus on the use of pharmacological interventions in the promotion of abstinence and in the reduction of alcohol consumption.

NICE have assessed several medications which help people maintain abstinence, reduce harmful drinking and prevent relapse. These pharmacotherapies are believed to reduce the reinforcing (pleasurable) effects of drinking and help people maintain commitment to recovery.

NICE limited its systematic review to acamprosate, naltrexone and disulfiram. These are medications that are licensed for use in the UK for the treatment of alcohol problems and where there is substantial evidence of clinical efficacy.

Since NICE carried out their review, nalmefene, which reduces heavy drinking, has also been endorsed by NICE for use with adults with mild dependence without physical withdrawal symptoms and who do not require immediate detoxification.

Acamprosate

The pharmacological mechanism of action of acamprosate is not fully known, but it appears to reduce the craving for alcohol in patients who have consumed large amounts of alcohol over a long period of time. Acamprosate is most effective in combination with psychosocial support and can help facilitate reduced consumption as well as abstinence.

NICE identified 19 RCTs including over 4,600 participants comparing acamprosate to placebo for the effectiveness of relapse prevention (377). There was no difference between acamprosate and placebo at increasing the percentage days abstinent at two months follow-up $SMD = -0.10$ ($-0.43, 0.23$) however acamprosate was better at promoting abstinence in participants when compared with placebo, relative risk $[RR] = 0.83$ ($0.77, 0.88$). The quality of this evidence was high.

One UK cost-effectiveness study showed that in comparison with standard care, acamprosate resulted in net healthcare savings of about £68,900. This finding was mirrored by a German study.

Naltrexone

Naltrexone is a drug that is used in the management of alcohol dependence by decreasing the desire for alcohol, heavy drinking and the volume and frequency of drinking occasions.

NICE identified 27 RCTs including almost 4,300 participants comparing naltrexone to placebo for the effectiveness of relapse prevention (377). Compared to placebo, naltrexone was more effective at increasing the percentage days abstinent at three months follow-up $SMD = -0.22$ ($-0.37, -0.07$). The quality of this evidence was high. The cost-effectiveness evidence supporting naltrexone is varied. For example, in one study it was shown to be cost-effective in comparison with standard care resulting in an ICER of approximately AUS\$13,000, while a UK study reported naltrexone to result in net economic costs of approx. £83,400 in comparison with standard care. Another study showed that provided in combination with acamprosate, provision of naltrexone was cost-effective over a 16-week period.

Disulfiram

Disulfiram is an aversion therapy drug. It causes an unpleasant hypersensitivity to alcohol including flushing, throbbing headache, respiratory difficulty, nausea, vomiting, sweating and a range of other symptoms. The mechanism of action is based in aversion therapy.

NICE identified three open-label trials comparing disulfiram versus placebo including 859 participants (377). Compared to control, disulfiram was more effective at increasing the total number of abstinent days (per week or month) $SMD=-0.45$ (-0.86 , -0.45). Nonetheless, one UK study reported that disulfiram resulted in significant net economic costs in comparison to standard care, though NICE suggest a high level of heterogeneity in the study design which could affect the results.

Nalmefene

Nalmefene is an opioid antagonist which can be used by adult patients with alcohol dependence who have a high-risk level of alcohol consumption but do not have physical withdrawal symptoms and do not require immediate detoxification. Nalmefene can also be taken 'as needed', when a person feels the urge to consume alcohol.

NICE identified three RCTs including almost 2,000 participants (408). At six months, nalmefene, coupled with psychosocial management, compared to placebo, plus psychosocial management, reduced the number of heavy drinking days by 3.0 days per month (-4.36 , -1.66) and total alcohol consumption reduced by 14.2 g per day (-20.0 , -8.5). The quality of this evidence was high.

In the cost-effectiveness analysis supporting the appraisal, three scenarios were modelled:

- patients relapsing after one year to high or very high drinking risk level
- treatment was effective and in line with other patients in whom treatment was effective
- treatment was not effective for those in the nalmefene plus psychosocial support group but that it was effective for patients in the psychosocial alone cohort

The modelling suggested that nalmefene plus psychosocial support was more cost-effective than psychosocial support alone even when certain parameters were changed: the proportion of people having treatment following relapse, the utility values used and the cost of nalmefene. However, nalmefene plus psychosocial support did not dominate when the number of medical visits per month was doubled in the sensitivity analysis. When applying the upper estimate for the number of medical visits per month, the ICER increased to £6274 per QALY gained.

