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# Alcohol pricing and criminal harm: a rapid evidence assessment of the published research literature

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# Summary

## Introduction and aims

This rapid evidence assessment (REA) of the published research literature provides a specific Home Office focus after previous independent reviews on the effects of pricing and taxation on alcohol consumption and alcohol-associated harms. It looks specifically at the effects on crime-related outcomes.

The REA covers

- primary studies examining a direct association between alcohol pricing/taxation and crime-related outcomes (4,975 studies were reviewed and 36 papers met the inclusion criteria)
- review-level evidence for associations between pricing and consumption and between consumption and crime (58 reviews or meta-analyses)
- new primary research examining the association between pricing and consumption.

The latter two areas provided an update to the recent review by Booth *et al.* (2008).

This report examines the first of the three areas, and attempts to answer the following research question:

*To what extent does the research evidence support a direct association between the price of alcohol and crime, disorder and anti-social behaviour?*

## Methodology

An REA is a tool in the systematic review methods family and is based on comprehensive electronic searches of appropriate databases, internet sources and follow-up of cited references. To complete REAs in a short timeframe, researchers make some concessions in comparison with a full systematic review. Exhaustive hand searching of journals and textbooks is not undertaken, and searching of 'grey' literature is necessarily curtailed. This shortened timeframe is essential for policy makers to meet deadlines, but increases the risk of publication bias.<sup>a</sup>

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<sup>a</sup> The tendency for studies that find significant relationships between variables of interest to have a higher chance of acceptance in academic journals than studies that find no such relationships.

## Key findings

### Alcohol tax/price *increases*

Increases in alcohol tax/price were associated with reductions in overall crime, violent crime, sexual assault and criminal damage/property offences. Evidence for the effect of tax/price increases on homicide and domestic violence was inconclusive and there was conflicting evidence regarding tax/price increases being associated with a lower incidence of robbery. No evidence was found on the association between alcohol tax/price increases and anti-social behaviour.

### Alcohol tax/price *decreases*

The evidence base for alcohol tax/price decreases and their impact on crime is smaller than that for tax/price increases. The evaluation evidence is dominated by Scandinavian studies on recent tax reductions, which concluded that while tax reductions had led to increases in overall crime levels, they had not led to increases in violent crime, domestic violence or robbery, and had led to a reduction in public order offences. In non-Scandinavian and modelling studies, decreases in tax/price were associated with an increase in overall crime, violent crime, and drunk and disorderly behaviour. Evidence for the effect of tax/price reductions on homicide was inconclusive. No evidence was found for an association between alcohol tax/price reductions and anti-social behaviour.

Specifically:

- **Overall crime:** Taxation decreases were associated with increased overall crime rates, and taxation increases with decreased rates of crime.
- **Violent crime:** While taxation *increases* in Australia and the US led to reductions in violent crime, studies on taxation *decreases* in Scandinavia found no significant effects on violent crime. Several correlational studies,<sup>b</sup> including studies from the UK, supported an association of cheaper alcohol with higher violent crime rates. With two exceptions, modelling studies estimate that higher prices were associated with reductions in violent crime.
- **Sexual assault:** Most studies are based on modelling, which consistently links higher alcohol prices to lower rates of sexual violence. This finding was supported by one study that analysed the effects of actual price variations.

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<sup>b</sup> Studies where researchers investigate the extent to which variations in one factor (for example, price) correspond with variations in one or more other factors (for example, crime rates).

- **Homicide:** Evidence on whether murder rates are responsive to alcohol price changes was inconclusive.
- **Domestic violence:** Evidence on whether domestic violence rates are responsive to alcohol price changes was inconclusive.
- **Drunk and disorderly behaviour:** Only two studies covered this offence with both evaluating the same large tax reduction. Both studies found that the tax reduction was associated with increases in drunk and disorderly behaviour. Overall the evidence base was not strong enough to arrive at firm conclusions.
- **Public order offences:** Only one study was identified, which found that a large tax decrease was associated with a decrease in public order offences.
- **Criminal damage:** The evidence was mainly from several modelling studies that project that tax and price increases would reduce criminal damage offences. Only one older observational study was located, with findings consistent with the modelling studies. The evidence base was weaker than for overall and violent crime.
- **Robbery:** The evidence on whether robbery rates were responsive to alcohol price changes was inconclusive.
- **Anti-social behaviour:** There was no evidence on whether rates of anti-social behaviour were responsive to alcohol price changes.
- **Specific policies:** A large majority of modelling studies from both the UK and internationally estimated that increased alcohol taxes, minimum alcohol prices or restrictions on discounting would be associated with a reduction in alcohol-related crime. The evaluation evidence relates only to taxation or naturally occurring price changes.

### **Conclusions and points for consideration**

Evidence from this review is consistent with previous forecasts that levels of crime are reduced following tax/price *increases* (Purshouse *et al.*, 2009). Significantly, more recent evidence from Scandinavia examined tax/price *reductions*. This review concluded that it was not possible to demonstrate a symmetrical effect between the effects of price increases and corresponding effects from price reductions for specific crime-related outcomes. On the whole, US evidence is more supportive of links between alcohol price and crime than the more variable Scandinavian evidence base. The role of policy and cultural contexts in explaining inconsistent effects remains unclear. Few evaluations of actual price or tax changes in the UK have been carried out but several modelling studies are specific to England and Scotland. UK evaluation studies showed significant associations between lower alcohol prices and higher rates of hospital admissions for violence-related injuries.

Most studies support an association between higher alcohol taxation/pricing and decreased crime. Available evidence typically focuses on average patterns of consumption and is unable to clarify whether specific pricing policies are differentially related to patterns of drinking.

# 1. Introduction and methodology

## Introduction

Evidence for the link between changes in the price of alcohol and inverse changes in consumption is strong and well established. Although price is only one factor influencing levels of consumption considerable numbers of research studies, including two meta-analyses (Wagenaar, Salois and Komro, 2008; Gallet 2007 confirm it plays an important role. Building on previous work for the Department of Health that considered the effects of alcohol price on alcohol consumption and related harm (Booth *et al.*, 2008; Brennan *et al.*, 2008) this review updates and explores the evidence for a direct link between alcohol price and crime, disorder and anti-social behaviour in more detail to answer the following question:

*To what extent does the research evidence support a direct association between the price of alcohol and crime and disorder?*

## Background

Alcohol-related crime and disorder cost England and Wales between £8 billion and £13 billion in the year (2007–08 figures) (House of Commons Daily *Hansard* 2009), including costs related to the anticipation of, response to, and consequences of crime. The 2009/10 British Crime Survey, estimated there were 986,000 violent incidents where the victim believed the offender(s) to be under the influence of alcohol (Flatley *et al.*, 2010). The burden of alcohol includes costs incurred by victims, by offenders, by families of both parties, and by society in general, including the healthcare, social care and criminal justice systems.

Although the actual sales price of most types of beverage alcohol has, on average, increased over the last 30 years, the increase in price has not kept up with disposable income in many western countries. In 2007 alcohol was 69% more affordable in the UK than it was in 1980 (NHS, 2008), with the trend even more pronounced in the off-trade sector. A cheapening in the real price of alcohol has been matched by an increase in consumption. Price is only one of the factors influencing levels of consumption, but the evidence linking alcohol price and consumption is strong and consistent. Clearly, individual, cultural and social factors also play a part and have a differential effect for specific types of crimes in particular settings and contexts.

Many factors also contribute to the association between alcohol and crime; some directly related to the price of alcohol, some completely independent, while yet others may carry some difficult-to-attribute association. Graham and Homel (2008) situate alcohol-related crime within a model that recognises the wider societal/cultural context (including alcohol-related norms, attitudes and expectations) as well as the drinking context (including situations, locations and settings). To these may be added individual characteristics (demographic characteristics, attitudes, expectations and personality characteristics, such as impulsivity and willingness to take risks). In terms of the measurement of drinking behaviour, considerations of both peak volume and drinking patterns are important, with crime being more clearly related to acute intoxication than to longer term chronic drinking.

While most studies support a correlational link between alcohol consumption and crime there is still scientific debate about the causality of the link between consumption and crime and the relevant mechanisms. This report does not seek to add to the debate but discusses issues of causality where appropriate (also see Appendix 1).

## **Methodology**

This rapid evidence assessment (REA) of the literature draws heavily on the methods employed for systematic reviews using comprehensive electronic searches of appropriate databases and some searching of print materials. The REA method has been developed for use in public policy research and evaluation and aims to:

- search the electronic and print literature as comprehensively as possible within the constraints of a policy or practice timetable
- collate descriptive outlines of the available evidence on a topic
- critically appraise the evidence
- sift out studies of poor quality
- provide an overview of what the evidence is saying (Davies, 2004).

To complete an REA in a relatively short timeframe, as compared to a systematic review, a research team makes concessions. As a result, exhaustive database searching, hand searching of journals and textbooks, and searching of 'grey' literature are not immediately undertaken. This shortened timeframe is essential for policy makers to meet deadlines, but increases the risk of publication bias.<sup>c</sup>

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<sup>c</sup> The tendency for studies that find significant relationships between variables of interest to have a higher chance of acceptance in academic journals than studies that find no such relationships.

Following consultation with the commissioners of this work, it was agreed to exclude the extensive literature on drink-driving offences from this review.

## **Identification of studies**

### **Overview of search process**

The search process consisted of three main phases:

- broad scoping searches of bibliographic databases to identify systematic reviews relating to alcohol and crime
- detailed searches of bibliographic databases focusing on specific questions to be addressed by the review
- reference searching, including citation and hand searches of relevant studies, together with web browsing using Internet search engines undertaken throughout the duration of the review.

Each phase is described in Appendix 1 along with full details, including sources searched and keyword strategies.

### **Summary of included studies**

A total of 4,975 references were screened from across 12 databases. Of these 1,294 were removed as duplicates. A further 590 references were identified from citation searches. After title and abstract screening, 36 papers were used as the evidence base for Review 1, covered in this report. For a full PRISMA flow diagram, see Appendix 1.

Twelve of the 36 papers examined what actually happened when alcohol taxes/prices were increased or decreased in a variety of settings. These mainly constituted natural experiments in Scandinavia, Australia or the US. Such studies have the inherent advantage of recording actual occurrences. However, they vary in the degree to which they are able to control for other potential explanations for changes in levels of crime-related activity that may relate to factors occurring at the same point in time. They also include a wide range of contextual factors that may or may not be present in any country (such as the UK) to which the findings might be applied.

The remaining 24 papers reported modelling studies that used available data (either contemporary or historical) and published evidence to estimate the likely effects of price policies or naturally occurring price changes on changes in crime-related activity. Such

studies have the potential to examine factors in addition to price and crime, and to explore the relative importance of these factors as well as to test the robustness of their underpinning assumptions through sensitivity analyses. However, such studies are not designed to establish a conclusive cause and effect relationship and their findings are vulnerable to other unidentified factors that affected the evidence and data underlying the model.

On balance, the evidence base was stronger for overall crime and violent crime than for more specific crime types like domestic violence, sexual assault and robbery. Very few studies covered criminal damage, public order offences and anti-social behaviour.

### **Quality assessment of included studies**

All studies were required to meet a minimum quality threshold of using a research or evaluation design, providing an adequate description of methods and adequate reporting of results. No relevant studies were excluded at the sift stage. Studies were then divided into those reporting an estimated effect or an actual effect of a price change and were assessed against a number of different criteria. Appendix 1 provides detailed information on the quality review and data synthesis stage of the REA.

## **Limitations of the evidence base**

### **Study design and methodology**

As mentioned the studies included in this REA fall into two broad categories. The limitations associated with these studies are discussed below:

1. **Examinations of observed prices and crime rates.** These include cross-sectional studies,<sup>d</sup> time-series analyses,<sup>e</sup> and natural experiments. Cross-sectional designs describe the strength of associations between price and crime (for example, areas with higher beverage prices have lower crime rates) but are unable to establish whether one factor has caused the other. Time-series designs describe co-variations of price and crime over time, and can control for other co-occurring trends. Natural experiment designs examine whether a sudden 'shock' to price is reflected in changes in crime at the time of the shock or whether, for example, crime rates change in US states that have seen a price change but not in comparison states where prices were stable. The degree to which inferences can be made from each study strongly depends on whether the comparisons being made are appropriate

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<sup>d</sup> Studies measuring both alcohol price and crime-related harm at a single point in time.

<sup>e</sup> Studies measuring both alcohol price and crime-related harm at repeated points in time.

or not. Designs comparing the same place over time and/or comparable places at the same time generally provide a stronger indication that one factor has a causal effect than cross-sectional designs involving a single locality. An important quality marker is whether studies are statistically powered to detect the effects they set out to detect. Commonly, authors did not comment on the statistical power of their analyses. This means that it is often not possible to determine whether a non-significant finding is indicative of 'no effect' or whether it is due to a lack of statistical power to determine whether or not there is an effect.

**2. Modelling studies.** Modelling studies are unable on their own to help determine whether one factor is likely to have caused another. If, however, evaluations of past price changes give reason to believe that changes in alcohol pricing are causing changes in alcohol consumption and the incidence of crime, they can help to estimate how much of an effect on crime might be expected for a given tax or price rise. The quality of such studies is dependent on the availability of data, whether they make appropriate assumptions about how the system will behave in the future, and whether they quantify uncertainties in the modelling assumptions. See also the note on causality in Appendix 1.

