Modelling the impact of alcohol duty policies since 2012 in England & Scotland

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Executive Summary

Main findings

Estimates from new versions of the Sheffield Alcohol Policy Model for both England and Scotland suggest that:

- Changes in UK alcohol duty since 2012 have led to increased levels of alcohol consumption, greater levels of alcohol-related ill health, premature mortality, higher rates of alcohol-related crime and workplace absence than if the alcohol duty escalator had remained in place until 2015 as originally planned
- There have been almost 2,000 additional deaths caused by alcohol in England and 250 more in Scotland as a result of these changes in Government policy since 2012.
- These additional deaths have occurred disproportionately in more deprived households, widening inequalities in health
- Since 2012 there have been an additional 66,000 hospital admissions in England and Scotland, at a cost of £341m to the NHS, compared to if the duty escalator had remained until 2015
- Reintroducing an alcohol duty escalator in 2020 would be an effective way to reduce alcohol consumption and related harms, resulting in an estimated 4,700 fewer deaths in England and 420 in Scotland over the period to 2032 as a result.

Research questions

This report was commissioned in 2019 by the Institute of Alcohol Studies in order to estimate the impact of the UK Government's decision in 2012/13 to abolish the alcohol duty escalator and its subsequent cuts and freezes in alcohol duty. We used the Sheffield Alcohol Policy Model to model the impacts of these changes in duty policy from 2012 onwards on alcohol consumption, consumer spending on alcohol, alcohol-attributable hospital admissions and deaths, health inequalities, NHS costs, alcohol-related crimes and associated costs and workplace absence and associated productivity losses. We compared these impacts to those under alternative scenarios where the duty escalator had remained in place until 2015 as originally planned, or where it stayed in place until 2019, as well as modelling the impact of reintroducing the duty escalator in 2020. As a Minimum Unit Price (MUP) for alcohol was introduced in Scotland in 2018, we developed separate models for England and Scotland to assess the differential impact of duty policies in each country and to allow us to account for the interaction of MUP and duty policy in Scotland.

Summary of model results

We estimate that recent changes in alcohol duty since 2012 have, all else being equal, increased alcohol consumption in England by 1.0% from 2012 levels. In Scotland, although duty changes are estimated to have increased consumption prior to the introduction of MUP, the combined effect of MUP and duty is to have reduced consumption by 5.2%.

Modelled estimates of consumer spending suggest it fell by £23.11 per drinker per year in England as a result of recent duty policy compared to an estimated increase of £10.15 if the duty escalator had remained in place until 2015. Equivalent figures for Scotland are -£16.32 and +£10.83 per year respectively.

Changes in alcohol duty policy between 2012 and 2019 are estimated to have led to an additional 1,969 deaths (a 2.7% increase) and 61,386 (+1.4%) hospital admissions in England over the same period, increasing NHS costs by £317million (+1.7%), compared to a scenario where the alcohol duty

escalator remained in place until 2015. In Scotland we estimate an additional 254 deaths (+2.2%) and 4,556 admissions (+1.7%) at a cost of £24million (+1.9%).

Looking at the longer-term impact of duty policy changes between 2012 and 2019, we estimate that, if there are no further real-terms changes in alcohol duty, an additional 8,942 people (+4.4%) will die in England between 2012 and 2032 compared to the duty escalator having remained in place until 2015. The modelled impact of MUP means that the equivalent figure for Scotland is somewhat lower, at 429 (+1.4%).

We estimate that, comparing recent alcohol duty policies to a scenario where the duty escalator remained in place until 2015, there have been an additional 111,063 additional alcohol-related criminal offences in England (+0.8%) and 10,979 in Scotland (+0.5%) over the period from 2012 to 2019, at a cost to society of £377m and £92m respectively.

Model results suggest that there have been an additional 484,726 workplace absence days due to alcohol in England (+0.7%) and 37,252 in Scotland (+0.6%) between 2012 and 2019 compared to a duty escalator remaining in place until 2015. The estimated economic value of this lost production is £58m in England and £4m in Scotland.

Our analysis suggests that alcohol duty policy in the UK between 2012 and 2019 has likely widened existing inequalities in health in England compared to 2012 levels, while the additional estimated impact of MUP in Scotland means that inequalities have likely narrowed overall.

Results from our analysis suggest that reintroducing the alcohol duty escalator in 2020 would lead to 4,710 fewer alcohol-attributable deaths in England (-2.2%) and 420 in Scotland (-1.3%) in total by 2032 compared to a policy of maintaining duty rates constant in real terms. We estimate that this would also reduce alcohol-related hospital admissions by 160,760 and 8,719 over the same period in England and Scotland respectively, saving the NHS £794m and £46m.