NICE recommends that the prescribers of these medications, which need to involve some basic counselling support, should consider helping their patient to access a structured psychological intervention, for example CBT, behavioural therapies, social network or couples therapy.

NICE stress the importance of recognising that not every patient will wish to take these medications. Some may have medical conditions which make their use contra-indicated, and not everyone will derive a clinical benefit. At present, there is little evidence on how to inform clinical decisions concerning how long medication should be continued. Patients who are achieving good outcomes may be best advised to remain on one of these medications for at least six months. However, other patients may be confident to discontinue medication at an earlier stage.

Secondary care alcohol specialist services

Secondary care alcohol specialist services, also known as alcohol care teams, alcohol; specialist nurse services or alcohol liaison services, are highly variable in their configuration, staffing and approach, however all have the primary aims of improving the care of alcohol misusing hospital patients to reduce the number of hospital admissions, readmissions and length of stay, thereby reducing costs. Broadly speaking there are four key models of delivery that have been identified by qualitative work; multidisciplinary alcohol care teams, in-reach alcohol care teams, high impact user services and specialist alcohol provision within the more broadly focused rapid assessment, interface and discharge (RAID) model (409).

Models using multidisciplinary care teams are variable and therefore difficult to define. They can be a comprehensively commissioned entity or a virtual team comprising input from other specialist services within the hospital. Though typically working throughout the hospital, their focus can vary with clinical leadership and service base, which tend to be gastroenterology, emergency departments and psychiatric liaison. Typically however, most are led by a senior clinician and co-ordinate resources which will involve alcohol specialists and practitioners from within the hospital or external resources such as community alcohol or psychiatric liaison services.

In-reach alcohol care teams are based outside of the hospital setting and provide interventions within hospital or community clinical settings. Interventions are delivered by diverse combinations of staff, which may include specialist alcohol workers, nurses and doctors, meaning that the range of services they are able to offer are contingent on the staffing mix. Typically pathways are set up to 'trigger' conditions known to be associated with alcohol such as accidents, injuries, gastric, cardiovascular or psychiatric conditions.

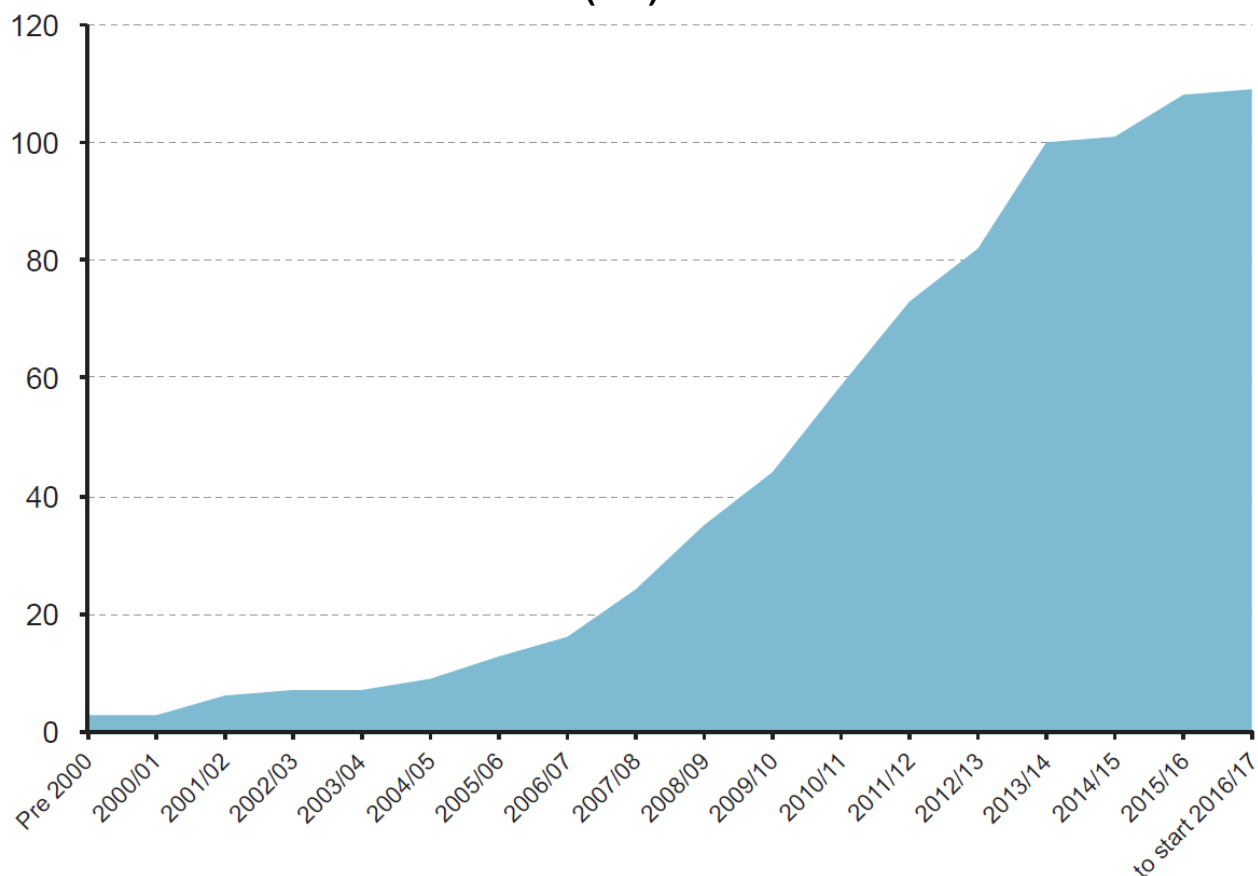
High impact user services identify and assertively engage with, usually a small number of patients who frequently attend emergency departments, are admitted to hospital and have frequent repeat admissions. (410). This group often have complex physical health, psychiatric and social needs, commonly relating to alcohol use, and are known to interact poorly with mainstream services (411). High impact user services primarily concentrate on this group. These services can be offered as part of a wider hospital service or may be an integrated service managed by an external agency.