### **Types and quality of data**

All analyses, whether providing a basis for modelling studies or evaluations, heavily depend on available data on alcohol pricing, consumption and crime.

In terms of price, many authors use tax as a proxy for price, sometimes without demonstrating that tax changes translated into corresponding price changes. Tax increases may not be passed on to consumers in full or retailers may take the opportunity to increase prices even further, depending on the competitiveness of the market. On occasion, price indices are used that are based on an incomplete sample of goods. Such indices are useful for investigating price trends, but may not be representative of the distribution of prices in the whole market (Young and Bielinska-Kwapisz, 2003).

A common problem with consumption data is that individual-level data typically stem from school or general population surveys, which either tend to under-represent both young adult and very heavy drinkers, or heavy drinkers underestimate their drinking when self-reporting their behaviour (Stockwell *et al.*, 2004, Townshend and Duka, 2002). On the other hand, estimates of per capita consumption from sales or customs data do not account for either unrecorded consumption or the distribution of consumption in the population.

In terms of criminal justice data, authors commonly point to significant limitations in the scope, reliability and comparability of indicators over time and jurisdictions (see Appendix 3 evidence tables). Typically, these limitations concern changes in recording practices or crime coding; underreporting (and changes in underreporting over time) of offending behaviour and victimisation, as well as non-response bias in population surveys. Finally, the results of studies may be influenced by the type of data used, for example consumer/victim self-reported survey data or administrative data sources, but it has not been possible to examine the impact of such differences in this report.

### **Applicability to the UK policy landscape**

Few of the reviewed studies on associations between alcohol price changes and crime originate from the UK, and these are mostly modelling studies with the exception of two studies showing significant associations between beer pricing and violence-related hospital admissions. It was not possible to locate studies looking at UK trends in pricing and non-violent crime over time, nor has a significant one-off price or taxation change occurred that could have been evaluated. As found by an earlier review (Booth *et al.*, 2008) much evidence was based on studies conducted in the US, with a dominant second set of studies relating to evaluations of a single price change in Finland. The predominance of such studies creates concerns regarding differences arising from variations in cultural contexts. For example, the legal age for buying and drinking alcohol in the US is higher than in the UK (Carpenter and Dobkin, 2008), while in Finland, there is a tradition of a more restrictive alcohol policy. On the whole, US evidence was more supportive of alcohol price to crime links than the more inconsistent Scandinavian evidence base. However, drinking preferences in Finland and the US are not easily comparable to those in the UK, with the UK remaining more oriented towards on-trade drinking than many other countries.

Apart from the lack of UK-based policy evaluations, many of the reviewed studies evaluate and model significant one-off changes in alcohol price (for example, a large increase in tax) to examine a readily discernible effect. Such changes may bear less relation to such small, incremental changes as recently observed in the UK. A further limitation is that studies tend to focus on major crimes and do not typically examine public disorder and anti-social behaviour offences.

### **Differences between tax/price increases and tax/price decreases**

It cannot be assumed that there is a consistent symmetrical effect between crime-related outcomes following a price increase and those same outcomes following a price decrease. While this review did not find studies which considered the symmetry of price effects in

alcohol pricing specifically, asymmetrical consumer responses to price increases and decreases have been reported in the economics literature. Generally, consumers appear to respond both more strongly and more rapidly to price *increases* than price *decreases* (for example, Abe, 1998; Bidwell, Wang and Zona, 1995). For this reason, this review presents evidence on these two types of price/policy change separately. Consistent with the general economics literature, effects seem to be more readily detected for price increases than for decreases, although this picture is somewhat complicated by the lack of comparability of study methods and settings. It should also be noted that asymmetrical responses to price increases or decreases may depend on the ordering of the change and not only on increases versus decreases. This is because consumer behaviour may adapt and preferences change.

## 2. Effects of alcohol tax or pricing changes on crime-related outcomes

### Effects of alcohol pricing on overall level of crime

#### Details of studies

The effects of alcohol pricing on crime in general were covered in five studies, represented by six papers, with the earliest published in 1996 and the most recent in 2009. Two studies were conducted in the US (Chaloupka and Wechsler, 1996; Saffer, 2001), two in the UK (Purshouse *et al.*, 2009a and 2009b) and the remaining study was reported in two papers from Finland (Herttua *et al.*, 2008a; Mäkelä Österberg, 2009). The Finnish study reported a natural experiment when quotas for travellers' tax-free imports of alcoholic beverages from other EU countries were abolished and excise duties on alcoholic beverages reduced in 2004, so that prices dropped by an average 33%. One US study (Saffer, 2001) evaluated the effect of a 1991 price rise.

A UK modelling study by Purshouse *et al.* (2009a) examined the potential impact of introducing varying thresholds of minimum price for a unit of alcohol, from 20p through to 70p, different discount restrictions in the off-trade, as well as targeted and general price increases in England for the total population and various subgroups of drinkers.

### Results

**Summary:** Evidence from both natural experiments and modelling studies support a link between alcohol pricing and overall crime: increases in tax/price were associated with reductions in overall crime whereas decreases in tax/price were associated with an increase in overall crime. Evidence was based on a small number of studies. The two UK-based studies were policy appraisals.

**Evaluation studies:** A study examining the impact of an actual increase in the price of beer in 1991 on young drinkers (Saffer, 2001) concluded that increased beer taxes reduced crime. Two studies analysed the effects of lowering alcohol prices. Chaloupka and Wechsler (1996) found that drinking practices of female US college students were sensitive to the price of beer, and lower prices and easy availability of alcohol on campus were correlated to more binge drinking and crime. Following an excise reduction of, on average, 33% in Finland in 2004, Mäkelä and Österberg (2009) reported an across-the-board increase in alcohol-related harms including crime-related outcomes. This increase in alcohol consumption and in

associated harms led to a recent policy U-turn within Finland. At the beginning of 2008 the Finnish Government increased the tax on spirits by 15% and on beer and wine by 10%. In January 2009 the tax on all alcohol increased by 10% and in October by an additional 10% in an attempt to curb alcohol consumption and related harm (Helakorpi, Mäkelä and Uutela, 2010). The conclusion from evaluation studies only was that a higher beer price was associated with a reduction in crime (one study) and a lowering of beer prices (one study) or an excise tax reduction (one study) was associated with an increase in crime.

**Modelling studies:** Reductions in overall crime following modelled price rises were estimated in two UK studies; Purshouse *et al.* (2009a) projected the effects of minimum unit prices, discount restrictions, general price rises on numbers and types of crimes for England. Estimated effects for minimum pricing ranged from savings of 500 to 83,000 crimes per year, with effectiveness estimates increasing steeply for higher minimum pricing thresholds. A 25% price increase affecting all beverages was estimated to lead to savings of 160,000 crimes per year, and a total discount ban in the off-trade sector to savings of 16,000 crimes. A second study (Purshouse *et al.*, 2009b) provided corresponding results for Scotland. In both modelling studies, crime harms were estimated to reduce as prices are increased, and crime reductions took place across the spectrum of violent crime, criminal damage and theft, robbery and other crimes. Crime harms were estimated to reduce particularly for 11 to 18-year-olds, who are disproportionately involved in alcohol-related crime and are affected significantly by targeting price rises at low-priced products. Hazardous drinkers aged 18 to 24 would be most affected by policies targeting prices in the on-trade sector. Crime avoided comes more from harmful and hazardous drinking groups than from moderate drinkers, whose consumption is less affected by most pricing policies. The lowest minimum pricing thresholds modelled would have marginal effects on crime.

## **Effects of alcohol pricing on violence (including assault)**

### **Details of studies**

In terms of specific crime types studies meeting the inclusion criteria for an association between pricing of alcohol and violence were by far the most plentiful. A total of 20 papers, reporting 17 studies, were identified with the earliest published in 1992 and the most recent in 2009. The majority of the studies were conducted in the US. However, studies from Sweden, Denmark, Finland, Australia and the UK were also represented. The most common type were modelling studies, followed by cross-sectional surveys and interview studies. There were two tax policy papers from an evaluation of the Living With Alcohol Project from

the Northern Territory in Australia. Several UK studies examined the association of beer prices with presentations of violence-related injuries to emergency departments.

## Results

**Summary:** Evaluation studies from the UK and elsewhere yield a consistent pattern that an *increase* in the price of beer or in drinks with an alcohol content greater than 3% is associated with a reduction in violent crime. However, evaluations did not detect any corresponding changes associated with large *reductions* in alcohol tax, suggesting that price increases and decreases may not have symmetrical effects. Methodological as well as contextual factors may also be important in explaining findings as studies on tax increases and decreases stem from different countries (McCambridge and Kypri, 2009; Room *et al.*, 2009). With few exceptions, modelling studies consistently estimated that increases in alcohol price/tax would be associated with a reduction in violent crime and decreases in tax/price with higher rates of violent crime.

**Evaluations:** Evidence from natural experiments in Finland (Herttua *et al.*, 2008a]; Herttua, Mäkelä and Martikainen, 2008b) and Denmark (Bloomfield, Rossow and Norstrom, 2009; Bloomfield *et al.*, 2010) showed no link between significant tax reduction and violent crime rates or related hospitalisations, except in the underage drinker group for the latter. In Finland, although assault and battery rates increased by 4.5%, this was not significant. It has been suggested that alcohol consumption may already have been at high levels and therefore less responsive to price decreases (saturation). Bloomfield *et al.* (2010) also point to a contradiction between survey-based harm indicators (showing a decrease in harm) and official health and social statistics, many of which show increases in level of harm. In two studies relating to the Northern Territory, Australia, experience of increasing tax on drinks with alcohol content of more than 3% (Chikritzhs, Stockwell and Pascal, 2005; Stockwell *et al.*, 2001) document a decrease in levels of violence after the introduction of a new beverage tax (combined with other programme activities). An international comparative study found that higher alcohol prices tended to be associated with lower rates of assault (Markowitz, 2000a). Similarly, an econometric analysis from the UK (Matthews *et al.* (2006) and Sivarajasingam *et al.* (2006)) found strong associations between temporal and regional variations in beer prices and risk of hospital admission for violence-related injuries, as did a cross-sectional survey with respondents to 29 emergency departments in different regions from the same group (Sivarajasingam *et al.* (2008). In summary, evaluation studies from the UK and elsewhere yield a consistent pattern across five studies that an *increase* in the price of beer (three studies) or in drinks with an alcohol content greater than 3% (two studies) is

associated with a reduction in violent crime. However, two evaluations from Scandinavia (three studies) did not detect any corresponding changes associated with large *reductions* in alcohol tax, suggesting that price increases and decreases may not have symmetrical effects.

**Modelling studies:** Evidence from the US, Scandinavia and the UK shows a generally consistent pattern, with violent crime rates estimated to increase as prices decrease, and decrease as prices increase. Andreasson *et al.* (2006) modelled for Sweden that expected tax decreases (40% for spirits and 15% for wine) would be associated with significant increases in assault rates (1,600 extra assaults). In four concurrent older modelling studies, Cook and Moore (1993c) estimated that a 10% increase in beer tax would be associated with a 3% decrease in violent crime, no decrease in assault (Cook and Moore, 1993b) or a 0.26% reduction in assault (Cook and Moore, 1993a). Chaloupka and Saffer (1992) estimated that an increase in beer tax would not result in a change to assaults. The four models are based on different US geographical regions, datasets and methods, which may explain the inconsistent results. Grossman and Markowitz (2001) modelled that for US college students, a 10% increase in the price of beer would be associated with a decline from 12.3% to 11.7% for trouble with police/authority and a decline from 31.2% to 30.2% in verbal/physical fights. They estimated that a 10% increase in the price of beer would reduce the number of college students involved in violence each year by 4%. Holder *et al.* (1995) estimated, in the context of EU accession, that for Sweden and Norway a reduction in taxation and abolition of retail monopolies would lead to an increase in alcohol consumption and violence, with an additional litre of per capita consumption related to a 9–10% increase in assault rates. Utilisation of the US National Crime Victimization Surveys allowed Markowitz (2000b and 2005) to project that a higher beer tax would decrease probability of being a victim of assault by between 0.03 and 0.05%. The two recent UK modelling studies (Purshouse *et al.*, 2009a and 2009b) on the effects of minimum alcohol pricing, discount bans and general price rises in England and Scotland again estimated reductions in violent crime as prices increase. For example, in England, low levels of minimum price (20–30p per unit) were not estimated to affect violent crime substantially, but higher levels had increasing effects, with estimated reductions of 2,100; 7,700; 14,800 and 22,100 violent crimes per year for minimum price thresholds of 40p, 50p, 60p and 70p per alcohol unit (=10ml ethanol), respectively. A total ban on off-trade price discounting was estimated to reduce violent crime by 4,400 cases per annum, a 10% across-the-board price increase by 15,100 and a 25% across-the-board price increase by 37,800.

# Homicides

## Details of studies

The inclusion criteria for the effects of alcohol prices or taxes on homicides were met by eight studies, with the earliest published in 1992. The majority were econometric/modelling studies from the US, augmented by several correlational studies. One appraisal anticipated what would happen following a price policy change in Sweden. Another study evaluated what actually happened when alcohol duty rates were lowered in Finland.