We estimate that reintroducing the duty escalator in 2020 would reduce alcohol-related criminal offences by 263,084 in England and 31,992 in Scotland over the period to 2032, reducing the cost to society by £901m and £279m respectively. Over the same period, we estimate there would be 1.4m fewer workplace absences in England, saving the economy £156m, compared to 115,296 fewer absences in Scotland, saving £13m.

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Introduction

In 2008, the then-UK Chancellor, Alistair Darling, introduced a 'duty escalator' under which alcohol duties would rise by 2% above inflation each year until 2012. In 2012 this approach was extended to run until 2015; however in 2013, his successor, George Osborne, abolished the duty escalator on beer and the following year he abolished it for all other products. In the subsequent years, alcohol duties have been cut or frozen several times and have not been increased above inflation in any budget.

In August 2019, the Sheffield Alcohol Research Group was commissioned by the Institute of Alcohol Studies to examine the impact of these changes in alcohol duty policy from 2012 onwards on alcohol consumption, health, crime and workplace outcomes in both England and Scotland. In this report we present the outcomes of this work, estimating the impact of historic duty policies using adaptations of the most recent version of the Sheffield Alcohol Policy Model (4.0) and comparing these estimates to alternative scenarios where the duty escalator remained in place, or was re-introduced.

Methods

UK alcohol duties 2012-present

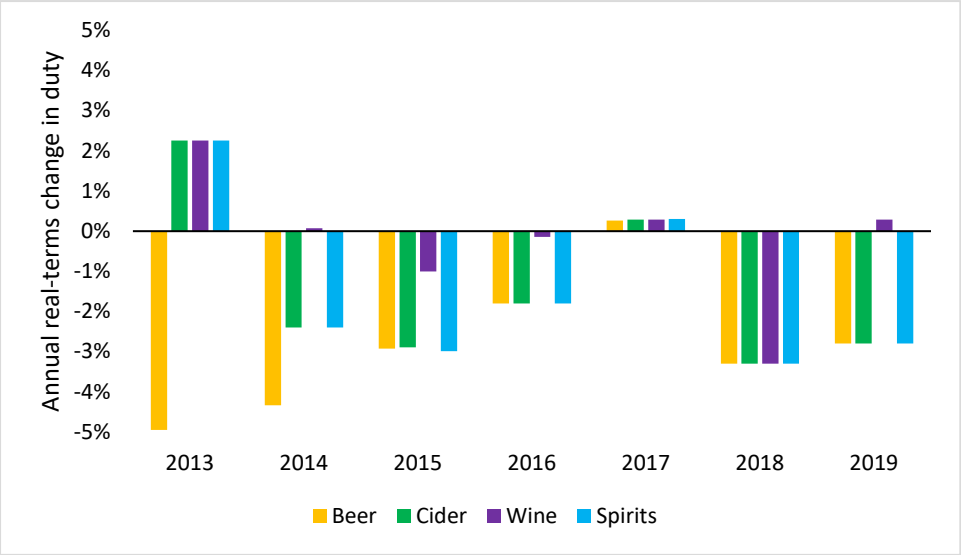
A comprehensive list of changes in UK alcohol duties since 2012 is given in Table 1. Prior to the introduction of the duty escalator in 2008, the default position was that alcohol duty rates would increase in line with inflation (measured using the Retail Prices Index (RPI)[1]), i.e. that they remain constant in real terms. A failure to increase duties in line with inflation, whether this be through a below-inflation rise, a freeze in duty rates or a duty cut, will mean that the value of alcohol duty will fall in real terms. As a result, all else being equal, alcohol prices will fall, increasing the affordability of alcoholic products. Figure 1 illustrates how the historic changes in duty from 2012 to present compare with inflation, showing that, in almost all years, alcohol duty fell in real-terms. This Figure also highlights that duties have changed differently on different products. Between 2012 and 2019, beer duty fell by 2.0% in nominal terms, which equates to a 19.4% reduction once inflation is accounted for. Over the same period wine duty rose by 17.4% in nominal terms, equivalent to a 2.0% reduction in real terms. Cider duty increased by 7.3% in nominal terms and spirits duty by 7.2%, which equate to real-terms falls of 11.4% and 11.5% respectively.

[1] In 2017 the UK government announced that their preferred measure of inflation was changing from RPI to CPI (or CPIH), however alcohol and other duties continue to be linked to RPI and we therefore use RPI as the measure of inflation throughout this report

Table 1: Historic UK alcohol duty rates since 2012. Red = duty cut, orange = duty freeze, light green = RPI increase, dark green = above RPI increase.