High impact user services identify and assertively engage with, usually a small number, of patients who frequently attend emergency departments and are admitted to hospital (411). These services can be offered as part of a wider hospital service or may be an integrated service managed by an external agency. Within the general trend of rising hospital admissions in England, there is a cohort of patients who frequently attend hospitals and emergency departments and have a high number of repeated admissions (410). This group often have complex physical health, psychiatric and social needs, commonly relating to alcohol use, and are known to interact poorly with mainstream services (411). High impact user services primarily concentrate on this group.

The RAID model is a model of liaison psychiatry, which is increasingly being adopted to expedite safe discharge of patients with mental health problems from acute hospitals. The original RAID model provided a rapid response, 24-hour, seven-day, age-inclusive service and a comprehensive range of mental health specialties. In many cases, where the RAID model is implemented, existing alcohol care teams are being absorbed into the RAID service.

The number of alcohol care teams for which there is research literature that formally evaluates their effectiveness and cost-effectiveness is relatively small compared with the large number of district general hospitals self-identifying as having an alcohol care team in some form (Figure 49) (409). This section reviews the published evidence for the effectiveness and cost-effectiveness of alcohol care teams in reducing hospital admissions and attendances at emergency departments and readmissions.

Figure 49: The number of district hospitals in England self-identifying as running an alcohol care team service since 2000 (412)



Salford Royal NHS Foundation Trust employed a high impact user model and identified 54 patients with the highest number of hospital admissions and used an assertive outreach approach led by a multidisciplinary team of medical, psychiatric, substance misuse workers, psychologists, nurses and social work specialists (411). Their primary aim was to reduce hospital admissions and emergency department attendances among this group. The patients were managed over a period of six months involving ongoing clinical interaction which extended beyond the hospital and into the community setting. Analysis of the total number of hospital admissions and attendances at emergency departments compared the three months prior to the intervention to the three months following the intervention and can be seen in Table 16.

Table 16: The total number of hospital admissions and emergency department attendances before and after the assertive outreach intervention (411)

Patient <i>n</i> =54	3 months prior case management	3 months following case management
Total number of hospital admissions	151	50
Total number of emergency department attendances	360	146

Christo inventory for substance misuse services (CISS) is a validated outcome tool which reflects patients' psychological and general health, compliance, drug and alcohol use, criminality and social functioning. Significant improvements were seen across the CISS scores between the start and end of the study period.

