How dependent is the alcohol industry on heavy drinking in England?

Aveek Bhattacharya[1] (iD), Colin Angus[2] (iD), Robert Pryce[2], John Holmes[2] (iD), Alan Brennan[2] & Petra S. Meier[2] (iD)

Institute of Alcohol Studies, London, UK[1] and School of Health and Related Research, University of Sheffield, Sheffield, UK[2]

ABSTRACT

Aims To understand the extent of the alcohol industry's financial dependence on drinking above government low-risk guidelines in England. **Design** Scenario modelling using descriptive analyses of pooled data from the 2013 and 2014 waves of two nationally representative surveys: the Health Survey for England (HSE) and the Living Costs and Food Survey (LCF). We estimated the proportion of alcohol sales revenue accounted for by drinkers above guideline levels, and how this varies between different beverage and retailer types. We then estimated the impact on sales revenue if the entire population reduced their drinking to within guideline levels, as well as the average price increases necessary to compensate for such a loss of revenue. **Setting** England. **Participants** A total of 16 872 individual (HSE) and 9975 household (LCF) survey respondents. **Measurements** Transaction-level estimates of volume of alcohol purchased and price paid by beverage type and trade sector. **Findings** Those drinking above guideline levels are estimated to account for 68% of total alcohol sales revenue in 2013/14: 81% of off-trade revenue and 60% of on-trade revenue. This represents 77% of beer, 70% of cider, 66% of wine and 50% of spirits sales value. The heaviest drinking 4% of the population account for 30% of all consumption and 23% of all industry revenue. If all consumers reduced their drinking to within guideline levels, alcohol sales revenue could decline by 38% (£13 billion). To mitigate this loss, average prices paid would have to rise substantially—for example, by £2.64 for a pint of on-trade beer or £12.25 for a 70 cl bottle of off-trade spirits. **Conclusions** In England, the alcohol industry appears to be highly financially dependent upon heavy drinking, and might face significant financial losses were consumers to drink within guideline levels.

Keywords Alcohol consumption, alcohol industry, concentration of alcohol consumption, conflict of interest, consumption patterns, distribution of alchol consumption, drinking patterns.

INTRODUCTION

Partnership with industry has been a central feature of recent UK alcohol policy [1]. This tendency is best exemplified by the Public Health Responsibility Deal, a 2010–15 government initiative encouraging businesses to make voluntary pledges to contribute to improving public health [2]. These include standardized health warning labels on drinks containers, funding for public awareness campaigns and actions to reduce sales to underage drinkers. A 'core commitment' of the Responsibility Deal, endorsed by more than 100 alcohol producers and retailers, was to 'foster a culture of responsible drinking, which will help people to drink within guidelines' [3]. As of August 2016, the government's guideline for low-risk drinking is 14 UK units per week for both men and women (a unit is equivalent to 8 g or 10 ml of pure alcohol) [4].

Critics of the government's approach argue that such voluntary measures are doomed by their expectation of businesses to 'engage in activities and policies ostensibly aimed towards reducing the harmful behaviours on which their profitability depends' [5]. A 2009 parliamentary inquiry concluded that 'the Government must be more sceptical about the industry's claims that it is in favour of responsible drinking' [6]. On no fewer than four occasions during the inquiry, parliamentarians raised the question of how businesses would be affected financially if drinkers were to reduce their consumption

to within government guidelines—without receiving a direct answer [7].

Many in the alcohol industry maintain that promoting lower consumption need not be bad for business [8]. An article on the trade news website *just-drinks* claims that 'Moderation per se is not a negative message for the alcohol sector to work with, and nothing in itself to be feared… Indeed, the "drink less, but drink better" mantra has been a constant theme in the alcohol sector for decades' [9]. From this view, lower volume consumption can be counterbalanced by a strategy of premiumization (selling more expensive, higher quality drinks), as well as price increases.