Category	Sub-category	Duty rate								
		2012	2013	2014	2015	2016	2017	2018	2019	Units
Beer	General	£19.51	£19.12	£18.74	£18.37	£18.37	£19.08	£19.08	£19.08	per 1%ABV per hectolitre of product
	High strength >7.5% ABV	£24.39	£24.21	£24.03	£23.85	£23.85	£24.77	£24.77	£24.77	
	Lower strength 1.2%-2.8% ABV	£9.76	£9.17	£8.62	£8.10	£8.10	£8.42	£8.42	£8.42	
Cider (and perry)	Still 1.2%-6.9% ABV	£37.68	£39.66	£39.66	£38.87	£38.87	£40.38	£40.38	£40.38	per hectolitre of product
	Still 6.9%-7.5% ABV	£37.68	£39.66	£39.66	£38.87	£38.87	£40.38	£40.38	£50.71	
	Still 7.5%-8.5% ABV	£56.55	£59.52	£59.52	£58.75	£58.75	£61.04	£61.04	£61.04	
	Sparkling 1.2%-5.5% ABV	£37.68	£39.66	£39.66	£38.87	£38.87	£40.38	£40.38	£40.38	
	Sparkling 5.5%-8.5% ABV	£245.32	£258.23	£264.61	£264.61	£268.99	£279.46	£279.46	£288.10	
Wine	Still 1.2%-4% ABV	£78.07	£82.18	£84.21	£84.21	£85.60	£88.93	£88.93	£91.68	
	Still 4%-5.5% ABV	£107.36	£113.01	£115.80	£115.80	£117.72	£122.30	£122.30	£126.08	
	Still 5.5%-15% ABV	£253.39	£266.72	£273.31	£273.31	£277.84	£288.65	£288.65	£297.57	
	Still 15%-22% ABV	£337.82	£355.59	£364.37	£364.37	£370.41	£384.82	£384.82	£396.72	
	Sparkling 5.5%-8.5%	£245.32	£258.23	£264.61	£264.61	£268.99	£279.46	£279.46	£288.10	
	Sparkling 8.5-15%	£324.56	£341.63	£350.07	£350.07	£355.87	£369.72	£369.72	£381.15	
Spirits and spirits-based RTDs		£26.81	£28.22	£28.22	£27.66	£27.66	£28.74	£28.74	£28.74	per litre of ethanol

Figure 1: Annual real-terms changes in average alcohol duties by product 2012-19



It is also worth noting that over the period from 2012-2019, three other alcohol pricing policies were introduced in England and/or Scotland. In 2014 the UK government introduced a ban in England and Wales on selling alcohol for below the cost of the duty plus VAT applicable to the sale. Previous modelling work has demonstrated that this policy affected a tiny proportion of the alcohol market and therefore was unlikely to have a substantial impact on alcohol consumption or population health [1]. In 2018 the Scottish government introduced a Minimum Unit Price (MUP) for alcohol of 50p. Although a comprehensive evaluation of this policy is currently underway, results from this evaluation are not yet available, however prior modelling work suggested that MUP is likely to have a significant impact on alcohol consumption and related harm [2]. Finally, in 2019, the UK government introduced a change to the structure of cider duty, with the introduction of an additional duty band for products between 6.9% and 7.5% ABV. Whilst strong white cider is a particular concern from a public health perspective as it is disproportionately consumed by heavy drinkers [3,4], this new strength band covers only a small proportion of the cider market and increases the effective duty rate on cider at 7.4% ABV from 5.5p/unit to 6.9p/unit. Cider sold at 7.5% and above, which has seen its effective duty rates cut by over 11% since 2012, is unaffected by this change. This is in comparison to duty rates of 19.1p/unit for standard strength beer, 23.8p/unit for wine at 12.5% ABV and 28.7p/unit for spirits. As a result, it is unlikely that the introduction of this additional duty band will have a significant impact on alcohol consumption.

The Sheffield Alcohol Policy Model

The Sheffield Alcohol Policy Model (SAPM) is an advanced public health policy model which has been widely used for the prospective appraisal of alcohol pricing policies, including changes in taxation and Minimum Unit Pricing (MUP) in both England [5,6] and Scotland [2]. Full details of the modelling methodology have previously been published elsewhere[7,8]. Briefly, the model is comprised of two main components: an econometric model which links changes in the price of different types of alcohol to changes in alcohol consumption, and an epidemiological model which links these changes in consumption to changes in the risk of illness and death from 45 different alcohol-related health conditions as well as alcohol-related criminal offences and alcohol-attributable absence from work. The model is stratified throughout by age, sex and deprivation (measured as quintiles of the Index of

Multiple Deprivation), allowing the impact of a policy on different subgroups in the population to be examined in detail.

In order to model the impact of changing duty rates since 2012, it was necessary to create a 2012 version of SAPM to conduct the analyses described in this report. Due to differences in the available data and also the fact that MUP was introduced in 2018 in Scotland and not in England, we developed separate models for each country and present the results separately for each. Table 2 details the data sources used in each version of the model.