The experience in Salford Royal demonstrated that case management using the alcohol assertive outreach model can effectively reduce emergency department attendances and hospital attendances. While no formal cost-effectiveness analysis was carried out, based on national indicators and length of stay costs, taking into account the reductions in admissions and attendances at emergency departments associated with the intervention, the cost reductions are highly probable to cover the £300,000 that was required to establish the service. This does not take into account any ongoing reduction in admissions and subsequent savings.

Retrospective analysis of a multidisciplinary nurse-led alcohol liaison service in Nottingham reported a number of positive findings relating to the implementation of the service (413). Over a period of one year, the number of patients admitted for inpatient alcohol detoxification decreased from about 55 to about 20 admissions, with an average stay length of 4.2 days. The equivalent savings were 36 bed days per month.

Among a subsample of 40 cirrhotic patients in Nottingham, the number of bed days used six months post-intervention fell from 6.3 to 3.2 days per month. Over half of the sample had fewer bed days after intervention, and this was associated with a greater reduction in self-reported alcohol consumption. Overall alcohol consumption decreased from 8.4 units to 4.6 units per day, and among those with fewer bed days there was a greater reduction to 1.7 units per day.

Compared to patients who did not see the nurse-led liaison team, those who did had lower levels of primary care attendances with an average of 3.7 attendances compared to 8.1 attendances over six months.

Finally, violent incidents against staff for which alcohol was a significant factor also decreased over the intervention period, falling from 1.7 incidents per week in the six months prior to the intervention to 0.45 per week in the second six months of the service. This was attributed to better management of withdrawal from alcohol in the admissions unit.

A NICE endorsed study reported that a seven day alcohol specialist nurse service in Bolton is a highly effective and cost-effective approach to reducing hospital admissions and readmissions relating to alcohol misuse (414). Four alcohol specialist nurses screened, and triaged candidates, then provided brief interventions and comprehensive alcohol assessment including physical and mental health. This specialist nurse service, comprising four alcohol specialist nurses, cost £165,000 annually and saved 2,000 bed days liberating four to six hospital beds. Over the course of the study, readmission rates dropped by 3% compared with an increase across the region. After 12 months of the seven day Alcohol Liaison Nurse service, referrals increased by 63% and more than 600 healthcare staff were trained in identifying alcohol problems and delivering brief advice. This equates to a net saving of £448,000 per annum based on an average district general hospital population of 250,000, or £179,000 per 100,000 population (£179 per person).

The RAID liaison psychiatry team in Birmingham, delivered rapid response, 24-hour, seven days a week, age-inclusive services and a comprehensive range of mental health specialties, including old age, working age, postnatal mental health and substance misuse (415). A retrospective analysis of the RAID model reports it to be highly effective and cost-effective with estimated financial savings of £4 to 6 million on saved beds alone. A number of positive findings were reported as follows:

- the involvement of RAID led to an increase in the detection and diagnosis of mental illness (13% of referrals were for alcohol-related problems)
- the mean length of stay decreased from 10.3 to 9.4 days following implementation of RAID
- total savings over eight months were over 9,000 bed days
- estimated savings over 12 months were almost 14,000 bed days across a range of medical and mental health conditions, equivalent to just under 40 beds per day

These findings support the use of a rapid response to psychiatric patients in acute hospitals within a comprehensive and integrated model as an effective and cost-saving approach to reducing readmissions to hospital and length of stay.