## Results

**Summary:** Evidence regarding an association between alcohol pricing and homicide is inconclusive.

**Evaluations:** Sloan, Reilly and Schenzler (1994) used an alcohol price index (1982–88) relative to the 1990 base year and found no significant effects for primary cause deaths. Zeoli (2008) was unable to support a hypothesis that an increase in federal or state beer taxes would lead to a reduction in intimate homicide. However, Zeoli points out that the observed increases had been very small. Sen (2006) reports a significant correlation between child homicide deaths and beer tax rates (elasticity -0.19),<sup>f</sup> and goes on to suggest that a 10% rise in beer tax would be associated with a 2% drop in child homicide if the relationship was causal. In summary, the three evaluations yield inconclusive results, with one study reporting a significant correlation between child homicide and beer tax, and the other two observing no significant change in overall homicide rates associated with alcohol price increases (one study) or higher beer taxes (one study). It is unclear whether the studies were statistically powered to detect small effects.

**Modelling studies:** Most studies report econometric projections. Several US studies (Chaloupka and Saffer 1992; Cook and Moore, 1993a and 1993b) projected that tax increases would lead to modest reductions in homicide. A further US modelling study (Cook, 2007) estimated no significant change in the homicide rate after a hypothetical beer tax rise, whereas a final study estimated no increase in homicides following an decrease in taxation in Sweden (Andreasson *et al.*, 2006).

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<sup>f</sup> Price elasticity is an economic term used to define the relationship between the price of a product and its demand. Demand for alcohol is relatively price inelastic; for example, a 10% price rise would lead to a less than 10% reduction in consumption.

## **Rapes (sexual assault)**

### **Details of studies**

There were eight studies that examined the association between rape and/or sexual assault and alcohol pricing, with the earliest published in 1992. Most were modelling studies conducted by two teams in the US.

## **Results**

**Summary:** With one exception, US modelling studies estimate a reduction in rape and sexual assault associated with beer tax/price increases. Survey-level correlational evidence suggests an association between higher alcoholic beverage prices and lower incidences of sexual assault, but a causal relationship has not been demonstrated in higher-level studies.

**Evaluations:** A large correlational study conducted by Markowitz (2000a) examined the relationship between the price of alcoholic beverages and the incidence of sexual assault in 16 countries. Using data from the 1989 and 1992 International Victimization Surveys, the sample comprised almost 50,000 respondents. Markowitz found that where country fixed effects were not included, higher alcoholic beverage prices were associated with lower incidences of sexual assault.

**Modelling studies:** Chaloupka and Saffer (1992) modelled data from the FBI's uniform crime reports for the 1970s and 1980s against the state excise tax on beer. They estimated that higher beer taxes were associated with lower rates of rape. Cook and Moore (1993a and 1993b) used panel data and annual data on rape from 48 neighbouring states (1979–88) to estimate that a 10% increase in beer tax would reduce rapes in the US by 1.3%. In a study of violence on college campuses Grossman and Markowitz (1999 and 2001) used data from the large scale Core Alcohol and Drug Survey of college students (N=120,000) conducted in 200 US colleges or universities (1989–91). They calculated that a 10% increase in the price of beer would be associated with a decline from 14.3% to 13.8% in 'sexual misconduct'. A US nationwide study by Markowitz (2000b; 2005) estimated that higher beer taxes would not lead to a change in cases of rape.

## **Domestic violence**

### **Details of studies**

There were four studies (five papers) that met the inclusion criteria for alcohol pricing and domestic violence, published between 1998 and 2008.

## Results

**Summary:** Modelling studies indicate a possible effect of alcohol price increases in reducing domestic violence. In contrast, a natural experiment found no significant difference in the reduction in domestic violence following a 33% average tax reduction.

**Evaluations:** In their study of an average 33% price reduction in Finland, Herttua *et al.* (2008a) and Herttua, Mäkelä and Martikainen (2008b) found a slight decrease in the rates of domestic violence (non-significant).

**Modelling studies:** Markowitz and Grossman (1998) estimated that a 10% increase in beer tax would reduce child abuse by females, but not males, by around 2%. A subsequent study by the same team (Markowitz and Grossman, 2000) computed that a 1% increase in the tax on beer would decrease the probability of physical child abuse by about 0.33%. Commentators expressed surprise that this was only found to affect women, concluding that perhaps women were more sensitive to changes in beer price than men. Markowitz (2000c) examined the relationship between alcohol prices and spouse abuse. The study found that a 1% increase in the price per ounce of pure alcohol would decrease the probability of domestic violence towards women by 5.3%, but no effect was reported on domestic violence towards men.

## Drunk and disorderly behaviour

### Details of studies

Only two recent studies, both from Finland, met the inclusion criteria for examining an association between alcohol pricing/taxation and drunk and disorderly behaviour (Koski *et al.*, 2007; Mäkelä and Österberg, 2009).

## Results

**Summary:** Evidence from the two studies showed that drunk and disorderly behaviour was sensitive to changes in alcohol pricing/taxation. Actual taxation decreases were accompanied by an increase in drunk and disorderly behaviour.

**Evaluations:** Mäkelä and Österberg (2009) reported that following a 2004 excise reduction in Finland averaging 33%, arrests for drunkenness increased by 7%. Koski *et al.* (2007) found that the same taxation decrease was associated with an 11% increase in intoxicated individuals apprehended by the police due to drunk and disorderly conduct.

# Public order offences

## Details of studies

Only one study, conducted in Finland, met the inclusion criteria for examining the relationship between alcohol price/tax and public order offences.

## Results

**Summary:** The only study that was available found that an alcohol tax reduction of 33% in Finland was associated with a reduction in public order offences.

**Evaluations:** Herttua *et al* (2008) evaluated a tax reduction, with no corresponding modelling studies. This study found that a substantial tax reduction of 33% was accompanied by a 13.6% reduction in public order offences (violating domestic peace). The authors provided two possible explanations for their unexpected finding. First they suggested that in Finland the association between alcohol consumption and violence was not as strong as might have been expected on the basis of earlier studies. Second, they suggested that it was heavy drinkers who were most likely to increase their alcohol consumption following the price reduction. So while they observed an increase in custody due to intoxication, resulting from an increased number of arrests among 'regulars' they noted that the number of arrests among the more occasional arrestees did not increase. This provided evidence for the importance of factoring in drinking patterns into any analyses of crime-related outcomes.

# Criminal damage

## Details of studies

There were four studies that met the inclusion criteria for the effect of alcohol on criminal damage, two from the US (both 2001) and two from the UK (both 2009).

## Results

**Summary:** An actual increase in beer price was correlated with a reduction in self-reported perpetration of criminal damage offences, a finding consistent with projections from three modelling studies from the US and the UK.

**Evaluations:** Saffer's (2001) correlational study used data from 32,000 people in the 1991 National Household Survey on Drug Abuse with data on state beer taxes and found that beer taxes reduce the likelihood of self-reported arrest, property crime, and property damage.

**Modelling studies:** Using data from a survey of 120,000 college students, Grossman and Markowitz (2001) modelled an inverse relationship between increase in beer prices and four types of violence, estimating that a 10% increase in the price of beer would be associated with a decline from 7.5% to 7.1% for property damage. Purshouse *et al.* (2009a and 2009b) estimated that pricing policies could reduce criminal damage in England and Scotland. A 10% across-the-board price rise on all products (this is not the same as a 10% rise in taxation) in England was estimated to reduce criminal damage by 27,600 offences per annum. A total ban on off-trade discounting was estimated to reduce offences by 6,200 per year, with partial restrictions on discounting having smaller effects. Minimum prices below 40p would have little effect, but levels from 40p to 70p per unit were estimated to see increasing levels of effectiveness (for England: reductions of 2,200 criminal damage offences per annum for 40p, 10,300 offences at 50p, and 30,000 offences per annum at 70p).

## Robbery

### Details of studies

Referring to six separate studies, eight papers met the inclusion criteria examining an association between alcohol pricing and robbery, with the earliest published in 1992 and the most recent in 2005. The majority of the studies were conducted in the US.

## Results

**Summary:** The evidence regarding the probability that increases in alcohol prices or higher taxes would be associated with a lower incidence of robbery is contradictory. A natural experiment in Finland found no significant difference in robbery, while a multinational comparison found associations between pricing levels and robbery rates. Modelling studies also provide inconclusive results.

**Evaluations:** A study by Markowitz (2000a) of 50,000 respondents across 16 different countries found that higher alcoholic beverage prices was associated with lower incidences of robbery, assault, and sexual assault in models where country fixed effects were not included. In contrast, a natural experiment in Finland found no significant change in robbery rates (indeed, it reported a non-significant reduction of 12.4%) following a tax decrease.

**Modelling studies:** Carried out in 1992/93, three US modelling studies estimated that raising beer taxes would reduce robberies (Cook and Moore, 1993a and 1993b; Chaloupka and Saffer, 1992). However, a later US modelling study (Markowitz, 2000b and 2005)

estimated that higher beer taxes would not affect the rates of robbery. Considerable uncertainty exists regarding the effects of price on alcohol-related robbery.

## **Anti-social behaviour**

### **Details of studies**

There were no studies that met the inclusion criteria for examining the relationship between alcohol pricing and anti-social behaviour.

### **Results**

None.

Extensive searches found no specific evidence for an association of anti-social behaviour with the pricing of alcohol. Anti-social behaviour has no internationally recognised definition, is difficult to record consistently, and does not figure in the FBI list of crimes used by economists for the majority of econometric pricing studies of the 1990s and early 2000s.

### 3. Conclusions and points for consideration

Compared with numerous studies on the association between alcohol pricing and consumption, the review found relatively few studies evaluating the effects of changes in alcohol pricing or taxation on crime. The studies mainly constituted natural experiments in Scandinavia, Australia or the US. Modelling studies, which estimate the likely effects of price policies, were more plentiful. On balance, the evidence base was stronger for overall crime and violent crime than for domestic violence, sexual assault and robbery. Very few studies covered criminal damage, public order offences and anti-social behaviour.

The main findings from the review are highlighted below.

- The evidence base for a direct association between alcohol taxation or price changes and crime-related outcomes mainly comprises studies that analysed what had happened following actual changes in alcohol price or tax, primarily in the US and Scandinavia, and modelling studies that estimated the expected effects of future alcohol tax or price changes and levels of criminal activity.
- This evidence suggested that, on the whole, price and tax *increases* tend to be associated with reductions in crime, whereas price and tax *reductions* have less consistent relationships with crime. There appeared to be relatively stronger associations between alcohol price and overall crime, violent crime, sexual assault, and a weaker association for criminal damage.
- Only a few studies, with sometimes inconsistent findings, were available for the links between alcohol pricing and specific offence types, namely; homicide, domestic violence, public order offences, drunk and disorderly behaviour, robbery and anti-social behaviour. Most, but not all, identified studies supported an association between increases in alcohol taxation/pricing and decreased crime. Thus, no firm conclusions can be drawn on whether or not there are direct effects of pricing changes on the latter types of offences.

Evidence from this review is consistent with previous forecasts of crime reductions following tax/price *increases* (Purshouse *et al.*, 2009). Significantly, more recent evidence from Scandinavia examined tax/price *reductions* and this review concludes that it is not possible to demonstrate a symmetrical effect between the effects of price increases and corresponding effects from price reductions for specific crime-related outcomes.

Most studies supported an association between higher alcohol taxation/pricing and decreased crime. Available evidence typically focused on average patterns of consumption and was unable to clarify whether specific pricing policies were differentially related to patterns of drinking. The degree to which alcohol pricing and crime are directly and causally related or a product of common underlying individual and societal factors remains an active area of research, with various theoretical models proposed.

# Appendix 1: Detailed methodology

## Use of terminology

For consistency this report uses 'crime-related outcomes' to cover a pre-defined list of violence, crime and disorder-related phenomena including: violence, rape and sexual assault, domestic violence and child abuse, drunk and disorderly behaviour, public order offences, criminal damage, robbery, and anti-social behaviour. Where findings relate only to a particular type of crime then that crime is specifically identified.

## Criteria for inclusion and exclusion of studies

This review focused on research published in English in 1990 and later. For inclusion in review one (Alcohol Pricing and Crime-related Outcomes) a study had to meet the following criteria:

- data published between 1990 to date
- in English language.
- measures at least one tax or pricing change/comparison as an 'input'
- measures at least one violence, crime or disorder outcome.

## Search strategy

Details of each search phase and sources searched are presented here. An illustrative search strategy is included in Appendix 2. Full details of all search strategies for all sources are available from the authors on request.

### Phase 1: Initial broad scoping searches

The aim of this phase was to identify studies for possible inclusion, to familiarise the assessment team with the relevant literature from the social science-related disciplines and to identify search terms to inform more detailed keyword strategies for Phase 2. Conceptually, the scope was alcohol and crime, and systematic reviews.

The assessment team searched five bibliographic databases, combining terms relating to alcohol with terms relating to crime. Search results were limited using systematic reviews filters (Wright and Sowden, 2004) and date restrictions (1990 to present). No language restrictions were applied. Searches were undertaken in early January 2010.

### Sources searched

Campbell Collaboration
NCJRS – National Criminal Justice Reference Service abstracts
SSCI – Social Sciences Citation Index
Sociological abstracts
WPSA – World Political Science Abstracts

### Phase 2: Detailed searches

These searches aimed to identify studies addressing specific questions for the review.

Conceptually, the scope was:

- alcohol and price (or tax) and crime-related outcomes
- alcohol and consumption level and crime-related outcomes
- alcohol and location and crime-related outcomes.