Table 2: Data sources for the country-specific adaptations of SAPM

Data	England	Scotland
Alcohol consumption	Health Survey for England (HSE) 2012	Scottish Health Survey (SHeS) 2012
Alcohol purchasing	Living Costs and Food Survey (LCFS) 2010-15 (England sample only)	Living Costs and Food Survey (LCFS) 2010-15 (combined Scotland and England sample[2]
Aggregate off-trade prices	Nielsen market research data 2012 (England & Wales)	Nielsen market research data 2012 (Scotland)
Aggregate on-trade prices	CGA market research data 2016 (England)	CGA market research data 2016 (Scotland)
Proportion of alcohol purchased in the on- vs. off-trade	CGA/Nielsen market research data 2012 (England & Wales)	CGA/Nielsen market research data 2012 (Scotland)
Alcohol-related and all-cause deaths	Office for National Statistics mortality records 2012-16 (England)	National Records Scotland mortality records 2011-17 (Scotland)
Admissions	Hospital Episode Statistics (HES) 2012/13-16/17 (England)	Information Services Division data 2011-17 (Scotland)
Crime	Office for National Statistics data 2007-17 (England)	Scottish Government/Scottish Crime Agency data 2009/10-16/17 (Scotland)
Workplace	Quarterly Labour Force Survey 2012 (QLFS) (England)	Quarterly Labour Force Survey 2012 (QLFS) (Scotland)

Modelling duty policies in SAPM

As outlined in Table 2, data on alcohol purchases for both the English and Scottish models comes from the Living Costs and Food Survey (LCFS). This data comprises transaction-level data detailing individual purchases of alcohol, the type of alcohol bought, the price paid and the volume of alcohol purchased. In order to estimate how changes to alcohol duty rates change these transaction-level prices we must first estimate the current duty associated with each transaction. This is achieved through a two-step process. Firstly, we calculate the effective duty rate per unit of alcohol associated with each product sub-category listed in Table 1. For cider and wine, which are taxed on the basis of product volume, this involves making assumptions about the average ABV of these products within each sub-category. These assumptions are set out in Table 3.

[2] Due to the smaller size of the Scottish sample in the LCFS, it was necessary to combine the English and Scottish samples for the Scottish model

Table 3: Assumed alcoholic strengths for cider and wine

Category	Sub-category	Assumed ABV
Cider (and perry)	Still 1.2%-6.9% ABV	4.5%
	Still 6.9%-7.5% ABV	7.4%
	Still 7.5%-8.5% ABV	8.4%
	Sparkling 1.2%-5.5% ABV	4.5%
	Sparkling 5.5%-8.5% ABV	7.4%
Wine	Still 1.2%-4% ABV	4.0%
	Still 4%-5.5% ABV	5.5%
	Still 5.5%-15% ABV	12.5%
	Still 15%-22% ABV	17.0%
	Sparkling 5.5%-8.5%	7.0%
	Sparkling 8.5-15%	12.5%

Secondly, we take sales data from market research company Nielsen, published by NHS Health Scotland[9], to estimate the proportion of alcohol sold within each category (beer, cider, wine and spirits) which falls into each duty band. From this we can calculate the average duty paid per unit of alcohol. These values, based on the actual duty rates in place from 2012-19 are shown in Table 4.

Table 4: Estimated average duty paid per unit by beverage type 2012-19

Category	2012	2013	2014	2015	2016	2017	2018	2019
Beer	£0.197	£0.193	£0.189	£0.186	£0.186	£0.193	£0.193	£0.193
Cider	£0.081	£0.085	£0.085	£0.083	£0.083	£0.087	£0.087	£0.087
Wine	£0.206	£0.217	£0.222	£0.222	£0.226	£0.235	£0.235	£0.242
Spirits	£0.268	£0.282	£0.282	£0.277	£0.277	£0.287	£0.287	£0.287

Finally, these values are converted into year-on-year real-terms changes in alcohol prices by comparing the observed annual changes in duty rates from Table 4 against observed changes in RPI[10]. These changes are applied to the transaction-level prices from the LCFS, after accounting for evidence on the extent to which changes in taxation are passed through to consumers and how this varies by drink type and by price[11], in order to estimate the change in purchase prices faced by individuals in the model in each year.