Brief interventions and treatment									
Intervention	Nature	Grade	Limitations	Effect	Coverage	Economic impact	Implementation	Inequalities	Summary
G1. IBA in primary care	1 review of reviews 2 meta-analyses 2 systematic reviews 1 RCT 1 modelling study	High	Not identified	IBA is effective for reducing the prevalence of harmful and hazardous consumption over 6 and 12 months	Harmful and hazardous drinkers attending primary health care	Cost-effective	The effectiveness depends on sufficient health delivery systems and dedicated funding	Those in the lowest socioeconomic groups are estimated to experience the greatest absolute reduction in harms	IBA is effective in reducing hazardous and harmful consumption in primary health care, and is cost-effective
G2. IBA in ED	1 meta-analysis 1 RCT	Moderate	Not identified	Small to moderate beneficial effect of IBA	Harmful and hazardous drinkers attending ED	Not identified	The effectiveness depends on sufficient health delivery systems and dedicated funding	Not identified	IBA is efficacious at reducing hazardous and harmful alcohol consumption
G3. IBA in CJS	1 RCT	Low	Not identified	Hazardous and harmful alcohol consumption reduced, offending reduced with most intensive interventions	Harmful and hazardous drinkers in the probation setting	Not identified	The effectiveness depends on sufficient delivery systems	Reduces alcohol consumption and harm in offenders	Hazardous and harmful alcohol consumption reduced, offending reduced with most intensive interventions
G4. eIBA	1 meta-analysis	Moderate	High levels of attrition	eIBA reduced hazardous and harmful consumption, effect mitigated after 12 months	Harmful and hazardous drinkers recruited into digital interventions	Not identified	eIBA could be a lower cost delivery option with the potential for widespread delivery	Not identified	Short-term, reductions in hazardous and harmful consumption

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G5. IBA in adolescents	1 systematic review	Low	Not identified	Evidence still emerging	Adolescents who drink	Not identified	It is not clear what the appropriate setting or screening tools are for this group	Potential to reduce harm in adolescents	Currently no clear evidence of benefit in this age group
G7. IBA in sexual health clinics	1 RCT	Low	Not identified	IBA did not lead to meaningful reductions in alcohol consumption	Harmful and hazardous drinkers attending sexual health clinics	Not cost-effective	Not identified	Not identified	Evidence suggests sexual health clinics are not effective settings for IBA
G8. IBA in pharmacies	1 literature review 1 RCT	Moderate	It is possible that the pharmacists were undertrained in the delivery of IBA	IBA did not lead to meaningful reductions in alcohol consumption	Harmful and hazardous drinkers attending pharmacies	Not identified	Not identified	Not identified	Evidence suggests pharmacies are not effective settings for IBA
G9. IBA in the workplace	1 systematic review	Low	Not identified	Effective in reducing hazardous and harmful consumption in the workplace, differing effectiveness across worker type unknown	Harmful and hazardous drinkers in employment	Not identified	Employees may not wish to disclose heavy drinking to their employer	Not identified	Promising results, not clear which employee type may benefit most. Some employees may be unwilling to disclose information
G9. Psychosocial and psychological interventions	1 expert review	Moderate	Not identified	Many treatments effective: behavioural couple's therapy, MET, CBT, SBNT and behavioural therapies compared to treatment as usual, controls and other active interventions	Alcohol dependent adults	MET was cost-effective Coping and skills training, marital or family therapy and behavioural self-control training was cost saving	Not identified	Not identified	Behavioural couple's therapy, CBT, SBNT, MET and behavioural interventions recommended by NICE as an effective therapy

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G10. Pharmacological interventions	1 expert review 1 technical appraisal 1 health economic analysis	High	Not identified	The use of nalmefene endorsed for mild dependence, acamprosate, and naltrexone for moderate to severe dependence, disulfiram not endorsed, given that the evidence was poorer quality and the potential for harm was greater	Alcohol dependent adults	Acamprosate and naltrexone were cost-effective Nalmefene was cost saving	Not identified	Not identified	Recommended by NICE as an effective therapy (with an adjunct of psychosocial)
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Conclusion

This review presents evidence for the public health burden of alcohol and the effectiveness and cost-effectiveness of alcohol control policies which aim to reduce this burden.

The harm caused by alcohol is wide ranging, relating to health, social and economic harms. Harm is typically determined by the volume and patterns of alcohol consumption. For example, injury is associated with a single bout of heavy drinking, while regular drinking is associated with an increased risk of cancer, and repeated heavy drinking can lead to alcohol dependence and liver cirrhosis. Sometimes the relationship between alcohol consumption and harm can be more complex. For example, excessive alcohol consumption can increase the risk of unemployment, but unemployment can also increase alcohol consumption. Furthermore, alcohol can act as a mechanism to cause harm in ways that are both acute and chronic. For example, acute intoxication can increase the propensity to attempt suicide, and long-term consumption increases the likelihood of suicidal ideation. Individual risk factors moderate the susceptibility to alcohol-related harm including hereditary components, age, gender, and socioeconomic status.