The sustainability of such an approach depends upon the extent to which the industry is currently dependent upon heavy drinkers. It is conceivable that higher average prices may be able to mitigate modest declines in sales, but if drinking above guideline levels represents a significant proportion of revenue, losing such sales poses a substantial commercial risk.

There is evidence from several countries that alcohol consumption is relatively concentrated within the minority of heavier drinkers [10–14]. The highest-consuming 20% of the population have been estimated to account for 74% of all alcohol units consumed in Australia [10], 67% in Brazil [11] and 59% in Sweden [12]. Moreover, the majority of volume consumption in Australia [15] and British Columbia [16] comes from drinkers consuming above those countries' guidelines.

In the British context, using 2006 data, Meier estimates that full compliance with the drinking guidelines would have reduced total alcohol consumption by 40% [7]. This updates Baumberg's analysis of 2000/01 data, which shows that 74% of alcohol was consumed by drinkers exceeding guidelines levels, and that compliance would have reduced total consumption by 36% [17]. Both estimates used the previous weekly guideline levels of 21 UK units for men and 14 for women.

However, these studies look only at consumption volume, rather than revenue. As the heaviest drinkers tend to favour cheaper drinks [18], their contribution to alcohol industry revenue is likely to be lower than their contribution to sales volume.

Only two studies in other countries have attempted to calculate the financial value of harmful drinking. Foster *et al.* estimate that underage and 'pathological' drinking accounts for 38–49% of all US alcohol expenditure [19]. Doran *et al.* estimate that revenue from Australian underage drinkers amounted to A\$218 million in 2015 [20]. However, both studies assume a single average price paid per beverage type (e.g. the same price for all beer), an approach that cannot account for the tendency of heavier drinkers to consume cheaper brands within a beverage category.

This study is the first to estimate the monetary value of heavy drinking in England. It extends previous work in several ways. It improves upon previous financial estimates by using detailed transaction-level data on alcohol expenditure, which permits accounting for variation in prices paid across drinkers. It analyses different sectors of the alcohol industry separately, comparing sales to heavy drinkers of beer, cider, wine and spirits, as well as comparing on-trade (pubs, bars, clubs, restaurants and hotels, where drinks are consumed on premises) with off-trade (supermarkets and stores, where drinks are bought for consumption elsewhere) retailers. It also examines the feasibility of potential industry strategies to mitigate the effect of heavy drinkers reducing their consumption to guideline levels through average price increases.

Specifically, it addresses the following questions:

1. What proportion of alcohol sales revenue do those drinking above guideline levels account for?
2. How does dependence on heavy drinkers vary between different sectors of the alcohol industry?
3. How would alcohol sales revenue be affected if everyone's consumption fell to within guideline levels?
4. How much would prices need to increase to counterbalance this loss of revenue?

METHODS

Data sets

This paper uses data from the UK Office for National Statistics' Living Costs and Food Survey (LCF) and NHS Digital's Health Survey for England (HSE). The LCF is distributed to households on a continuous basis throughout the year, and asks each individual aged 16 years and over to keep a detailed diary of their daily expenditure over a 2-week period. For alcohol, the survey provides transaction-level data on purchase location (on- or off-trade), beverage type (e.g. beer, cider, wine, spirits), price paid and volume of product purchased (which is converted to volume of pure alcohol using a standard set of assumptions about alcoholic strength) [21]. We use pooled data from the 2013 and 2014 iterations of the survey, comprising a total of 9975 households.

Two limitations of the LCF data need to be addressed. First, the survey substantially underestimates the volume of alcohol purchased when compared against tax revenue data from national accounts [22]. Secondly, the survey records purchases, not consumption, and assuming that the two are equivalent may potentially misattribute alcohol bought for another person. In order to mitigate these issues, we match the LCF data to alcohol consumption data from the HSE for the same years.