In all, 12 bibliographic databases were searched. Terms were combined to identify studies relevant to any questions addressed by the review. Search results were not limited by study design. Date restrictions (2000 to present) were applied. No language restrictions were applied. Searches were undertaken in early February 2010.

### Sources searched:

ASSIA – Applied Social Sciences Indexes and Abstracts
Campbell Collaboration
CINAHL – Cumulative Index to Nursing and Allied Health Literature
Cochrane Library
IBSS – International Bibliography of the Social Sciences
MEDLINE®
NCJRS – National Criminal Justice Reference Service abstracts
PsycINFO®
Social Care Online
Sociological abstracts
SSCI – Social Sciences Citation Index
WPSA – World Political Science Abstracts

### Phase 3: Reference and citation searching

Searches aimed to identify studies relevant to the specific questions addressed by the review, to triangulate results of bibliographic database searches, and to extend results of bibliographic database searches beyond stated date restrictions.

Citation searches using the Web of Science (WoS) cited reference search facility and hand searching reference lists of key relevant studies were undertaken. Key relevant studies were identified through phases 1 and 2 of the search process, through previous projects (Booth *et al.*, 2008; Brennan *et al.*, 2008) and through the expertise and knowledge of the assessment team. Targeted searches of the world wide web were also undertaken. This phase of searching iteratively ran concurrently with other search phases and lasted for the duration of the project (from January to February 2010).

In addition to the standard health and addiction-related databases, searches included the social science electronic databases such as criminal justice abstracts, BIDS, sociological abstracts, political science abstracts, the National Criminal Justice Reference Service (NCJRS) abstracts database search – summaries of more than 200,000 justice and substance abuse resources), PsycInfo and ISI Web of Social Sciences, as well as the publications sites of the government departments to identify government-funded research. Relevant professional networks were also accessed to identify grey literature and work in progress.

The review undertook a dual approach to the search strategy, combining traditional searches of bibliographic databases with calls for information from relevant individuals and organisations, and networking with key authors working in this area.

## **Citation searches**

Markowitz, S. and Grossman, M. (1998) 'Alcohol regulation and domestic violence towards children', *Contemporary Economic Policy*, 16, pp 309–20.

Markowitz, S. and Grossman, M. (2000) 'The effects of beer taxes on physical child abuse', *Journal of Health Economics*, 19, pp 271–82.

Markowitz, S. (2000) 'The price of alcohol, wife abuse, and husband abuse', *Southern Economic Journal*, 67, pp 279–303.

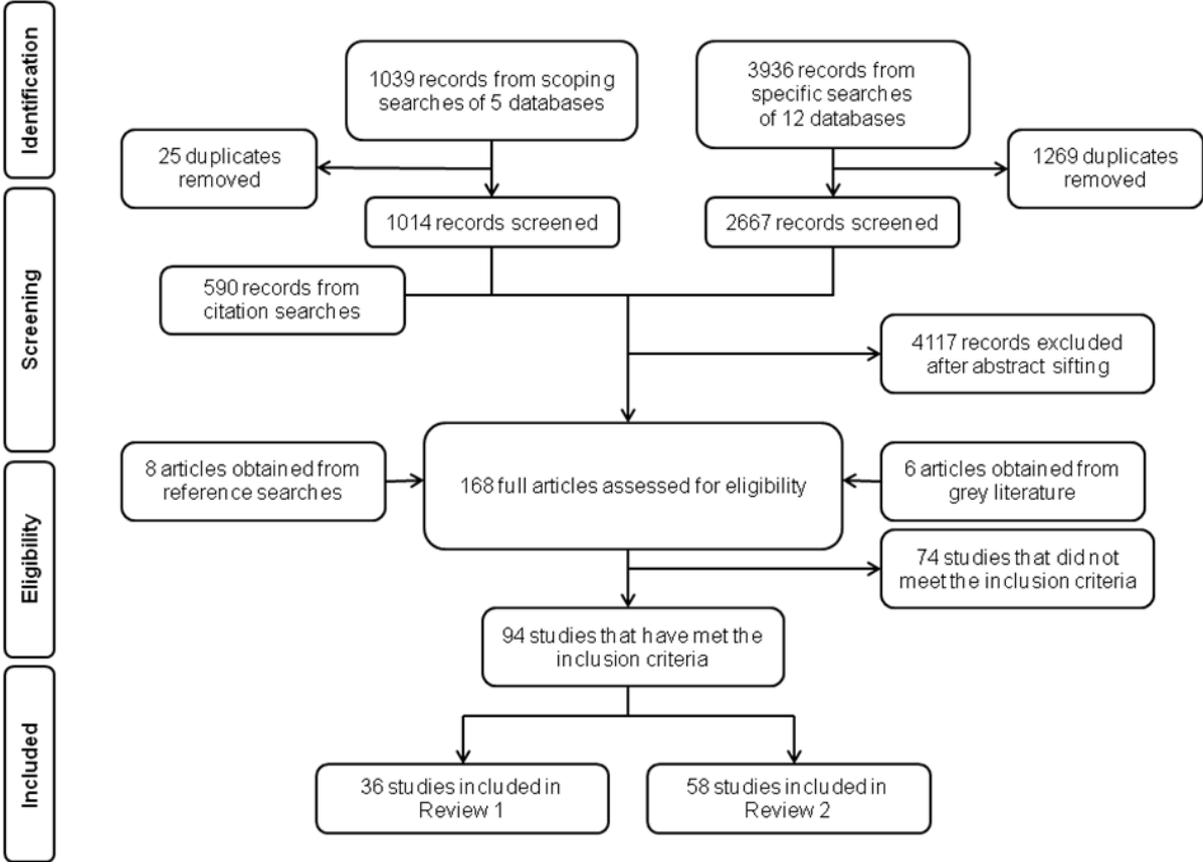
Sloan, F. A., Reilly, B. A., and Schenzler, C. (1994) 'Effects of prices, civil and criminal sanctions, and law enforcement on alcohol-related mortality', *Journal of Studies on Alcohol*, 55, pp 454–65.

Martin, S. E. (2001) 'The links between alcohol, crime and the criminal justice system: Explanations, evidence and interventions', *American Journal on Addictions*, 10(2), pp 136–58.

Rosow, I. (2001) 'Alcohol and homicide: a cross cultural comparison of the relationship in 14 European countries', *Addiction*, 96, pp S77–92.

Stockwell, T., Masters, L., Philips, M., Daly, A., Gahegan, M., Midford, R. and Philp, A. (1998) 'Consumption of different alcoholic beverages as predictors of local rates of night-time assault and acute alcohol-related morbidity', *Australian and New Zealand Journal of Public Health*, 22(2), pp 237–42.

### Search results (flow diagram)



### Quality review and data synthesis

While rapid evidence assessment (REA) methodologies require an approach to quality assessment, the limited timeframe for this review did not permit formal assessment and documentation of quality. For inclusion relevant studies were required to meet minimal quality criteria of:

- using a research or evaluation design
- adequate description of methods
- adequate reporting of results.

No relevant studies were excluded on the basis of quality at the initial sift stage. Initially, two experienced analysts separated studies on the basis of whether they reported an estimated effect or an actual effect of a pricing or price policy change on a relevant criminal justice outcome. For both types of study they considered general quality markers, such as whether the study addressed a clearly defined question, whether the conclusions were justified and how applicable the study was likely to be to a UK population/setting. For studies reporting an estimated effect ('modelling studies') they considered the following (based on the CASP)

checklist for Economic Evaluation Studies<sup>g</sup>): whether the analysis was based on valid data sources

- whether all important and relevant outcomes were identified for each policy intervention
- whether contemporaneous data sources were used (or adjustments made for the different times at which data were collected)
- whether an adequate sensitivity analysis was performed (taking into account different assumptions and possible confounders).

No studies were excluded on the basis of quality alone and a holistic quality assessment was used to inform the narrative summary and the overall analysis of limitations of the evidence base.

For studies documenting an actual effect ('evaluation studies') the validity, quality and contemporaneity of data sources was examined, together with comparability of before and after intervention measurements and the identification and analysis of potential confounding variables. Again, no studies were excluded on the basis of quality alone. An overall assessment of quality was used to inform the narrative summary. Quality assessment was also used to inform an overall analysis of limitations of the evidence base. No accepted checklists exist for models or for cross-sectional studies.

Finally the review-level component of the REA used a very unforgiving definition of systematic review, with only reviews that documented formal review methods being considered truly 'systematic'. Criteria from the CASP Checklist on Systematic Reviews were used to make an overall judgement of quality.<sup>h</sup> All reviews failing to meet such criteria were considered narrative or non-systematic with a corresponding risk of reporting bias.

## **A note on causality**

As noted above the two main types of study identified for this review, characterised as modelling studies and evaluation studies, fall short of the criteria required to demonstrate causality. While none of the following criteria (adapted from Bradford Hill criteria for determining causality) are sufficient to indicate causality, analysts generally consider that the more that are present in a particular study the more likely a cause-and-effect relationship is to exist.

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<sup>g</sup> [http://www.phru.nhs.uk/Doc\\_Links/Economic%20Evaluations%2010%20Questions.pdf](http://www.phru.nhs.uk/Doc_Links/Economic%20Evaluations%2010%20Questions.pdf)

<sup>h</sup> [http://www.phru.nhs.uk/Doc\\_Links/S.Reviews%20Appraisal%20Tool.pdf](http://www.phru.nhs.uk/Doc_Links/S.Reviews%20Appraisal%20Tool.pdf)

<b>Criteria for causation</b>	<b>Modelling studies</b>	<b>Evaluation studies</b>
Temporal relationship	Can use time-series data to demonstrate putative cause preceding effect	Typically use before–after design
Strength of relationship	Designed to estimate size of expected effect of a given intervention	Typically, evaluation studies quantify strength of statistical association
Dose–response relationship	Typically explore average population consumption, not individual drinking patterns. Some quantify estimated crime effects ('response') for different levels of price changes ('dose').	Typically explore average population consumption, not individual drinking patterns, and do not include clear dose–response information across pricing and drinking levels
Consistency	Only through external comparison	Only through external comparison
Plausibility	Modelled on plausible explanations but no opportunity to challenge assumptions	Can only explore association/no association hypotheses
Consideration of alternate explanations	Can explore presence of limited number of confounders where data are available	Reliant on availability of data
Experiment	May explore different assumptions but cannot manipulate environment itself	Purely correlational, unless study can utilise convincing natural experiment conditions
Specificity	Other factors may be causing both changes in alcohol price and changes in crime	Other factors may be causing both changes in alcohol price and changes in crime
Coherence (analogy)	Consistency with animal, biological, and social models to explain likely effect (for example, alcohol effect on aggression)	Consistency with animal, biological, and social models to explain likely effect (for example, alcohol effect on aggression)

High levels of evidence would require conduct of a controlled experiment and the identification and analysis of the effect of all plausible confounders, which is not usually possible in public health policy research.

## Appendix 2: Illustrative search strategies

### MEDLINE® (2000 – present; Ovid SP; search undertaken February 2010)

- 1 Alcohol drinking/
- 2 exp Alcoholic beverages/
- 3 or/1-2
- 4 exp Violence/
- 5 Crime/
- 6 Social behavior disorders/
- 7 exp Aggression/
- 8 exp Theft/
- 9 exp 'Wounds and injuries'/
- 10 exp Homicide/
- 11 exp Sex offenses/
- 12 (Violent or violence or assault or criminal or public order).ab,ti.
- 13 (Anti-social behavior?r or anti social behavior?r).ab,ti.
- 14 (Drunk and disorderly).ab,ti.
- 15 (Wound\$ or rape or burglar\$ or robber\$).ab,ti.
- 16 (Sex\$ adj5 (offence\$ or offense\$)).ab,ti.
- 17 (Homicide\$ or death\$ or murder\$ or killing\$ or abuse\$ or injur\$ or aggress\$ or suicide\$).ab,ti.
- 18 (Street adj5 (crime or offen?e\$)).ab,ti.
- 19 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18
- 20 Taxes/
- 21 Commerce/
- 22 Income/
- 23 (Tax and (low or minimum)).ab,ti.
- 24 ((Cost\$ or price\$ or pricing) and (minimum or under or baseline or below or low)).ab,ti.
- 25 (Pricing or price\$ or tax\$).ab,ti.
- 26 or/20–25
- 27 3 and 19 and 26
- 28 (Off-trade or off trade).ab,ti.
- 29 'Supermarket\$.'.ab,ti.
- 30 (Store\$ and (grocer\$ or convenience or CTN)).ab,ti.
- 31 (On-trade or on-licenc?e\$).ab,ti.
- 32 (Pub or pubs or public house).ab,ti.
- 33 (Bar or bars or club\$).ab,ti.
- 34 (Street and drinking).ab,ti.
- 35 (Hotel\$ or restaurant\$).ab,ti.
- 36 Outlet\$.ab,ti.