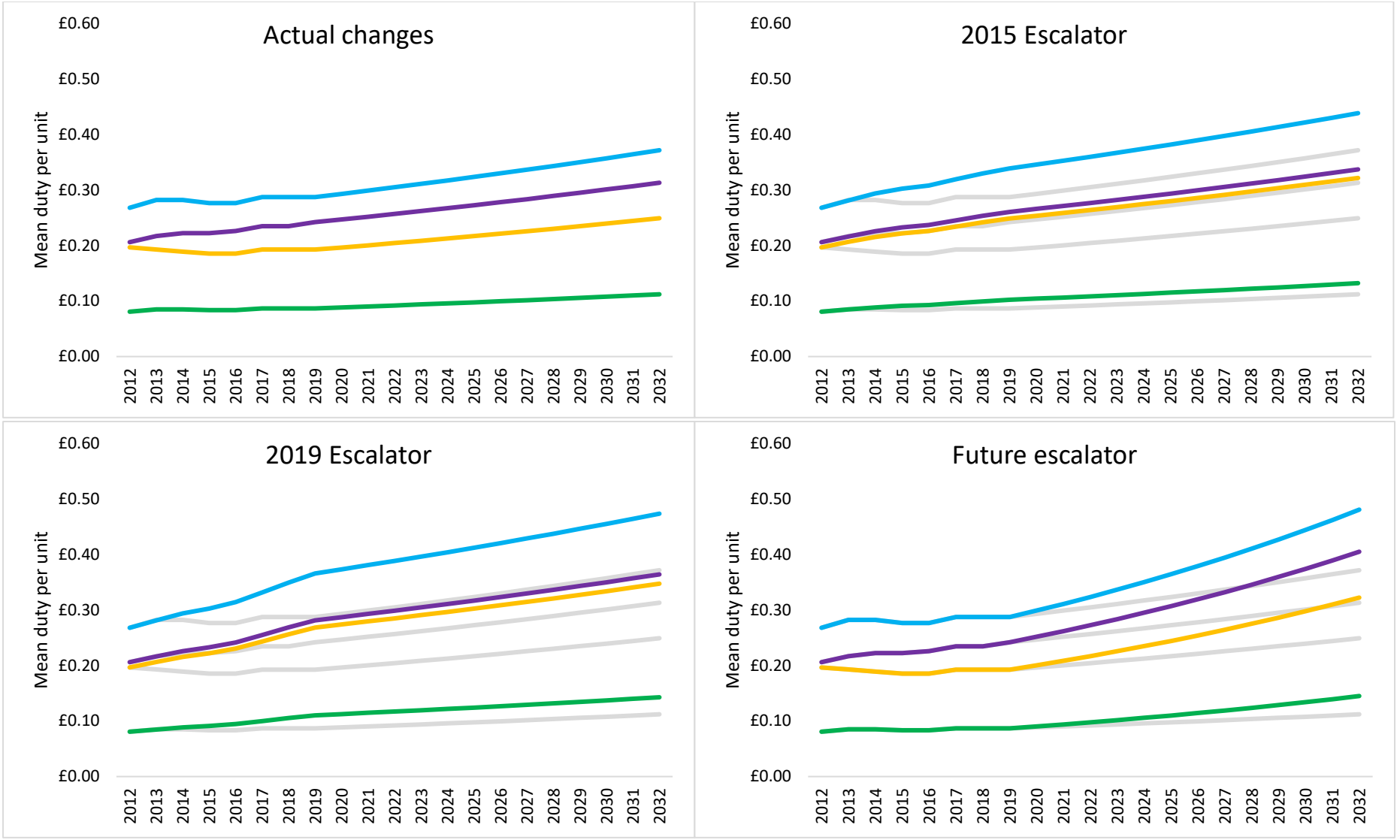
Modelled duty policies

In order to assess the impact of alternative duty policies, we modelled four alternative policy scenarios alongside a counterfactual where duty remains constant in real terms from 2012-2032:

1. What actually happened 2012-19 followed by no further real terms changes (i.e. assuming duty rises in line with inflation from 2020 onwards) – hereafter "Actual changes"
2. The alcohol duty escalator continuing until 2015, as planned, followed by no further real terms changes – hereafter "2015 Escalator"
3. The alcohol duty escalator continuing until 2019, followed by no further real terms changes – hereafter "2019 Escalator"
4. What actually happened 2012-19 followed by the reintroduction of the duty escalator from 2020 onwards – hereafter "Future escalator"

The implications of these four scenarios on alcohol duty rates are shown in Figure 2, assuming an RPI from 2020 onwards of 2% for illustrative purposes. The grey lines represent the equivalent duty rates under the 'Actual changes' scenario.

Figure 2: Absolute modelled alcohol duty rates under modelled scenarios



For each policy, we assess both the short-term impact up to the present day (i.e. from 2012-2019) and the longer-term impact from 2012-2032. The choice of 2032 is motivated by the fact that evidence suggests that it can take up to 20 years for changes in alcohol consumption to fully be realised as changes in risk of harm for some health conditions, particularly cancers[12]. This therefore reflects the 'full effect' of policy changes made in 2012. For each scenario we present results for the following outcomes:

- Changes in alcohol consumption
- Changes in consumer spending on alcohol
- Changes in alcohol-attributable deaths
- Changes in alcohol-attributable hospital admissions
- Changes in alcohol-attributable NHS costs
- Changes in alcohol-attributable criminal offences
- Changes in criminal justice costs
- Changes in alcohol-attributable workplace days absence
- Changes in costs to society of workplace absence

In addition, we present estimates of the differential impact of each scenario on different socioeconomic groups, defined by quintiles of the Index of Multiple Deprivation (IMD in England and SIMD in Scotland). All costs are presented in 2019 prices and are not discounted.