The HSE is a large, nationally representative survey of 16 872 individuals (2013 and 2014 pooled) which

records self-reported 'typical' consumption by beverage type. Coverage of total alcohol purchases relative to estimates from more robust national accounts [22] and sales [23,24] data is approximately 60% (compared to 40% for the LCF). The HSE does not collect data on prices paid, nor does it distinguish between off-trade and on-trade consumption or between beer and cider consumption, and therefore cannot be used in isolation to answer our research questions.

Both surveys categorize 'Ready-To-Drink' products (RTDs, also known as pre-mixed spirits or alcopops) separately, but as these represent a relatively insignificant share of the market (0.8% [24]) we combine them with spirits for the purposes of this analysis.

Linking data sets to estimate spending by individuals

For every HSE respondent, we take their self-reported weekly consumption of beer and cider (combined), wine and spirits. We then distribute this consumption between the on- and off-trades according to the proportions of alcohol purchased in each beverage category and location in the LCF by individuals of the same gender, age group (18–24, 25–34, 35–54, 55+), consumption level (moderate, hazardous and harmful, as described below) and income quintile (based on equivalized household income). Every HSE individual's reported combined beer and cider consumption is apportioned between on- and off-trade beer and cider in the same way. For each beverage category and location, the mean price paid per unit by LCF individuals in the same population subgroup is calculated and multiplied by the HSE consumption volume to calculate the estimated total annual spending by each individual on each beverage category in the on- and off-trade.

Linking the data sets in this way allows us to account for differences in the prices paid by different individuals —for example, reflecting the fact that heavier and lower-income drinkers tend to favour cheaper alcohol [18]. The specific variables used to link the data sets are those used in the Sheffield Alcohol Policy model, a leading policy analysis tool [25]. It should be noted, however, that this excludes 20% of HSE respondents from the estimated of consumption volume, as they are missing income data.

Defining drinker groups

In line with the revised government guidelines [4], we define 'moderate' drinking as individual consumption below or equal to 14 units per week for both genders. 'Heavy' drinking is used as a general term for consumption above this level. Within 'heavy drinking', we further distinguish 'hazardous (15–35 units for women, 15–50 for men) from 'harmful' (36+ for women, 51+ for men) drinking, following government definitions [26].

Analyses

To address research questions 1 and 2, we use these data to identify the proportion of annual expenditure on alcohol which is attributable to heavy drinkers by aggregating the individual estimates described above. To address question 3, we calculate the impact of every drinker consuming more than 14 units per week moving to exactly 14 units. In our base case we assume no change in drink preferences—people consume the same beverages in the same proportions—and that people continue to pay the same price per unit for each beverage. For example, a person who drinks 10 units of beer and 10 units of wine each week would drink 3 units fewer of each beer and wine in order to reach 14 units a week.

As this approach does not reflect the possibility that the alcohol industry may mitigate revenue losses by encouraging drinkers to shift to more expensive brands and/or raising prices, to address question 4 we estimate the extent to which the mean price per unit would have to increase for each beverage type (e.g. on-trade beer, off-trade wine) in order for the industry to maintain current revenue levels from sales of that product after the modelled reduction in consumption. We do this by dividing the initial revenue for the beverage type by the post-reduction consumption volume, and comparing the implied average price to the initial average price.

It is important to emphasize that we are not modelling a specific policy or mechanism to reduce drinking to within guideline levels. The analysis merely seeks to explore the consequences of such a decline in drinking, as a type of 'thought experiment' to elucidate the potential conflict of interest facing the alcohol industry, without seeking to explain how such a decline might come about. In practice, of course, there are significant obstacles (such as dependent drinking) to such a substantial and immediate fall in drinking.

Similarly, in calculating the price increases necessary to avoid any loss of revenue, we are not making any assumptions about consumers' price responsiveness. Instead, we are merely calculating how much more the industry would have to persuade consumers to pay, were consumption to fall in line with guidelines. In other words, how plausible is the 'drink less, but drink better' strategy in a world where people conform with the guidelines?