37 28 or 29 or 30 or 31 or 32 or 33 or 34 or 35 or 36  
 38 3 and 26 and 37  
 39 (Drinker\$ and (binge or heavy)).ab,ti.  
 40 (Drinking and (binge or heavy)).ab,ti.  
 41 39 or 40  
 42 3 and 19 and 41  
 43 Comment/ or letter/ or editorial/  
 44 Animal/  
 45 Human/  
 46 44 and 45  
 47 44 not 46  
 48 43 or 47  
 49 27 not 48  
 50 38 not 48  
 51 42 not 48  
 52 or/49-51  
 53 Limit 52 to (English language and yr='2000 – current')  
 54 Limit 49 to (English language and yr='2000 – current')  
 55 Limit 50 to (English language and yr='2000 – current')  
 56 Limit 51 to (English language and yr='2000 – current')  
 57 or/53-56

## **ASSIA (2000 – present; CSA Illumina; Search undertaken February 2010)**

Search Query #69 (((KW=alcohol) or(KW=beer\*) or(KW=wine\*) or(KW=(spirit or spirits)) or(KW=liquor\*)) and((KW=(violence or violent)) or(DE="violations") or(DE="deviant behaviour") or(DE=("crime" or "computer related crime" or "hacking" or "corporate crime" or "explorative crime" or "hate crime" or "high technology related crime" or "international crime" or "juvenile crime" or "organized crime" or "mafia" or "sicarios" or "triads" or "yakuza" or "penal system" or "parole officers" or "penal institutions" or "boot camps" or "detention centres" or "juvenile detention centres" or "prison officers" or "prisoners" or "ex prisoners" or "long term prisoners" or "maximum security prisoners" or "remand prisoners" or "prisons" or "maximum security prisons" or "remand prisons" or "secure units" or "youth custody centres" or "petty crime" or "serious crime" or "street crime" or "violent street crime" or "trafficking" or "drug trafficking" or "violent crime" or "white collar crime"))) or(DE=("criminal behaviour" or "stealing")) or(DE=("antisocial behaviour" or "aggression" or "fighting" or "street fighting" or "sexual aggression" or "social aggression" or "verbal aggression" or "cheating" or "flirtatiousness" or "loitering")) or(DE="criminal offences") or(DE=("theft" or "burglary" or "serious theft" or "shoplifting")) or(DE="stealing") or(DE=("injuries" or "back injuries" or "low back injuries" or "brachial plexus injuries" or "erb s palsy" or "brain injuries" or "concussion" or "traumatic brain injury" or "unilateral neglect syndrome" or "contusions" or "criminal injuries" or "eye injuries" or "facial injuries" or "fatal head injuries" or "fractures" or "colles fracture" or "fractured femurs" or "fractured hips" or "fractured limbs" or "fractured ribs" or "prevalent fractures" or "hand injuries" or "head injuries" or "industrial injuries" or "lesions" or "brain lesions" or "minor injuries" or "narcissistic injuries" or "nonaccidental injuries" or "penetrating injuries" or "personal injuries" or "selfinjury" or "serious injuries" or "shoulder injuries" or "skeletal injuries" or "pyomyositis" or "spinal cord injuries" or "cervical spinal cord injuries" or "sports injuries" or "whiplash injuries" or "wrist injuries")) or(DE=("homicide" or "euthanasia" or "assisted suicide" or "life terminating acts" or "filicide" or "infanticide" or "manslaughter" or "matricide" or "parricide" or "patricide")) or(DE="killing") or(DE="murder") or(DE=("assault" or "actual bodily harm" or "grievous bodily harm" or "psychic assault" or

"sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape") or(DE=("sexual offences" or "indecent exposure" or "sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape")) or(TI=(assault\* or criminal\* or (public order)) or AB=(assault\* or criminal\* or (public order))) or(TI=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r)) or AB=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r))) or(TI=drunk near disorderly) or(AB=drunk near disorderly) or(TI=(wound\* or rape or burglar\*) or TI=robber\*) or(AB=(wound\* or rape or burglar\*) or AB=robber\*) or(TI=(sex\* near (offence\* or offense\*))) or(AB=(sex\* near (offence\* or offense\*))) or(TI=(homicide\* or death\* or murder\*) or TI=(killing\* or abuse\* or injur\*) or TI=(aggress\* or suicide\*)) or(AB=(homicide\* or death\* or murder\*) or AB=(killing\* or abuse\* or injur\*) or AB=(aggress\* or suicide\*)) or(TI=(street near (crime or offen\*e\*)) or(AB=(street near (crime or offen\*e\*)))) and((KW=(taxation or tax or taxes) or KW=(price\* or pricing)) or(DE=(income or costs or costing\*) or DE=trade) or(DE=("cost analysis" or "functional cost analysis")) or(DE=cost) or(ti=((cost\* or price\* or pricing) near (minimum or under or baseline or below or low\*))) or(ab=((cost\* or price\* or pricing) near (minimum or under or baseline or below or low\*)))) or(((KW=alcohol) or(KW=beer\*) or(KW=wine\*) or(KW=(spirit or spirits)) or(KW=liquor\*)) and((KW=(violence or violent)) or(DE="violations") or(DE="deviant behaviour") or(DE=("crime" or "computer related crime" or "hacking" or "corporate crime" or "explorative crime" or "hate crime" or "high technology related crime" or "international crime" or "juvenile crime" or "organized crime" or "mafia" or "sicarios" or "triads" or "yakuza" or "penal system" or "parole officers" or "penal institutions" or "boot camps" or "detention centres" or "juvenile detention centres" or "prison officers" or "prisoners" or "ex prisoners" or "long term prisoners" or "maximum security prisoners" or "remand prisoners" or "prisons" or "maximum security prisons" or "remand prisons" or "secure units" or "youth custody centres" or "petty crime" or "serious crime" or "street crime" or "violent street crime" or "trafficking" or "drug trafficking" or "violent crime" or "white collar crime")) or(DE=("criminal behaviour" or "stealing")) or(DE=("antisocial behaviour" or "aggression" or "fighting" or "street fighting" or "sexual aggression" or "social aggression" or "verbal aggression" or "cheating" or "flirtatiousness" or "loitering")) or(DE="criminal offences") or(DE=("theft" or "burglary" or "serious theft" or "shoplifting")) or(DE="stealing") or(DE=("injuries" or "back injuries" or "low back injuries" or "brachial plexus injuries" or "erb s palsy" or "brain injuries" or "concussion" or "traumatic brain injury" or "unilateral neglect syndrome" or "contusions" or "criminal injuries" or "eye injuries" or "facial injuries" or "fatal head injuries" or "fractures" or "colles fracture" or "fractured femurs" or "fractured hips" or "fractured limbs" or "fractured ribs" or "prevalent fractures" or "hand injuries" or "head injuries" or "industrial injuries" or "lesions" or "brain lesions" or "minor injuries" or "narcissistic injuries" or "nonaccidental injuries" or "penetrating injuries" or "personal injuries" or "selfinjury" or "serious injuries" or "shoulder injuries" or "skeletal injuries" or "pyomyositis" or "spinal cord injuries" or "cervical spinal cord injuries" or "sports injuries" or "whiplash injuries" or "wrist injuries")) or(DE=("homicide" or "euthanasia" or "assisted suicide" or "life terminating acts" or "filicide" or "infanticide" or "manslaughter" or "matricide" or "parricide" or "patricide")) or(DE="killing") or(DE="murder") or(DE=("assault" or "actual bodily harm" or "grievous bodily harm" or "psychic assault" or "sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape")) or(DE=("sexual offences" or "indecent exposure" or "sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape")) or(TI=(assault\* or criminal\* or (public order)) or AB=(assault\* or criminal\* or (public order))) or(TI=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r)) or AB=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r))) or(TI=drunk near disorderly) or(AB=drunk near disorderly) or(TI=(wound\* or rape or burglar\*) or TI=robber\*) or(AB=(wound\* or rape or burglar\*) or AB=robber\*) or(TI=(sex\* near (offence\* or offense\*))) or(AB=(sex\* near (offence\* or offense\*))) or(TI=(homicide\* or death\* or murder\*) or TI=(killing\* or abuse\* or injur\*) or TI=(aggress\* or suicide\*)) or(AB=(homicide\* or death\* or murder\*) or AB=(killing\* or abuse\* or injur\*) or AB=(aggress\* or suicide\*)) or(TI=(street near (crime or offen\*e\*)) or(AB=(street near (crime or offen\*e\*)))) and((KW=(supermarket\* or superstore\* or shops) or KW=(bar or bars or club\*) or KW=(hotel\* or restaurant\* or outlet\*)) or(DE=("licensed premises" or "public houses")) or(DE=("restaurants" or "cafes")) or(DE="street drinkers") or(TI=(off-trade or (off trade)) or AB=(off-trade or (off trade))) or(TI=((off licence) or off-licence) or AB=((off licence) or off-licence)) or(ti=((store\*) near (convenien\* or grocer\* or ctn)) or(ab=((store\*) near (convenien\* or grocer\* or ctn)) or(TI=((on trade) or on-trade or (on licen\*e)) or TI=on-licen\*e) or(AB=((on trade) or on-trade or (on licen\*e)) or AB=on-licen\*e) or(TI=(pub or pubs or (public house\*)) or AB=(pub or pubs or (public house\*))) or(ti=(street near drink\*)) or(ab=(street near drink\*))) or(((KW=(violence or violent)) or(DE="violations") or(DE="deviant behaviour") or(DE=("crime" or "computer related crime" or "hacking" or "corporate crime" or "explorative crime" or "hate crime" or "high technology related crime" or "international crime" or "juvenile crime" or "organized crime" or

"mafia" or "sicarios" or "triads" or "yakuza" or "penal system" or "parole officers" or "penal institutions" or "boot camps" or "detention centres" or "juvenile detention centres" or "prison officers" or "prisoners" or "ex prisoners" or "long term prisoners" or "maximum security prisoners" or "remand prisoners" or "prisons" or "maximum security prisons" or "remand prisons" or "secure units" or "youth custody centres" or "petty crime" or "serious crime" or "street crime" or "violent street crime" or "trafficking" or "drug trafficking" or "violent crime" or "white collar crime") or(DE=("criminal behaviour" or "stealing")) or(DE=("antisocial behaviour" or "aggression" or "fighting" or "street fighting" or "sexual aggression" or "social aggression" or "verbal aggression" or "cheating" or "flirtatiousness" or "loitering")) or(DE="criminal offences") or(DE=("theft" or "burglary" or "serious theft" or "shoplifting")) or(DE="stealing") or(DE=("injuries" or "back injuries" or "low back injuries" or "brachial plexus injuries" or "erb s palsy" or "brain injuries" or "concussion" or "traumatic brain injury" or "unilateral neglect syndrome" or "contusions" or "criminal injuries" or "eye injuries" or "facial injuries" or "fatal head injuries" or "fractures" or "colles fracture" or "fractured femurs" or "fractured hips" or "fractured limbs" or "fractured ribs" or "prevalent fractures" or "hand injuries" or "head injuries" or "industrial injuries" or "lesions" or "brain lesions" or "minor injuries" or "narcissistic injuries" or "nonaccidental injuries" or "penetrating injuries" or "personal injuries" or "selfinjury" or "serious injuries" or "shoulder injuries" or "skeletal injuries" or "pyomyositis" or "spinal cord injuries" or "cervical spinal cord injuries" or "sports injuries" or "whiplash injuries" or "wrist injuries")) or(DE=("homicide" or "euthanasia" or "assisted suicide" or "life terminating acts" or "filicide" or "infanticide" or "manslaughter" or "matricide" or "parricide" or "patricide")) or(DE="killing") or(DE="murder") or(DE=("assault" or "actual bodily harm" or "grievous bodily harm" or "psychic assault" or "sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape")) or(DE=("sexual offences" or "indecent exposure" or "sexual assault" or "indecent assault" or "rape" or "acquaintance rape" or "date rape" or "drug rape" or "gang rape" or "male rape" or "marital rape" or "serial rape")) or(TI=(assault\* or criminal\* or (public order)) or AB=(assault\* or criminal\* or (public order))) or(TI=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r)) or AB=((anti social behavi\*r) or (anti-social behavi\*r) or (antisocial behavi\*r))) or(TI=drunk near disorderly) or(AB=drunk near disorderly) or(TI=(wound\* or rape or burglar\*) or TI=robber\*) or(AB=(wound\* or rape or burglar\*) or AB=robber\*) or(TI=(sex\* near (offence\* or offense\*))) or(AB=(sex\* near (offence\* or offense\*))) or(TI=(homicide\* or death\* or murder\*) or TI=(killing\* or abuse\* or injur\*) or TI=(aggress\* or suicide\*)) or(AB=(homicide\* or death\* or murder\*) or AB=(killing\* or abuse\* or injur\*) or AB=(aggress\* or suicide\*)) or(TI=(street near (crime or offen\*e))) or(AB=(street near (crime or offen\*e)))) and((DE="problem drinkers") or(DE="street drinkers") or(DE="binge drinking") or(DE="problem drinking") or(ti=(drinker\* and (binge or heavy))) or(ab=(drinker\* and (binge or heavy))))

Full details of all search strategies for all sources are available from the authors on request.