'All else being equal'

In this study we are only interested in modelling the direct causal impact of changes in alcohol duty (and in the case of Scotland, Minimum Unit Pricing). In reality, levels of alcohol consumption, spending and harm are influenced by a range of demographic, social, cultural and economic factors. In order to isolate the effect of government pricing policies, all of these are left out of the model. As such, the Sheffield Alcohol Policy Model adopts a 'ceteris paribus' or 'all else being equal' approach, assuming that in the absence of any real-terms change in alcohol prices, alcohol consumption will remain at current levels.

It is important to emphasise, therefore, that the estimates in this report are not estimates of the change in overall alcohol consumption, spending and harm since 2012. Rather, they reflect the portion of that change which can be attributed to government policies. For example, the model estimates that average alcohol consumption in England rose by 0.9% between 2012 and 2018 as a result of duty cuts and freezes. Yet alcohol sales data suggests that overall, alcohol consumption *fell* by 1.1% over this period in England and Wales [9]. The implication of this is that factors other than pricing policy and therefore outside the model, pushed consumption down by 2% between 2012 and 2018 and that the 1.1% fall in overall consumption would have been greater had alcohol duties not reduced in real-terms over this period.

Results

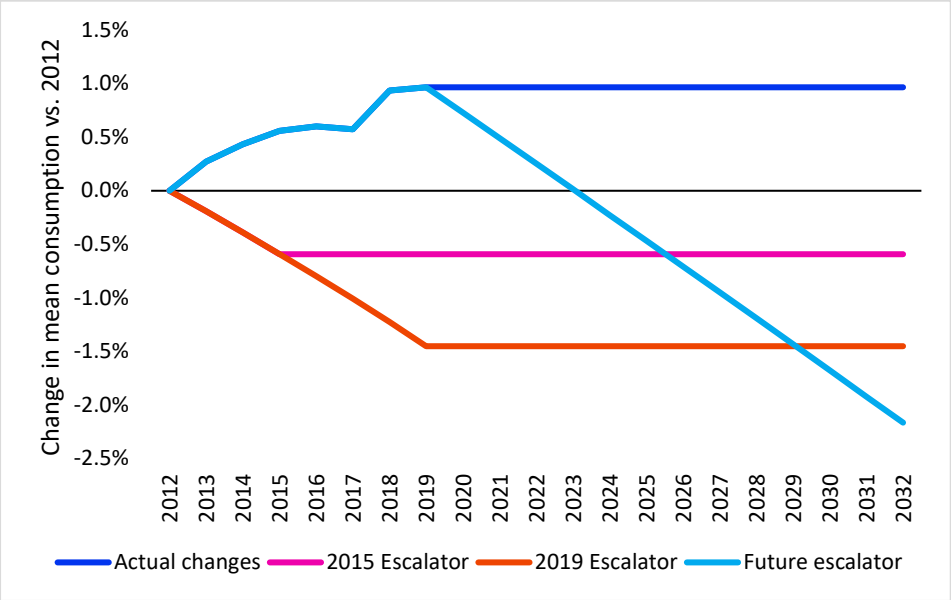
England

Alcohol consumption

The impact of historic and alternative alcohol duty policies on average population alcohol consumption is shown in Figure 3. Alcohol consumption in 2019 is estimated to be 1.0% higher (+7.45 units per drinker per year) as a result of changes in alcohol duty since 2012 than if duty had simply been increased in line with inflation. If the duty escalator had remained in place until 2015, mean consumption would be an estimated 0.6% lower (-4.57 units per drinker per year) than in

2012, while continuing the escalator until 2019 would have led to consumption being 1.5% (-11.19 units/drinker/year) lower. These results equate to alcohol consumption in 2019 being 1.6% higher than it would have been if the duty escalator had continued until 2015 as originally intended. Alternatively, if an alcohol duty escalator was reintroduced in 2020, mean consumption is estimated to return to 2012 levels by 2024 and to be 2.2% lower than 2012 levels by 2032.