Finally, we explore the possibility that drinkers do not reduce their consumption equally across the price spectrum through a pair of sensitivity analyses. In the first, we assume that each heavy drinker cuts out their most expensive units of consumption until they reach the guideline level. In the second, we assume that they start cutting out the cheapest drinks first. These provide upper and lower bounds on the total impact on alcohol sales revenue of heavy drinkers cutting down to guideline levels. Note that

these analyses explore the impact of structural uncertainty in our assumptions. We have not sought to explore the impact of uncertainty around individual level consumption or prices.

RESULTS

What proportion of alcohol sales revenue do those drinking above guideline levels account for?

Our analysis confirms that the heaviest drinkers continue to account for the majority of alcohol consumed in England. In 2013/14, an estimated 77% of alcohol units (hereafter alcohol) were sold to drinkers consuming above guideline levels: 30% to harmful drinkers and 48% to hazardous drinkers. Units consumed in excess of the guideline levels accounted for 44% of all sales. Note that these numbers are not directly comparable with Baumberg's [17], as the guidelines have been updated since his study. The heaviest 20% of drinkers accounted for an estimated 70% of the total quantity of alcohol sold. This is slightly higher than previous results—Meier found the figure to be 66% in 2006 [7].

As expected, Fig. 1 shows that heavy drinkers accounted for a smaller share of revenue than their volume sales would suggest, as they tend to spend less per unit of alcohol. However, the overall picture is not substantially different: moderate drinkers represented an estimated 59% of the population, but were estimated to consume only 23% of all alcohol and accounted for 32% of all revenue. By contrast, the 25% of the population that consumed above guideline levels accounted for more than two-thirds (68%) of alcohol sales revenue. The 21% of the population who were hazardous drinkers consumed an estimated 48% of all alcohol and accounted for an estimated 45% of all revenue. A relatively small group of harmful drinkers, comprising 4% of the total population, consumed almost a third (30%) of all alcohol sold in England, and accounted for nearly a quarter (23%) of all alcohol sales revenue.
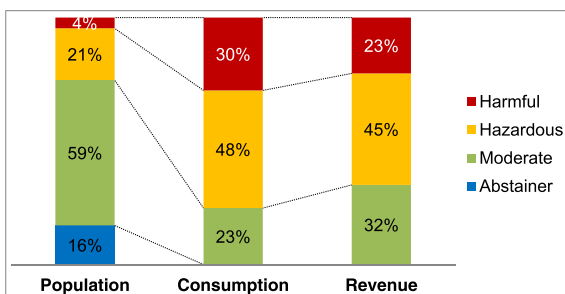
How does dependence on heavy drinkers vary between different sectors of the alcohol industry?

The most striking difference we found in sales revenue from purchases by heavy drinkers was between the on- and off-trade (Fig. 2). Fully 81% of off-trade revenue was estimated to come from those drinking above guideline levels. The corresponding figure was substantially lower (60%) for the on-trade, although heavy drinkers also still accounted for the majority of sales revenue.

Every beverage and retailer type has significant exposure to changes in consumption by heavy drinkers. This holds true even for sectors such as wine that are more likely to be associated with moderate drinking in the popular perception; 77% of beer expenditure was estimated to come from drinkers consuming above guideline levels, compared to 70% for cider, 66% for wine and 50% for spirits (Fig. 2).