## Appendix 3:

Table 1: Studies included in the review

Study identifier	Tax or pricing change	Study design	Results	Study quality
<b>General effects on crime</b>				
Chaloupka, F. J. and Wechsler, H. (1996)	Estimated beer prices [US]	Data from nationally representative survey of students in colleges and universities. Drinking participation, participation in binge drinking and level of drinking equations estimated using appropriate econometric methods	Lower alcohol prices and higher availability were positively correlated with binge drinking and crimes among US college students. Crime rates were substantially higher when alcohol was available on campus than when it was not. Estimates indicate that drinking practices of college students were sensitive to price of beer, with average estimated price elasticity of drinking participation of -0.066 and an average estimated price elasticity of binge drinking of -0.145. Analysis by gender found effects of prices on drinking were limited to young women. Many other elements of campus life were important determinants of drinking/ binge drinking among college students	Correlational study
Herttua, K., <i>et al.</i> (2008)	Alcohol tax reduction (average 33%). Off-premise retail price of spirits went down by an average 36%, wines 3%, and other alcoholic beverages 13–28% [Finland]	86 administrative tracts from Helsinki Metropolitan Area, Finland in 2004	Interpersonal violence rates did not increase after large reduction in alcohol prices and increase in consumption. For domestic violence, rate decreased. Significant relationship between measures of social disadvantage and interpersonal violence (for example, low educational level and high out-migration level). No adverse effects of price reduction on police-recorded violent crime or emergency call-outs related to domestic violence. Incidents involving custody due to intoxication underwent a 3.1% increase (P=0.567). Violating domestic peace significantly decreased by 13.6% (P=0.001), while domestic violence incidents requiring emergency call-outs decreased by 6.8% (P=0.069). Total emergency call-outs remained stable (0.4% increase, P=0.921). All estimates (excluding violating domestic peace) are statistically insignificant. Small differences in impact of decrease in alcohol prices on interpersonal violence between high, intermediate, and low status areas.	<b>Retrospective analysis of natural experiment</b> Before–after comparison was appropriate because an interrupted time-series analysis needs a longer study period and at least 100 observations to detect moderate effect – only had 48 measurement points. Data included only crimes about which the police had information (a report of an offence). Many criminal events fail to enter records; may not be known to the police; or the police may not record them as crimes. However, coverage of police records is high for severe crimes, (for example, acts of interpersonal violence). Factors affect compilation of statistics (no marked changes in readiness to report crimes and no significant changes in legislation or police control during study period).

Mäkelä, P. and Österberg, E. (2009)	Actual excise reduction of 33% [Finland]	Published research and routinely available data (prices of alcoholic beverages, recorded/unrecorded alcohol consumption, criminality and other police statistics, alcohol-related deaths and hospitalisations, service use)	Reviews changes in Finnish alcohol policy in 2004, when quotas for travellers tax-free imports of alcoholic beverages from other EU countries was abolished, Estonia joined the EU and excise duties on alcoholic beverages reduced in Finland by one-third, on average. Alcohol consumption increased 10% in 2004, more than in early 2000s. With few exceptions, alcohol-related harms increased. Consumption and harms increased most among middle-aged and older segments of population, and harms in the worst-off parts of the population, who paid the highest price in terms of health for cuts in alcohol prices	Retrospective analysis of natural experiment
Purshouse R <i>et al.</i> (2009a)	Estimated effects of minimum price per unit of alcohol thresholds from 20p through to 70p, discount restrictions and ban in off-trade, 1%, 10% and 25% general price increases and price increases targeted at cheap alcohol [England]	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and underage, 18–24-year-old hazardous, moderate, hazardous and harmful drinkers	Crime harms were estimated to reduce as prices increased. Crime reductions for policies were estimated to take place across a spectrum of violent crime, criminal damage and theft, robbery and other crimes. Crime harms were estimated to reduce particularly for 11–18s who were disproportionately involved in alcohol-related crime and were affected significantly by targeting price rises at low-priced products. The 18 to 24-year-old hazardous drinkers would be most affected by policies targeting prices in the on-trade sector. When estimating policy impacts, crime avoided comes more from harmful and hazardous drinking groups than moderate drinkers. Lowest minimum pricing thresholds modelled would have only a marginal impact on crime	Cross-sectional data on expenditure and consumption; alcohol attributable fractions rely on data from offender survey
Purshouse R. <i>et al.</i> (2009b)	Estimated effects of minimum price per unit of alcohol thresholds from 25p through to 70p, discount ban in the off-trade, combinations of minimum pricing and discount bans [Scotland]	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and moderate, hazardous and harmful drinkers	Crime harms were estimated to reduce as prices increased. Crime reductions for policies would take place across spectrum of violent crime, criminal damage and theft, robbery and other crimes. When estimating policy impacts, crime avoided comes more from harmful and hazardous drinking groups than moderate drinkers. The lowest minimum pricing thresholds modelled would have only a marginal impact on crime	Cross-sectional data on expenditure and consumption; alcohol attributable fractions rely on data from offender survey
Saffer, H. (2001)	Increase in beer price [US]	Data from more than 32,000 people in 1991 National Household Survey on Drug Abuse (NHSDA) and data on state beer taxes. Estimated effectiveness of drug control spending and beer taxes on arrests, property crime, property damage, use of force, and drug selling	Impact of increase in beer price in 1991. Increased beer taxes reduced crime. Effects larger for under 21s (=underage in US) than for over 21s. Because of lower average disposable income changes in controlled access to alcohol through price or tax increases, expected to have especially strong harm-reduction impact on young drinkers. Since young drinkers more responsive to increase in real price from alcohol than other drinkers, increase in real price would have a beneficial impact by reducing high-risk drinking. Conversely, reduction in real price may stimulate overall alcohol consumption in this population, including high-risk drinking	Retrospective analysis of natural experiment

<b>Violence (including assault)</b>				
Andreasson S. <i>et al.</i> (2006)	Comparison of observed changes with prior projections, and further projection of effects of a planned tax reduction of 40% on spirits and 15% on wine [Sweden]	Measures of Swedish alcohol-related mortality (including homicide and assaults) from 1950 to 1995	Two part study: Comparison of the observed changes with prior projections, and further projection of effects of a planned tax reduction of 40% on spirits and 15% on wine: <ul style="list-style-type: none"> <li>older modelled estimates were relatively close to later actual observed trends</li> <li>tax cut by 40% on spirits and by 15% on wine were estimated to increase total per capita alcohol consumption by 0.35 litre, and increases for non-fatal assaults (1,627 additional assaults)</li> </ul>	<b>Modelling study</b> subject to assumptions and limitations of data
Bloomfield, K. <i>et al.</i> (2009)	45% tax reduction on spirits [Denmark]	Interrupted time-series analysis. Data on violent assaults and hospitalisations for acute alcohol intoxication (2003–05)	26% increase in number of acute alcohol intoxication hospitalisations among people aged 15 years and younger detected after tax reduction on spirits. No significant increase in violent assaults and acute intoxication among adults	<b>Interrupted time-series analysis</b>
Bloomfield, K. <i>et al.</i> (2010)	Lower taxes on alcohol [Denmark, Finland and Sweden]	Annual cross-sectional surveys (2003–06). Five dependency items and seven extrinsic alcohol-related problems examined. Changes analysed within each country/region and tested for short- and long-term changes. Differential change also tested between each country and control site, northern Sweden	EU travellers' allowances for alcohol import to Denmark, Finland and Sweden abolished in 2004. Excise taxes on alcohol lowered in 2003 and 2005 in Denmark, and in 2004 in Finland. Using northern Sweden as control, examined whether levels of reported alcohol problems changed in Denmark, Finland, and southern Sweden following policy changes. Prevalence of alcohol problems decreased over study period. Only in selected subgroups did problems increase; mainly in northern Sweden and Finland, and among older age groups and men. For control site, no increases in problem prevalence found. Survey-based findings contradicted health and social statistics in Denmark and Finland, which indicated significant increases in alcohol-related harm. Findings on decline in reported alcohol problems largely agreed with survey reports of alcohol consumption over same period in study countries	<b>Repeated cross-sectional surveys</b>
Chaloupka, F. J. and Saffer, H. (1992)	Estimated higher beer taxes [US]	Uses data from the FBI's uniform crime reports, looks at rates of murder, rape, assault, and robbery during 1970s and 1980s	Estimates reduced form model where crime rate is a function of state excise tax on beer and state specific characteristics. Model also included price of marijuana and expenditures on police. Higher beer taxes, lower rates of rape, robbery, and homicide, but <i>not</i> assault	<b>Econometric model</b> Aggregate level data present a problem in that such data only include crimes that have been reported to the police. In the US estimates from the National Crime Victimization Survey reveal that less than one-half of violent crimes are reported to the police
Chikritzhs, T., Stockwell, T. and Pascal, R. (2005)	Increase in tax on drinks with alcohol content above 3% alcohol by volume [Northern Territory (NT), Australia]	Age-standardised rates of acute/chronic alcohol-attributable deaths in NT before, during and after implementation of Living with Alcohol (LWA) program and levy before and during LWA program. Time-series analyses included internal and external controls and adjustments for possible confounders	Evaluated effects of LWA tax on alcohol-attributable deaths controlling for simultaneous trends in death rates from control region and non-alcohol-related death trends in NT (1985 and 2002). LWA program introduced in 1992 with funding from tax on beverages with greater than 3% alcohol content by volume. Tax removed in 1997 but LWA program was funded by the federal government until 2002. Tax and LWA program associated with significant declines in acute alcohol-attributable deaths, including assaults (16%). Combined impact reduced burden of alcohol-attributable injury in the short term	<b>Natural experiment: time-series analysis with spatial controls</b> Effect of tax and remainder of LWA programme cannot be disentangled

Cook, P. and Moore, M. (1993a)	Estimated increase in beer tax [US]	Used annual data on homicide, rape, assault and robbery from 48 contiguous states (1979–88)	Examined relationships between alcohol use and violence and between alcohol availability and per capita alcohol consumption. 10% increase in beer tax would reduce assault by 0.26%. Suggested that increases in beer excise taxes reduced per capita alcohol consumption and decreased incidence of violent crime, particularly rape and robbery	<b>Econometric model</b> Requirement for more contextually-sensitive measures of violent crime.
Cook, P. J. and Moore, M. J. (1993b)	Estimated increase in beer tax [US]	Used annual state-level data obtained from 1979–87 uniform crime reports	Examined impact of per capita alcohol consumption and beer excise taxes on violent crime rates (that is homicides, assaults, rapes, and burglaries). Employed fixed-effects models, in which only independent variable other than state and year indicators was beer tax. Concluded that higher beer taxes would lead to significant reductions in rapes and robberies but would have little impact on homicides and assaults	<b>Econometric model</b>
Cook, P. J. and Moore, M. J. (1993c)	Estimated increase in beer tax [US]	Used panel data on states	Found close link between per capita ethanol consumption and violent crime rates. Estimated beer tax elasticities on violent crime rates in the US were -0.03 ( $p_{0.05}$ )	<b>Econometric model</b>
Grossman, M. and Markowitz, S. (2001)	Estimated beer price increase [US]	Core Alcohol and Drug Survey of college students (N=120,000) in 200 US colleges or universities (1989–91)	Inverse relationship between increase in beer prices and four types of violence: 10% increase in price of beer would result in decline from 12.3% to 11.7% for trouble with police/authority and a decline from 31.2% to 30.2% in verbal/physical fights. 10% increase in price of beer would reduce number of college students involved in violence each year by 4%	<b>Econometric model</b>
Herttua <i>et al.</i> (2008)	Alcohol tax reduction (reduced by an average 33%). Off-premise retail price of spirits went down by an average 36%: wines 3%, and other alcoholic beverages 13–28% [Finland]	86 administrative tracts from Helsinki Metropolitan Area, Finland in 2004	Interpersonal violence rates did not increase after large reduction in alcohol prices and increase in consumption. No adverse effects of price reduction on police-recorded violent crime. Incidents involving custody due to assault and battery increased by 4.5% (not significant). Assault rates were higher in tracts with a higher proportion of people with low educational status and out-migration. Small differences in impact of decrease in alcohol prices on interpersonal violence between high, intermediate, and low status areas	<b>Retrospective analysis of natural experiment</b> Data included only crimes for which the police had information (a report of an offence). Many criminal events may fail to enter records. Factors affect compilation of statistics (for example, changes in police control and in legislation). No marked changes in readiness to report crimes. No significant changes in legislation or police control during study
Holder, H. D. <i>et al.</i> (1995)	Estimated reduction of taxation; reduction of state monopoly [Finland, Norway, Sweden]	Projected absolute alcohol consumption in each country based on different possible changes in alcohol price and availability. Predicted future levels of alcohol-related problems are likely to result from increased per capita alcohol consumption (Norway and Sweden only)	Projected the consequences of modifying or eliminating current national alcohol retail monopolies from countries' membership in the EU. All scenarios expected to lead to increases in per capita alcohol consumption. Smallest increase in consumption from partial elimination of current monopoly and a modest reduction in alcohol prices. Projected per capita consumption in Sweden for inhabitants aged 15 and older (from 6.3 to 9.3 litres); in Norway (from 4.7 to 6.7 litres); and in Finland (from 8.4 to 11.1 litres). Greatest projected increase in consumption from complete elimination of state monopolies, along with substantial drop in alcohol prices with private	<b>Modelling study</b>