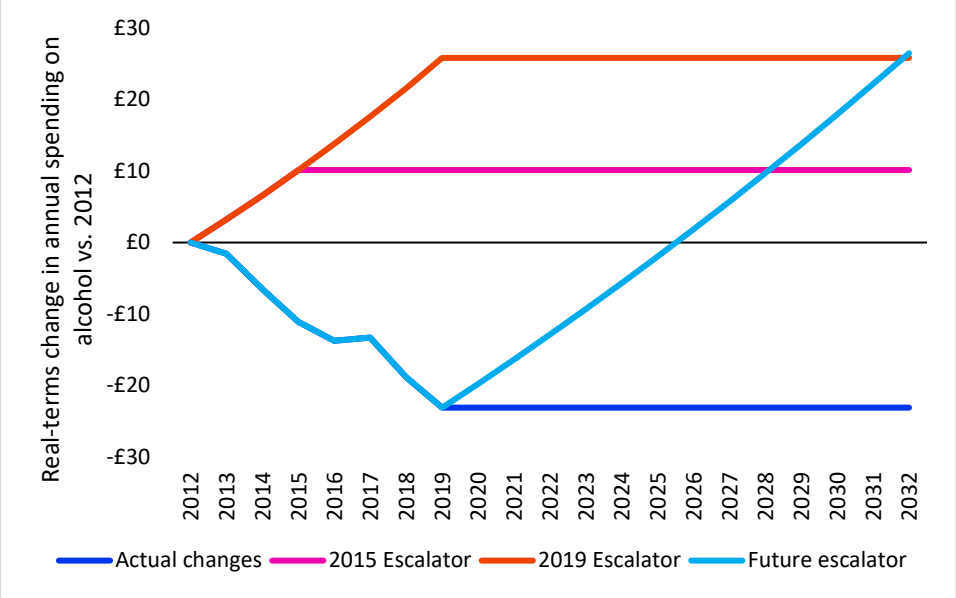
Figure 3: Estimated changes in mean alcohol consumption under modelled scenarios



Consumer spending on alcohol

The average spend on alcohol per drinker in 2012 was an estimated £833 per year. As a result of the duty changes enacted up to 2019 this is modelled to have fallen by £23.11 (-2.8%). Had the duty escalator remained in place until 2015, spending would have been £10.15 (+1.2%) higher per drinker in 2019 than in 2012, while continuing the escalator to 2019 would have increased spending by £25.84 per year (+3.1%) compared to 2012 levels. These changes are illustrated in Figure 4.

Figure 4: Estimated changes in mean annual spending on alcohol under modelled scenarios



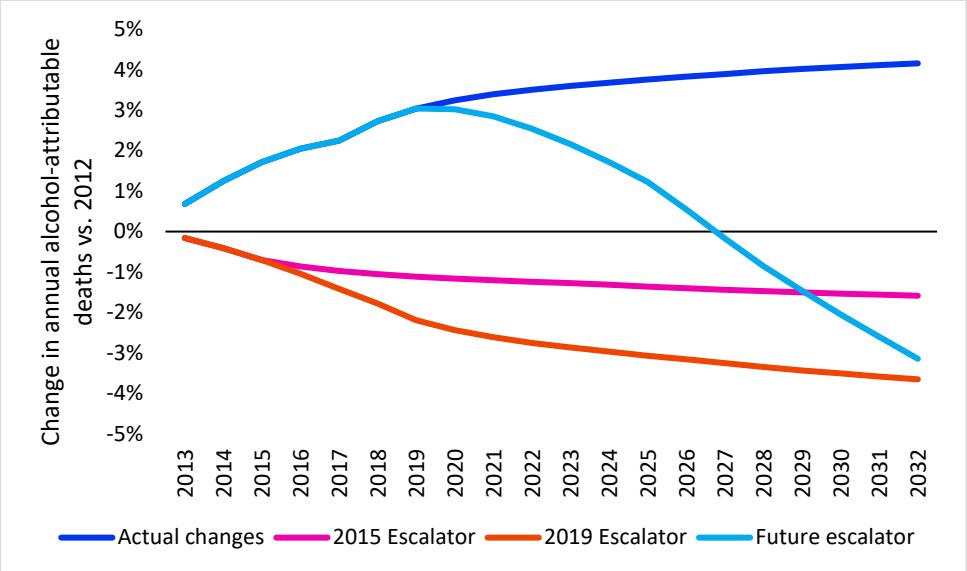
Alcohol-attributable deaths

SAPM estimates that there are 10,365 deaths in England each year caused directly by alcohol consumption. The impact of the four modelled policies on this figure are presented in Table 5 and visualised in Figure 5. Recent changes in alcohol policy are estimated to have led to an additional 1,422 deaths between 2012 and 2019 (an increase of 2.0%), rising to 6,524 between 2012 and 2032 (+3.1%) compared to a policy of increasing duty in line with inflation. Compared to the duty escalator remaining in place until 2015, actual duty policies are estimated to have led to an additional 1,969 deaths up to 2019 (an increase of 2.7%) and a total of 8,942 deaths up to 2032 (+4.4%). These figures rise to 2,222 (+3.1%) and 11,535 (+5.7%) when historic duty rates are compared against the duty escalator remaining in place until 2019. If a duty escalator were introduced in 2020, an estimated 4,710 alcohol-attributable deaths would be averted by 2032 compared to a policy of increasing current duties in line with inflation, a reduction of 2.2%.