These differences in the share of revenue from heavy drinkers between beverage types are driven almost entirely by differences in on-trade sales revenues, as Fig. 3 shows. By contrast, in the off-trade, heavy drinkers accounted for around 80% of sales of all beverage types.
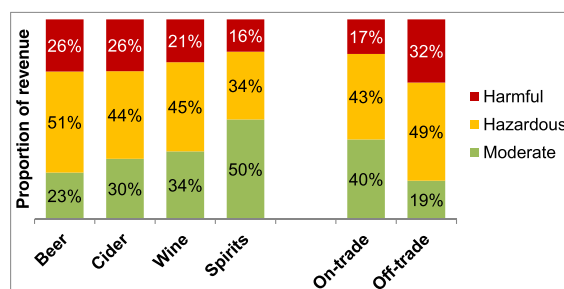

Figure 2 Proportion of revenue from harmful, hazardous and moderate drinkers by beverage types and retailer, 2013/14 [Colour figure can be viewed at wileyonlinelibrary.com]
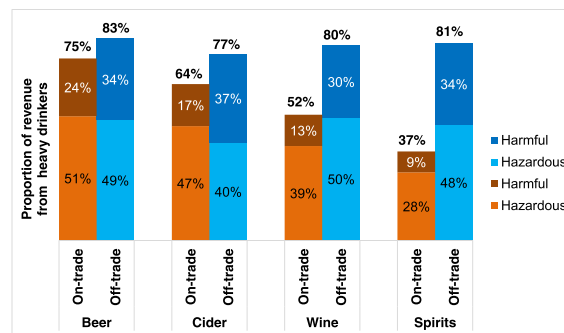

Figure 1 Volume and value of sales by consumption level, 2013/14 [Colour figure can be viewed at wileyonlinelibrary.com]

Figure 3 Proportion of revenue from heavy drinkers by beverage type and retailer, 2013/14 [Colour figure can be viewed at wileyonlinelibrary.com]

How would alcohol sales revenue be affected if everyone's consumption fell to within guideline levels?

We estimate that total revenue from sales of alcohol in England would fall by 38% if all consumers drank within the government low-risk guidelines of 14 UK units per week. In absolute terms, this implies that market value would fall by £13 billion, given that alcohol sales in England were approxomately £35 billion in 2014 [24].

All industry sectors would face sizeable losses in such a scenario, as Fig. 4 demonstrates. The off-trade would be most affected, with revenue from alcohol sales estimated to fall by 46%, compared to 33% for on-trade retailers. The estimated declines are substantial among all beverage types, although not equal, with beer revenue falling by 45% compared to a 27% fall for spirits.

How much would prices need to increase to counterbalance this loss of revenue?

One response to the commercial threat posed by lower levels of alcohol consumption would be for producers and retailers to recoup their losses through changes to the prices consumers pay, either through price increases, or by encouraging consumers to trade up to more expensive
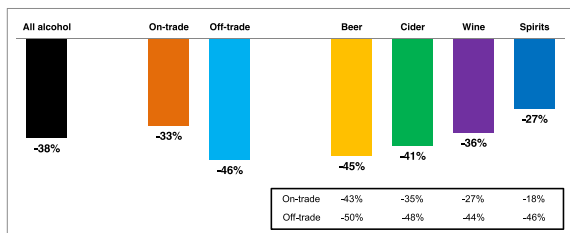

Figure 4 Percentage decline in revenue if consumption were to fall to guideline levels [Colour figure can be viewed at wileyonlinelibrary.com]
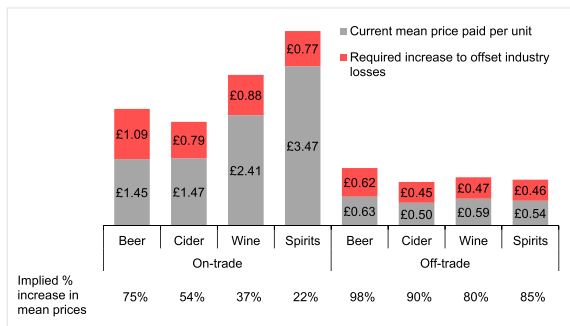

Figure 5 Change in mean prices paid per unit required to offset alcohol sales revenue lost from reduced consumption if everyone drank within guideline levels [Colour figure can be viewed at wileyonlinelibrary. com]

drinks. Figure 5 explores the potential of such a strategy by calculating the per unit price increase for each drink (separately for on- and off-trade) necessary to avoid any loss of revenue, given the estimated base case sales volume declines.