			competition and increased cross-border alcohol purchases. That scenario would result in projected per capita consumption of 12.7 litres (Sweden), 11.1 litres (Norway) and 13.7 litres (Finland). A 1-litre increase in per capita consumption would lead to an increase in alcohol-related assaults by 9% (Sweden) and 9.6% (Norway). A 5-litre increase in consumption would result in a 57% increase in alcohol-involved assaults in both countries	
Markowitz, S. (2000a)	Alcohol prices [International]	Data from 1989 and 1992 International Victimization Surveys. Sample of almost 50,000 respondents in 16 countries	Examined the relationship between price of alcoholic beverages and incidence of criminal violence in different countries. Respondents were asked if they had been victims of robbery, assault, and sexual assault (female respondents only) in the past year. Model estimated where probability of being a victim of violent crime determined by price of alcohol, area person lived in, and other socio-economic characteristics. Higher alcoholic beverage prices led to lower incidences of all three types of crime where country fixed effects were not included. Results from models that include country fixed effects are not reliable	Econometric analysis
Markowitz, S. (2000b)	Alcohol prices [US]	Data from 1992, 1993 and 1994 National Crime Victimization Surveys	Examined the direct relationship between prices of alcohol and incidence of criminal violence in nationally representative samples. Violence measured by assault, rape/sexual assault, and robbery. Model estimated probability of being victim of violent crime determined by full prices of alcohol, arrest rates for violent crimes, and respondent characteristics. Higher beer taxes were associated with lower incidence of assault	Econometric model
Markowitz, S. (2005) ' [related to Markowitz, S. (2000b) above]	Higher beer taxes [US]	Data from 1992, 1993 and 1994 National Crime Victimization Surveys	Examined the relationship between alcohol and illegal drug regulation, and incidence of criminal violence. A 1% increase in beer tax would decrease probability of being victim of assault by 0.03–0.05%. Higher beer taxes decreased probability of assault and alcohol- or drug-involved assault, but not rape or robbery	Econometric model Uses individual level data
Matthews, K. Shepherd, J. and Sivarajasingam, V. (2006) and Sivarajasingam, V., Matthews, K. and Shepherd, J. (2006)'	Changes in prices of beer [England and Wales]	Monthly frequency of violent-injury collected from stratified sample of 58 NHS emergency departments 1995–2000	Examined the influence of the real price of beer on violence-related injuries. Econometric model based on economic, socio-demographic and environmental factors estimated using panel techniques. Rate of violence-related injury negatively related to real price of beer, as well as economic, sporting and socio-demographic factors. Regional distribution of incidence of violent injury related to regional distribution of price of beer. Increased alcohol prices would result in substantially fewer violent injuries and reduced demand on trauma services	Econometric study
Purshouse R. <i>et al</i> (2009a)	Estimated effects of minimum price per unit of alcohol thresholds from 20p through to 70p, discount	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and	For overall results see section on overall crime.  Violent crime was estimated to reduce as prices are increased	Modelling study Cross-sectional data on expenditure and consumption, alcohol attributable fractions rely on data from offender survey

	restrictions and ban in the off-trade, 1%, 10% and 25% general price increases and price increases targeted at cheap alcohol [England]	incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and underage, 18 to 24-year-old hazardous, moderate, hazardous and harmful drinkers		
Purshouse R. <i>et al.</i> (2009b)	Estimated effects of minimum price per unit of alcohol thresholds from 25p through to 70p, discount ban in the off-trade, combinations of minimum pricing and discount bans [Scotland]	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and moderate, hazardous and harmful drinkers	For overall results see section on overall crime.  Violent crime was estimated to reduce as prices were increased	<b>Modelling study</b> Cross-sectional data on expenditure and consumption, alcohol attributable fractions rely on data from offender survey
Sivarajasingam V., Moore, S. and Shepherd, J. (2008)	Price of beer [England and Wales]	Cross-sectional survey from structured sample of 29 A&E departments	Overall decrease of 12% in England and Wales in 2007 vs 2006, with approximately 43,000 fewer presentations at A&E as a result of violence-related injury following Licensing Act (2003)	<b>Cross-sectional survey</b>
Stockwell, T. <i>et al</i> (2001)	Levy of 5 cents per standard drink [Northern Territory (NT), Australia]	Indicators of alcohol-related harm tracked (1980 to June 1996) and developed from hospital, mortality and road crash data. Data used to control for confounding. Regression and time-series analyses tested for effects coinciding with Living with Alcohol (LWA)	Impact of comprehensive population-based alcohol harm reduction programme in NT funded by levy from April 1992. Proceeds of levy supported increased treatment, public education and other prevention. Towards the end of study period (the first four years) other initiatives were introduced: lowering of legal limit for drivers to 0.05 mg/ml and a special levy on cask wine. Substantial reductions in per capita alcohol consumption and self-reported hazardous and harmful consumption via surveys. Significant health and safety benefits accrued to people of NT during first four years of the LWA programme. Benefit likely to be due to effect of levy, other factors depressing alcohol consumption, and the effect of the LWA programme itself	<b>Before-after controlled intervention study using time-series analyses</b>

<b>Homicide</b>				
Andreasson S. <i>et al.</i> (2006)	Estimated tax reduction of 40% on spirits and 15% on wine [Sweden]	Measures of Swedish alcohol-related mortality (including homicide and assaults) 1950–95.	No increases were reported for homicides or alcohol-related mortality in males. Increases seen in non-fatal assaults, fatal accidents and alcohol-related mortality in females. Tax cut by 40% on spirits and by 15% on wine estimated to increase total per capita alcohol consumption by 0.35 litre. The increase was estimated to cause 289 additional deaths and 1,627 additional assaults	<b>Time-series analysis</b> Total consumption increased, but heavy drinkers' share of total consumption may have decreased, dampening impact of increasing consumption. Factors other than consumption may have affected multi-factorial harms, for example, homicide
Chaloupka F. J. and Saffer, H. (1992)	Higher beer taxes [US]	Used data from the FBI's uniform crime reports, looked at rates of murder, rape, assault, and robbery during the 1970s and 1980s	Estimated model where crime rate is a function of state excise tax on beer and state specific characteristics. Model also included price of marijuana and expenditures on police. Higher beer taxes led to lower rates of homicide, but not assault	<b>Econometric model</b> Aggregate level data present problem as only included crimes reported to the police. In the US estimates from the National Crime Victimization Survey reveal less than one-half of violent crimes were reported to the police
Cook, P. and Moore, M. (1993a) ' (1993c)	Estimated tax increase [US]	Used annual data on homicide, rape, assault and robbery from 48 contiguous States (1979–88)	Examined relationships between alcohol use and violence and between alcohol availability and per capita alcohol consumption. A 10% increase in beer tax estimated to reduce homicide by 0.32%. Analysis suggested that increases in beer excise taxes reduced per capita alcohol consumption and decreased incidence of violent crime, particularly rape and robbery	<b>Correlational study</b>
Cook, P. J. and Moore, M. J. (1993c)	Beer tax increase [US]	Used panel data on states	Close link between per capita ethanol consumption and violent crime rates. Estimated that beer tax elasticities on violent crime rates in the US were -0.03 ( $p_{0.05}$ ) for homicide; -0.03 ( $p_{0.05}$ ) for assault; -0.13 ( $p_{0.05}$ ) for rape; and 0.09 ( $p_{0.05}$ ) for robbery. Direct evidence that an increase in beer tax helped suppress rape and robbery. Higher beer prices shown to lead to reductions in rapes and robberies. 10% increase in alcohol consumption corresponded with 5.9% increase in rate of assault in US	<b>Econometric analysis and modelling</b>
Cook, P. (2007)	Estimated tax increase [US]	Used reduced-form analysis of state panel data on policy changes	Estimated effects of taxes on homicide and suicide. 10% increase in per capita drinking was associated with a 5% increase in homicide and suicide. A 10 cent increase per ounce of ethanol would result in an 11 per cent increase in homicide (statistically indistinguishable from zero)	<b>Econometric model</b>
Sen, B. (2006)	Estimated tax increase [US]	Homicide death count for children aged 0–9 at state level between 1981–2002 as dependent variable. Negative binomial regression models with state and year fixed effects. Other control variables estimate.	Investigated relationship between beer taxes, other alcohol policies and child homicide deaths. Inverse relationship between per gallon beer taxes and child homicide deaths (elasticity approximately -0.19), and direct relationship between alcohol retail outlet density and child homicide deaths (elasticity approximately 0.16). Very similar results for sum of child homicide deaths and child deaths due to 'undetermined intent'. \$1 increase in real beer tax rates predicted to reduce child homicide deaths by 24–25%, (homicide plus undetermined intent deaths by 38–39%). Results for beer tax rates robust to other policy variables. 10% increase in per gallon beer taxes or 10% decrease in retail outlet densities would on average reduce child homicide deaths by 1.1–1.6% and 1.3–1.9% respectively.	<b>Econometric analysis and model</b> Modelling reliant on estimates and assumptions. Aggregate data prevent analysis whether policies affect child homicide deaths caused by parents or by other relatives/acquaintances or by strangers. Unable to control for prevalence or prices of other hard drugs, which may complement consumption of alcohol and affect violence against children. Unable to control for quality and prevalence of law enforcement and child welfare services.

Sloan, F. A., Reilly, B. A. and Schenzler, C. (1994)	Alcohol price increases [US]	Empirical analysis of effects of various public policies on mortality rates by state and year for the years 1982-88	Causes of death analysed (including homicides). Increasing price of alcohol decreased mortality rates for some causes, but not for primary cause deaths. <b>Non significant</b> ( $p > 0.05$ ) relationship between alcohol prices and deaths from homicides and other injuries. This was surprising given the stronger relationship between alcohol consumption and intentional and unintentional injuries, robust across several regression models	<b>Correlational study</b>
Zeoli, A. M. (2008)	Higher federal and state beer taxes 29-cent federal tax increase. State tax increase less than 7c/gallon; less than 8c/six-pack of 12 oz beer containers. Average State tax 15c/gallon [US]	Multiple time series to examine intimate homicide counts in 49 of largest cities (1979 to 2003)	Assessed relationships between intimate homicide and beer excise taxes that may impact on intimate partner violence and homicide. Four intimate homicide groups, based on gender and firearm use, were tested. No statistically significant associations between beer taxes and intimate homicide. Lack of statistically significant association of either federal beer excise tax increase or small increases in beer excise tax at state level on intimate homicide may indicate that increases were not large enough to affect intimate homicide levels	<b>Time-series analysis</b>

<b>Sexual assault (including rape)</b>				
Chaloupka, F. J. and Saffer, H. (1992).	Higher beer taxes [US]	Used data from the FBI's uniform crime reports, including rape during 1970s and 1980s	Estimated model where crime rate was a function of state excise tax on beer and state specific characteristics. Found higher beer taxes led to lower rates of rape	<b>Econometric model</b> Aggregate level data present a problem in that such data only include crimes that have been reported to the police. Estimates from the US National Crime Victimization Survey reveal that less than one-half of violent crimes are reported to the police
Cook, P. and Moore, M. (1993a)	Estimated beer tax increase [US]	Used annual data on rape from 48 neighbouring states (1979–88)	Examined relationships between alcohol use and violence. A 10% increase in beer tax was estimated to reduce rape by 1.3%	<b>Modelling study</b>
Cook, P. J and Moore, M. J. (1993c) [same study as Cook, P. J and Moore, M. J. (1993b)]	Estimated beer tax increase [US]	Used annual data on rape from 48 neighbouring states (1979–88)	Examined relationships between alcohol use and violence. A 10% increase in beer tax was estimated to reduce rape by 1.3%	<b>Modelling study</b>
Grossman, M. and Markowitz, S. (1999) [same study as Grossman, M. and Markowitz (2001)]	Estimated beer price increase [US]	Core Alcohol and Drug Survey of college students (N=120,000) conducted in 200 US colleges or universities (1989–91)	Studied effects of variations in alcoholic beverage prices on violence on college campuses. 10% increase in price of beer would reduce the number of college students involved in violence each year by 4% A 10% increase in price was estimated to result in decline from 14.3% to 13.8% in sexual misconduct	<b>Modelling study</b>
Markowitz, S. (2000a)	Alcohol prices [International]	Data from 1989 and 1992 International Victimization Surveys. Sample of almost 50,000 respondents in 16 different countries	Examined the relationship between price of alcoholic beverages and incidence of criminal violence in different countries. Respondents were asked if they had been victims of sexual assault (female respondents only). Model estimated where probability of being a victim of violent crime is determined by price of alcohol, area person lives in, and other socio-economic characteristics of respondent. Country fixed effects were also employed in some models. Higher alcoholic beverage prices led to lower incidences of sexual assault in models where country fixed effects not included as they are not reliable	<b>Correlational study</b> Definitive causal implication cannot be drawn from correlation data, since a reverse flow of influence may be operating
Markowitz, S. (2000b) [same study as Markowitz, S. (2000b)]	Estimated higher beer taxes [US]	Data from 1992, 1993 and 1994 National Crime Victimization Surveys	Examined the relationship between prices of alcohol and incidence of violence in nationally representative sample of individuals in the US. Model estimated that higher beer taxes would not affect rape rates	<b>Modelling study</b>