In England there are currently over 10 million people drinking at levels which increase their risk of health harm. Alcohol is the leading risk factor for ill-health, early mortality and disability among those aged 15 to 49 years, and among all ages, it is the fifth leading risk factor. While the average age of death from all causes in England is 77.6 years, the average age of those dying from an alcohol-specific cause is 54.3 years. Alcohol harm affects younger age groups, with more working years of life lost in England to alcohol than from the 10 most frequent cancer types combined.

Since 1980, sales of alcohol in England and Wales have increased by 42%, from roughly 400 million litres in the early 1980s, with a peak at 567 million litres in 2008, and a subsequent decline. This growth has been driven by increased consumption among women, a shift to higher strength products, and increasing affordability of alcohol, particularly through the 1980s and 1990s. The way in which we are drinking has also changed, and we have seen a shift in drinking location such that most alcohol is now bought from shops and consumed at home. Although consumption has declined in recent years, levels of abstinence have also increased. Consequently, it is unclear how much of the decline is actually related to drinkers consuming less alcohol and how much to an increasing proportion of the population not drinking at all.

Despite the recent small declines in overall alcohol consumption, many indicators of alcohol-related harm continue to rise. There are now over 1 million hospital admissions relating to alcohol each year, half of which occur in the lowest three socioeconomic deciles. Alcohol-related mortality has also increased, particularly for liver disease

mortality which has seen a 400% increase since 1970, and this trend is in stark contrast to much of Western Europe. Despite this burden of harm, some positive trends have emerged over this period, particularly indicators which relate to alcohol consumption among those aged less than 18 years, and there have been steady reductions in alcohol-related road traffic crashes.

The harm arising from alcohol is an internationally-accepted public health challenge, with substantial costs to individual drinkers, to those around them, and to society. The economic burden of alcohol use is substantial, with estimates placing the annual cost to be between 1.3% and 2.7% of annual GDP. Few studies report costs on the magnitude of harm to people other than the drinker, so the economic burden of alcohol consumption is generally underestimated. Crucially, the financial burden which alcohol-related harm places on society is not reflected in its market price, with taxpayers picking up a larger amount of the overall cost of harm compared to the individual drinkers. This should provide impetus for governments to implement effective policies to reduce the public health impact of alcohol, not only because it is an intrinsically desirable societal goal, but because it is an important aspect of economic growth and competitiveness.

Alcohol policies have “*significant potential to curb alcohol-related harms, improve health, increase productivity, reduce crime and violence and cut government expenditure*” (4). Policies can additionally address market failures by protecting people from the harm caused by other people’s drinking, deterring children from drinking, and improving consumer awareness of the risks of alcohol consumption. Policies can also be used as measures to increase wellbeing and productivity, while at the same time reduce health inequalities.

A substantial evidence base exists which evaluates the effectiveness and cost effectiveness of alcohol control policies for preventing and reducing the health, social and economic harms caused by alcohol. The approaches range from regulatory measures implemented at the population-level, through to non-statutory measures implemented at the local- or even licensed premise-level. The breadth of available policies, the settings in which they are carried out and the key groups which they target, demonstrates the range of harm that alcohol causes.

Key findings from the review are as follows.

Taxation and price regulation

Taxation and price regulation policies affect consumer demand by increasing the cost of alcohol relative to alternative spending choices. Policies that reduce the affordability of alcohol are the most effective, and cost-effective, approaches to prevention and health improvement. For example, an increase in taxation leads to substantial health and social returns and an increase in government revenue. Changing taxes does not incur a

significant cost to government and, depending on the precise consumption response, is likely to generate higher revenues (which could be used to mitigate any potentially regressive effect). According to Treasury forecasts, cuts in alcohol duty since 2013 are projected to have reduced income to the Exchequer by £5 billion over five years, reducing to £3.45 billion when consumption increases are considered. This does not include increases in societal and NHS costs.

Implementing a MUP is a highly targeted measure which ensures any resulting price increases are passed on to the consumer improving the health of the heaviest drinkers who experience the greatest amount of harm. MUP would have a negligible impact on moderate drinkers and the price of alcohol sold in pubs, bars and restaurants. Combining an increase in taxation alongside the implementation of a MUP is estimated to lead to substantial gains in alcohol-related health, reductions in crime and work absence costs and increases in Exchequer revenues. This reduction is greater than that achieved by a MUP in isolation.