It shows that that the average price per unit paid for on-trade beer would have to rise by £1.09 (an additional £2.64 on the price of a pint of 4.3% ABV beer, which would rise to £6.15), while off-trade wine prices would need to rise by 47p per unit (approximately an extra £4.36 per bottle, increasing the price to £9.86) and off-trade spirits by 46p per unit (or approximately £12.25 per 70-cl bottle, so that it would cost £26.68).

Table 1 puts these increases into historical perspective, comparing them against the actual inflation-adjusted increase in average price per unit paid in England and Wales between 2005 and 2015. This shows that the necessary increases far exceed what has been realized over a 10-year period, casting doubt on the plausibility of premiumization and price increases compensating fully for the lower volume sales that would be associated with a shift to drinking within guideline levels.

Sensitivity analyses

The assumption of proportional reductions in consumption among all beverages that underpins the results presented above represents just one of many possible ways in which heavy drinkers may reduce their consumption to guideline levels. If we assume instead that heavy drinkers stop drinking their cheapest units first, representing a best-case scenario for the industry as a whole, we estimate that the overall impact on revenue would be a 24% decline (£8 billion). In the worst-case scenario for the industry—where people cut out their most expensive units first—revenue would fall by 51% (£18 billion).

As Fig. 6 shows, however, the marked price difference between on- and off-trade means that these two scenarios have dramatically different implications for the different sectors. The cheapest-unit first scenario would have just a mild effect on the on-trade (an estimated 6% fall in revenue), with very substantial consequences (an estimated 70% fall in revenue) for off-trade sales value. By contrast, the expensive-units first scenario would affect the on-trade marginally more, with a 55% fall in revenue compared to a 45% drop in the off-trade.

DISCUSSION

This paper set out to explore the extent of the commercial conflict of interest faced by the alcohol industry in promoting moderate drinking. We estimate that heavy drinkers account for 25% of the English population, but

Table 1 Average price per unit increases necessary to mitigate revenue loss in historical perspective.

| | | Price per unit increase (£/unit) | |
		necessary to mitigate base case revenue loss	Actual (inflation-adjusted), 2005–15[a]
On-trade	Beer	£1.09	£0.24
	Cider	£0.79	£0.26
	Wine	£0.88	£0.28
	Spirits	£0.77	£0.71
Off-trade	Beer	£0.62	-£0.02
	Cider	£0.45	£0.11
	Wine	£0.47	£0.06
	Spirits	£0.46	£0.04

[a]Nominal price per unit taken from NHS Health Scotland [24], and deflated by 26%, in line with Consumer Prices Index Growth [34].
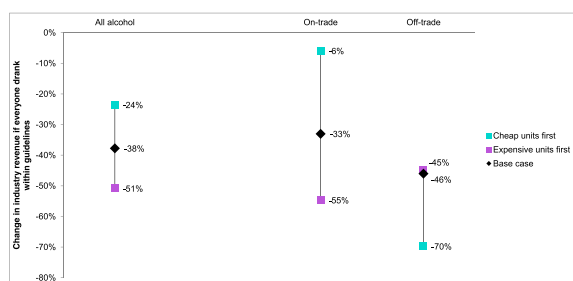

Figure 6 Impact of alternative assumptions on the alcohol sales revenue impacts of heavy drinkers cutting down to guideline levels [Colour figure can be viewed at wileyonlinelibrary.com]

two-thirds (68%) of all alcohol sales revenue. Our analysis suggests that if these drinkers were to reduce their consumption to guideline levels, that would represent a substantial threat to many retailers and producers: our base case estimate is that 38% of revenue from alcohol sales in England (some £13 billion) would be lost. Even under the most optimistic assumptions for the industry, where consumers cut out their cheapest alcohol units first, revenue would fall by 24% (£8 billion). In our base case scenario, all beverage types and retail sectors would face substantial revenue losses if everyone kept to the guidelines. However, the anticipated losses are estimated to be greater for the off-trade (where takings would fall by 46%) than for the on-trade (33%). Indeed, in the industry best-case scenario of drinkers cutting out cheaper units first, the on-trade would suffer relatively little loss of revenue. However, if consumers cut out more expensive drinks, both on and off-trade sales would decline by approximately half.