## Domestic violence (including child abuse)

<p>Herttua <i>et al.</i> (2008)</p>	<p>Alcohol tax reduction (by an average 33%). Off-premise retail price of spirits went down by an average 36%, wines 3%, and other alcoholic beverages 13–28% [Finland]</p>	<p>86 administrative tracts from Helsinki Metropolitan Area, Finland in 2004</p>	<p>Interpersonal violence rates did not increase after large reduction in alcohol prices and increase in consumption. For domestic violence, rate decreased. Significant relationship between measures of social disadvantage and interpersonal violence (for example, low educational level and high out-migration level). No adverse effects of price reduction on police-recorded violent crime or emergency call-outs related to domestic violence. Incidents involving custody due to intoxication underwent a 3.1% increase (<math>P=0.567</math>). Violating domestic peace significantly decreased by 13.6% (<math>P=0.001</math>), while domestic violence incidents requiring emergency call-outs decreased by 6.8% (<math>P=0.069</math>). Total emergency call-outs remained stable (0.4% increase, <math>P=0.921</math>). All estimates (excluding violating domestic peace) were statistically insignificant. Small differences in impact of decrease in alcohol prices on interpersonal violence between high, intermediate, and low status areas</p>	<p><b>Retrospective analysis of natural experiment</b> Before–after comparison is appropriate because an interrupted time-series analysis needs a longer study period and at least 100 observations to detect moderate effect – only had 48 measurement points. Data included only crimes about which the police had information (a report of an offence). Many criminal events fail to enter records: they may not be known to the police, or the police may not record them as crimes. However, coverage of police records is high for severe crimes, (for example, acts of interpersonal violence). Factors affect compilation of statistics (no marked changes in readiness to report crimes and no significant changes in legislation or police control during study period)</p>
<p>Markowitz. S. and Grossman, M. (1998)</p>	<p>Increase of beer tax [US]</p>	<p>Data from 1976 Physical Violence in American Families Survey. Model where violent outcomes were affected by state excise tax rate on beer; illegal drug prices, and regulatory variables, for example, availability and laws restricting advertising</p>	<p>10% increase in excise tax on beer would reduce probability of child abuse perpetrated by females by around 2%. Tax elasticities 0.12 (<math>p_{0.05}</math>) for any violence toward children and 0.16 (<math>p_{0.10}</math>) for severe violence toward children</p>	<p><b>Econometric model</b> Due to data, authors were not able to decipher whether the effects remain after controlling for state-level unobservables</p>
<p>Markowitz, S. and Grossman, M. (2000)</p>	<p>Taxation increases [US]</p>	<p>Analyses separately by gender of parent, and adds data from 1985 National Family Violence Survey</p>	<p>Violence by female respondents was responsive to changes in state excise tax rate on beer, with an average elasticity of -0.13. 10% increase in excise tax on beer would have no impact on child abuse perpetrated by males. Results appeared due to influence of taxes on violence by women but not by men. Specifically, 1% increase in tax on beer would decrease probability of violence by about 0.33%. For women, revealed downward trend in violence rate over time. Even though nominal tax rates had risen, increase had not kept up with inflation, resulting in decrease in real beer tax over time</p>	<p><b>Econometric model</b> Model reliant on estimates and assumptions. Due to data, it was not clear whether effects remain after controlling for state-level unobservables. Downward trend in both violence and real beer tax at odds with results of paper</p>
<p>Markowitz, S. (2000c)</p>	<p>Alcohol price increases [US]</p>	<p>Data from 1985 cross section and 1985–87 panel of National Family Violence Survey. Nationally representative sample. Oversamples violent individuals.</p>	<p>Examined the relationship between alcohol prices and spouse abuse (that is, wife abuse and husband abuse). Consistently indicated that increases in price per ounce of pure alcohol (measured by weighted average of prices of alcohol from beer, wine, and liquor) reduced the probability of severe violence (kicking, biting, hitting with a fist or other object, choking, and using or threatening to use gun/knife) aimed at wives. Estimated 1% increase in price per ounce of pure alcohol would decrease probability of being a victim of wife abuse by 5.3%. Evidence on propensity of increase</p>	<p><b>Correlational study</b> Definitive causal implication cannot be drawn from correlation data, since a reverse flow of influence may be operating. Author cautions value of estimate is somewhat imprecise because 95% CI is -1.0 to -9.7%</p>

		Dichotomous indicators of severe violence towards wives and husbands	in price of alcohol to lower violence towards husbands was mixed	
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## Drunk and disorderly behaviour

Mäkelä, P. and Österberg, E. (2009)	Excise reduction of 33% [Finland]	Review of published research and routinely available data (prices of alcoholic beverages, recorded/unrecorded alcohol consumption, data on criminality and other police statistics, alcohol-related deaths and hospitalisations, service use)	Arrests for drunkenness increased after 2004 by 7%, which was more than expected on basis of pre-existing trend	<b>Retrospective analysis of natural experiment</b> Study, based on natural experiment, confirmed what was earlier known based on time series and pooled cross-sectional time-series analyses about effects of taxes and prices on alcohol consumption: changes in prices of alcoholic beverages impact on consumption
Koski, A., Siren, R., Vuori, E. and Poikolainen, K. (2007)	Taxation decreases and removal of travellers' allowances; lowering of alcohol excise duty rates; Estonia joining EU [Finland]	Time-series analysis using national data. Weekly series of 33,782 alcohol-positive cases and control series of 37,617 alcohol-negative cases. Setting: Finland (1990-2004)	Alcohol tax cuts in March 2004 were associated with an increase of 11% in the number of intoxicated individuals apprehended by the police due to drunk and disorderly conduct from 2003 to 2004	<b>Retrospective analysis of natural experiment</b> While analysis of alcohol positive sudden deaths (primary hypothesis) is robust, there are no details on the source of this observation on drunk and disorderly conduct

## Public order offences

Herttua, (2008)	Alcohol tax reduction (an average 33%). Off-premise retail price of spirits went down by an average 36%, wines 3% and other alcoholic beverages 13-28% [Finland]	86 administrative tracts from Helsinki Metropolitan Area, Finland in 2004	Incidents involving custody due to intoxication underwent a 3.1% increase (P=0.567), assault and battery increased by 4.5% (P=0.161). Violating domestic peace significantly decreased by 13.6% (P=0.001), while domestic violence incidents requiring emergency call-outs decreased by 6.8% (P=0.069). Total emergency call-outs remained stable (0.4% increase, P=0.921). All estimates (with exception of violating domestic peace) were statistically insignificant. Small differences in the impact of decrease in prices on interpersonal violence between high, intermediate, and low status areas.	<b>Retrospective analysis of natural experiment</b> Before-after comparison appropriate because only had 48 measurement points. Data included only crimes about which the police had information (a report of an offence). Many crimes fail to enter records: may not be known to the police, or the police may not record them as crimes. However, coverage of police records is high for severe crimes (for example, acts of interpersonal violence). Factors affect compilation of statistics (no marked changes in readiness to report crimes. no significant changes in legislation or police control during study period).
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<b>Criminal damage</b>				
Grossman, M. and Markowitz, S. (2001)	Estimated beer price increases [US]	Core Alcohol and Drug Survey of college students (N=120,000) conducted in 200 US colleges or universities (1989-91)	10% increase in price of beer would result in decline from 7.5% to 7.1% for property damage	<b>Econometric model</b> For women, there was a downward trend in violence rate over time. Even though nominal tax rates had risen, increase had not kept up with inflation, resulting in decrease in real beer tax over time
Purshouse, R <i>et al</i> (2009a)	Estimated effects of minimum price per unit of alcohol thresholds from 20p through to 70p, discount restrictions and ban in the off-trade, 1%, 10% and 25% general price increases and price increases targeted at cheap alcohol [England]	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and underage, 18 to 24-year-old hazardous, moderate, hazardous and harmful drinkers	For overall results see section on overall crime.  In the UK, 31% of criminal damage offences committed by men and 34% of such offences committed by women were estimated to be attributable to alcohol, that is they would not have occurred if offender and/or victim had not drunk alcohol	<b>Modelling study</b> Cross-sectional data on expenditure and consumption, alcohol attributable fractions rely on data from offender survey
Purshouse, R <i>et al</i> (2009b)	Estimated effects of minimum price per unit of alcohol thresholds from 25p through to 70p, discount ban in the off-trade, combinations of minimum pricing and discount bans [Scotland]	Modelling study: Expenditure surveys, sales data, consumption surveys, data on alcohol-attribution of crime and incidence of different crime types, data on costs of crime. Average drinking and heavy episodic (peak) drinking, results for total population and moderate, hazardous and harmful drinkers	For overall results see section on overall crime.  Pricing policies could reduce criminal damage in England and Scotland. A 10% across-the-board price rise on all products (this is not the same as a 10% rise in taxation) in England was estimated to reduce criminal damage by 27,600 offences per annum. A total ban on off-trade discounting was estimated to reduce offences by 6,200 per year, with partial restrictions on discounting having smaller effects. Minimum prices below 40p would have little effect, but levels from 40p to 70p per unit were estimated to see increasing levels of effectiveness (for England: reductions of 2,200 criminal damage offences per annum for 40p, 10,300 offences at 50p, and 30,000 offences per annum at 70p)	<b>Modelling study</b>  Cross-sectional data on expenditure and consumption, alcohol attributable fractions rely on data from offender survey.
Saffer, H. (2001)	Actual increase in beer price [US]	Data from 32,000 people (1991 National Household Survey on Drug Abuse (NHSDA)), complemented by data on state beer taxes. Estimated effect of beer taxes on arrests, property crime, property damage, use of force, and drug selling.	Estimated the effectiveness of alcohol and other drug abuse policies in reducing crime. Impact of increase in beer price in 1991. Beer taxes were negatively related to self-reported property damage. Effects larger for the under 21s than for over 21s. Because of lower average disposable income, changes in controlled access to alcohol through price or tax increases were expected to have especially strong harm-reduction impact on youth and young drinkers.	<b>Correlational study</b> Definitive causal implication cannot be drawn from correlation data, since a reverse flow of influence may be operating.

<b>Robbery</b>				
Chaloupka, F. J. and Saffer, H. (1992)	Estimated higher beer taxes [US]	Used data from the FBI's uniform crime reports, looked at rates of murder, rape, assault, and robbery during 1970s and 1980s	Estimated a model where crime rate was a function of state excise tax on beer and state specific characteristics. Model also included price of marijuana and expenditures on police. Found higher beer taxes led to lower rates of rape, robbery, and homicide, but not assault. Also showed that decriminalizing marijuana would raise rates of rape, robbery and assault	Aggregate level data present a problem in that such data only include crimes that have been reported to the police. In the US, for example, estimates from the National Crime Victimization Survey reveal that less than one-half of violent crimes are reported to the police.
Chaloupka, F. J., Grossman, M. and Saffer, H. (2002)]	Beer tax increase [US]	Review	Increases in total price of alcohol could reduce alcohol-related violence and other crime. Increase in beer taxes would lead to a significant reduction in robberies	<b>Literature review</b> Non-systematic review selectively summarising evidence. Very dependent on constituent studies, many separately analysed below.
Cook, P. and Moore, M. (1993a) '	Estimated beer tax increase [US]	Annual data on homicide, rape, assault and robbery from 48 contiguous states (1979-88)	A 10% increase in beer tax would reduce robbery by 0.87%. Beer excise tax increases reduced per capita alcohol consumption and decreased incidence of violent crime, particularly robbery	Requires more contextually-sensitive measures of violent crime. Needs to factor in outlet density.
Cook, P. J. and Moore, M. J. (1993b)	Estimated higher beer taxes [US]	Used annual state-level data obtained from the FBI's uniform crime reports (1979 through 1987)	Examined impact of per capita alcohol consumption and beer excise taxes on violent crime rates (including burglaries). Employed fixed-effects models, in which independent variable was beer tax. Higher beer taxes would lead to significant reductions in robberies and rapes. Little impact on homicides and assaults	
Herttua ] (2008)	Alcohol tax reduction (by an average 33%). Off-premise retail price of spirits down by an average 36%, wines 3%, and other alcoholic beverages 13-28% [Finland]	86 administrative tracts from Helsinki Metropolitan Area, Finland in 2004	Robbery decreased by 12.4% (P=0.054). All estimates of change (with exception of violating domestic peace) were statistically insignificant.	Data included only reported crimes. Many crimes fail to enter records: may not be known to the police, or the police may not record them as crimes. Coverage of police records is higher for more severe crimes. Study period did not witness marked changes in readiness to report crimes. No significant changes in legislation or police control.
Markowitz, S. (2000a)	Actual alcohol prices [International]	Data from 1989 and 1992 International Victimization Surveys. Sample of almost 50,000 respondents in 16 countries	Respondents asked if they had been victims of robbery, assault, and sexual assault (female respondents only). Model estimated the probability of being a victim of violent crime determined by price of alcohol, variables describing area person lives in, and other socio-economic characteristics of respondent. Higher alcoholic beverage prices led to lower incidences of all three types of violent crime in models where country fixed effects were not included. Results from models including country fixed effects not reliable	<b>Evaluation: correlational study</b>
Markowitz, S. (2000b)	Actual higher beer taxes [US]	Data from 1992, 1993 and 1994 National Crime Victimization Surveys	Examined direct relationship between prices of alcohol/drugs and incidence of criminal violence in nationally representative sample of individuals in the US. Higher beer taxes led to lower incidence of assault, but not robbery. Higher beer taxes would also lead to lower probabilities of alcohol-involved assault	<b>Evaluation: correlational study</b>
Markowitz, S. (2005)	Actual higher beer taxes [US]	Data from 1992, 1993 and 1994 National Crime Victimization Surveys	Increasing tax on beer appeared to have no effect on probability of being a victim of robbery. Higher beer taxes decreased probability of assault and alcohol- or drug-involved assault, but not rape or robbery	<b>Evaluation: correlational study</b>

<b>Anti-social behaviour</b>
Not included, no studies found

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