Bans on the sale of alcohol below the cost of taxation do not impact on public health in their current form, and restrictions on price promotions may reduce overall alcohol consumption but can be easily circumvented.

Importantly, taxation and pricing policies need to be updated in line with changes in income and inflation, in order to retain their relative affordability and therefore be able to impact upon alcohol-related harm.

Regulating marketing

Attempts to quantify the impact of marketing at a population-level are hindered by methodological shortcomings. Such attempts tend to consider relationships over short time periods at the aggregate-level, considering all alcohol together or separating out the broad categories of beer, wine and spirits. However marketing occurs at the brand-level where the marginal effect is small, thus the loss of variance due to national aggregation of data leaves little to correlate with alcohol consumption.

The strongest evidence for the impact of marketing comes from reviews of longitudinal and cohort studies of children, which consistently report that exposure to alcohol marketing increases the risk that children will start to drink alcohol, or if they already drink, will consume greater quantities. Such findings are consistent across a variety of study designs, approaches and countries and many studies observe their effects after adjusting for differences in family and peer drinking or other cultural incentives to consume alcohol. Literature reviews are also beginning to show that this relationship holds for child exposure to digital marketing, a media platform with vast potential to reach large numbers of children and young people.

While the relationship between marketing and child alcohol consumption does not directly provide evidence that limiting marketing will reduce consumption the evidence is sufficient to support policies that reduce children's exposure to marketing. Emerging research has focused on specific mechanisms to do this, such as watershed bans or online age verification filters, however the available evidence is not able to guide the most effective and cost-effective approach to achieve this aim.

Modelling studies have estimated that complete and partial marketing bans are highly effective and cost-effective however these measures are rarely implemented and may not be considered a pragmatic or proportionate response. Complete bans are shown to be more effective and cost-effective than partial bans.

A consistent body of research demonstrates considerable violations of content guidelines within self-regulated alcohol marketing codes, suggesting that the self-regulatory systems that govern alcohol marketing practices are not meeting their intended goal of protecting vulnerable populations.

Regulating availability

Policies that sufficiently reduce the hours during which alcohol is available for sale – particularly late night on-trade sale – can substantially reduce alcohol-related harm in the night-time economy. When simultaneously enforced and targeted at the most densely populated areas this policy is cost-effective. While international evidence suggests that harms and consumption increases alongside increases in the temporal availability of alcohol, evidence derived from changes in the Licensing Act presents more of a mixed picture. On the whole, a small body of research suggests that the Act did not increase total violence, but may have shifted it later in the night, however broadly speaking the number of hospital admissions increased following the Act.

Policies which seek to regulate the availability of alcohol through reducing the density of licensed premises theoretically have the potential to reduce inequalities as they can be targeted at specific areas with known high levels of alcohol-related harm. A considerable body of research examines the relationship between AOD, alcohol consumption and a range of alcohol-related harms however the majority of evidence is carried out in North America, Australia and New Zealand. This hinders the applicability of their findings when using the evidence in a local context as the impact of outlet density is closely tied to regional factors such as the proportion of on- and off-trade outlets, socioeconomic and demographic trends.

Reviews assessing the relationship between density and consumption and/or harm show mixed results. Broadly speaking, however, evidence for a relationship between higher AOD and problems associated with social disorder is strong, whereas the relationship between AOD and consumption is less clear and the relationship for chronic

health harms is still emerging. The causality underpinning these relationships is unclear, partly because demand can increase supply, as well as vice versa. Furthermore, using the scientific literature within the constraints of the Licensing Act 2003 has proved challenging.

Low quality evidence suggests public-private partnerships involving voluntary pledges to reduce the number of units in the market are ineffective, given that most industry activity to reduce the number of units occurred regardless of the pledge. Furthermore, this activity related to the launch and promotion of new products, potentially increasing the size of the market.

Providing information and education

Although playing an important role in increasing knowledge and awareness, there is little evidence to suggest that providing information and education is sufficient to lead to substantial and lasting reductions in alcohol-related harm. However, these policies may increase public support for more effective policies. Importantly, health information is vastly outspent by pro-alcohol marketing and such competing messages may, in part, account for the lack of observed sustained behavioural change.