In recent years, the alcohol industry has had some success in mitigating the revenue effects of lower consumption through premiumization and price increases [27]. Full observance of the guidelines, however, would involve a much sharper decline (44%) than the observed 14% fall in per capita consumption between 2005 and 2015 [24]. As a

result, our analysis suggests that in order to avoid any loss of revenue, the average price paid per unit would have to increase substantially, by significantly more than historical price increases.

These findings raise serious questions about the conflicts of interest inherent to voluntary schemes and self-regulation. Moreover, in so far as they suggest that a financially successful alcohol industry of its current size and form depends upon harmful drinking, the government's economic support for alcohol producers, for example through tax cuts [28] and trade negotiations [29], appear more problematic. These findings may also have relevance for ongoing debates about whether to restrict alcohol sales to state monopolies or open them up to commercial enterprises [30]. A further implication is to reinforce the need for researchers to be cautious in receiving funding from, or collaborating with, the alcohol industry [31].

There are several limitations to this analysis. First, all numbers in this paper refer to sales revenue, although the ultimate objective of most businesses is to maximize profit; but revenue is both an important financial metric in its own right, and also ought to be positively (although imprecisely) related to a firm's level of profit. Furthermore, the magnitude of revenue decline associated with within-guideline consumption (38% in our base case) makes it implausible that profits would not be affected significantly by such a shift. Secondly, the analysis presented here is extrapolated from self-reported survey data—as mentioned above, this tends to underestimate alcohol consumption. Our approach here assumes implicitly that all sections of the population under-report their drinking in the same proportion. If anything, this probably underestimates the industry's full reliance upon the most harmful drinkers, who are less likely to be represented in surveys [32]. Our exclusion of survey respondents who did not report their household income may also bias our estimates to some extent if this missingness is correlated with other variables of interest [33]. Thirdly, our estimates of prices

relate to all alcohol purchases, and so may be inaccurate for certain groups if they buy large quantities of alcohol for others that is substantially cheaper or more expensive than the alcohol they drink themselves. Fourthly, we have only examined the impact of alternative structural assumptions in our sensitivy analyses and have not explored probabilistically the variation in individual parameters such as consumption or price. Finally, our analyses relate to the alcohol industry or sectors of the industry without distinguishing between specific companies. The degree to which any individual company benefits from sales to heavy drinkers is therefore unclear, although the domination of the market by a small number of very large companies suggests that substantial conflicts of interest exist.

There are a number of potential avenues for future research in this area. A robust method for estimating the relationship between different products and company profits would help to identify the bottom-line impact of shifts to lower consumption. Research on changes in patterns of consumption for people reducing their drinking would aid more realistic modelling of this phenomenon: in practice, to what extent do consumers who drink less 'drink better'? Indeed, more research on the extent to which the alcohol industry has, in the past, mitigated volume declines by raising prices and selling more premium products would provide an indication of how sustainable such a strategy is likely to be in the long term. A further possible extension would be to explore the tax revenue generated by the government from excise duty on harmful drinkers. Each of these would, however, require additional data beyond what we could access.

We have shown that all sectors of the alcohol industry in England are highly reliant upon revenue from heavy drinking. It is thus difficult to avoid the conclusion that significantly reducing harmful and hazardous drinking cannot be in the interests of the alcohol industry, raising serious questions about the appropriateness of the centrality of their role in government policy.

Declaration of interests

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