Though a popular intervention, alcohol education programmes carried out in schools and higher education settings are not well supported by the evidence base. When beneficial effects are reported, they tend to be in the short-term, and are often not replicated by future research suggesting such policies may be highly population and setting specific. Furthermore, modelling suggests that these programmes are not cost-effective.

The evidence cannot point to labelling as an effective mechanism to change behaviour nonetheless, similar to the provision of information, labelling can increase consumer awareness and knowledge. It should be acknowledged that the evidence-base is largely reliant on the evaluation of voluntary action by industry, or the poorly implemented mandatory US label which has remained unchanged since its introduction in 1985. Label content or forms are rarely stipulated and these are important aspects of an effective health warning.

There is no evidence in favour of industry health messages and the OECD have concluded that *“the delivery of education messages by private sponsors [is found to] have no significant public health effects”* (4).

Managing the drinking environment

Emerging research has evaluated interventions that are carried out within a local area or specific drinking premise. Many of these interventions are resource intensive, an aspect overlooked in much of the scientific literature to date. The aims of these interventions are generally to reduce the acute harms relating to alcohol consumption, such as violence or intoxication, rather than the long-term health damages of repeated intoxication. Research designs in this area vary greatly, and many policies have been infrequently evaluated. At best, interventions enacted in and around the drinking environment lead to small reductions in acute alcohol-related harm.

Multicomponent community programmes that co-ordinate their measures and are implemented through strong multi-agency partnerships, are effective, cost-effective and are amenable to local implementation. However, the evidence is predominantly based on the experience in Sweden and may not directly translate to the English context. Nonetheless, research based in England is progressing.

The evidence does not currently support server training, using safer glass alternatives or removing the sale of high strength alcohol as effective interventions for reducing the public health burden of alcohol, however the evaluations of these policies are typically low quality and further research is likely to change this estimate. Note the latter may be undermined if the sale of cheap and high strength alcohol is readily available from neighbouring areas. It should be noted that these policies are all grounded in solid basic principles. For example, it is sensible to train your staff of the hazards to serving to intoxicated individuals, and replacing glass with plastic alternatives will inevitably remove the risk of injury occurring from glassware.

Bans on public drinking may not be a desirable public health policy given that they may impact on the most marginalised groups in society, including the homeless.

Reducing drink-driving

There is strong evidence to support enforced legislative measures for reducing road traffic crashes, casualties and fatalities as effective measures. Enforcement, using breath testing is cost-effective. Policies which specify lower legal alcohol limits for young drivers are effective and cost-effective at reducing casualties and fatalities in this group thus have the potential to reduce inequalities given that the vast majority of harm on the road is experienced by young driver.

Other regulatory measures are also proven to be effective including immediate licence revocation, although such a policy may represent a significant cultural and legislative change within the English setting. There is no strong evidence to suggest that either

population or local incentive measures are effective in increasing the uptake of designated drivers, however the principles underpinning this intervention are logical.

Other drink-driving policies can reduce reoffending in drink-driving offenders, with better evidential support for alcohol ignition interlocks compared to mandated education programmes for offenders. The former is cost-effective however requires administrative resource and supervision.

Treatment and brief interventions

Health interventions aimed at drinkers who are already at risk, such as identification and brief advice, and specialist treatment for people with harmful drinking patterns and dependence are effective approaches to reducing consumption and harm in these groups. Typically, these interventions show favourable returns on investment. However, their success depends on large-scale implementation and dedicated treatment staffing and funding streams, without which they are less effective.

The overall policy mix

Alcohol policies rarely operate independently or in isolation from other measures. For example, it is known that stronger overall policy environments are associated with lower levels of alcohol-related cirrhosis mortality and binge drinking and the OECD suggests that combining alcohol policies may create a 'critical mass' effect, changing social norms around drinking to increase the impact on alcohol-related harm (416). Alcohol policy should be coherent and consistent. For example, warning labels highlighting the risks of alcohol consumption should not be undermined by a unit price that encourages heavy consumption. Such consistency is essential to creating a supportive environment for society, including for those who wish to adopt healthier lifestyles by reducing their alcohol consumption, and for those who drink at hazardous and dependent levels. The challenge for policy makers is implementing the most effective and cost-effective set of policies for the English context. This review provides evidence to identify those policies.

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