Table 5: Estimated changes in alcohol-attributable deaths under modelled policies

	Alcohol-attributable deaths 2012-19	**Difference from no change**		**Alcohol-attributable deaths 2012-32**	**Difference from no change**	
No real-terms change	72,555			207,301		
Actual changes	73,977	1,422	2.0%	213,825	6,524	3.1%
2015 Escalator	72,008	-547	-0.8%	204,883	-2,418	-1.2%
2019 Escalator	71,755	-800	-1.1%	202,289	-5,011	-2.4%
Future escalator	73,977	1,422	2.0%	209,115	1,814	0.9%

Figure 5: Estimated impact of modelled policies on alcohol-attributable deaths



Alcohol-attributable hospital admissions

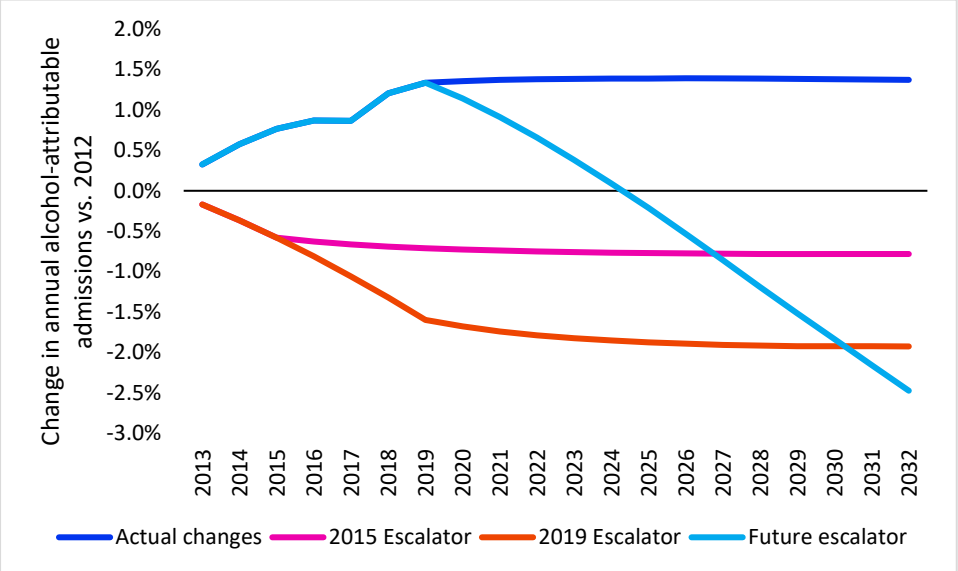
In addition to the substantial burden on mortality, alcohol consumption in England is also responsible for an estimated 629,999 hospital admissions each year. Changes in UK alcohol duties since 2012, shown in Table 6 and Figure 6, have increased this burden by 37,425 admissions over the period up to 2019, an increase of 0.8%, compared to a policy of increasing duty in line with inflation.

If we compare the impact of recent duty policy with the duty escalator having remained in place until 2015, we estimate there have been an additional 61,386 hospital admissions from 2012-2019 (+1.4%), a figure which rises to 237,183 (+1.9%) when considering the full effect experienced between 2012 and 2032. These figures rise further to an increase of 74,559 (+1.7%) between 2012-2019 and 339,640 (+2.7%) when comparing actual duty changes to a scenario where the escalator was continued until 2019. Given the duty changes that did happen between 2012 and 2019, reintroducing a duty escalator in 2020 is estimated to reduce hospital admissions by 160,760 (-1.3%) over the following 12 years.

Table 6: Estimated changes in alcohol-attributable hospital admissions under modelled policies

	Alcohol-attributable admissions 2012-19	**Difference from no change**		**Alcohol-attributable admissions 2012-32**	**Difference from no change**	
No real-terms change	4,409,994			12,599,982		
Actual changs	4,453,920	37,425	0.8%	12,898,807	150,436	1.2%
2015 Escalator	4,382,521	-23,961	-0.5%	12,427,552	-86,748	-0.7%
2019 Escalator	4,363,359	-37,134	-0.8%	12,222,639	-189,204	-1.5%
Future escalator	4,452,564	37,425	0.8%	12,577,287	-10,325	-0.1%

Figure 6: Estimated impact of modelled policies on alcohol-attributable hospital admissions



Healthcare costs

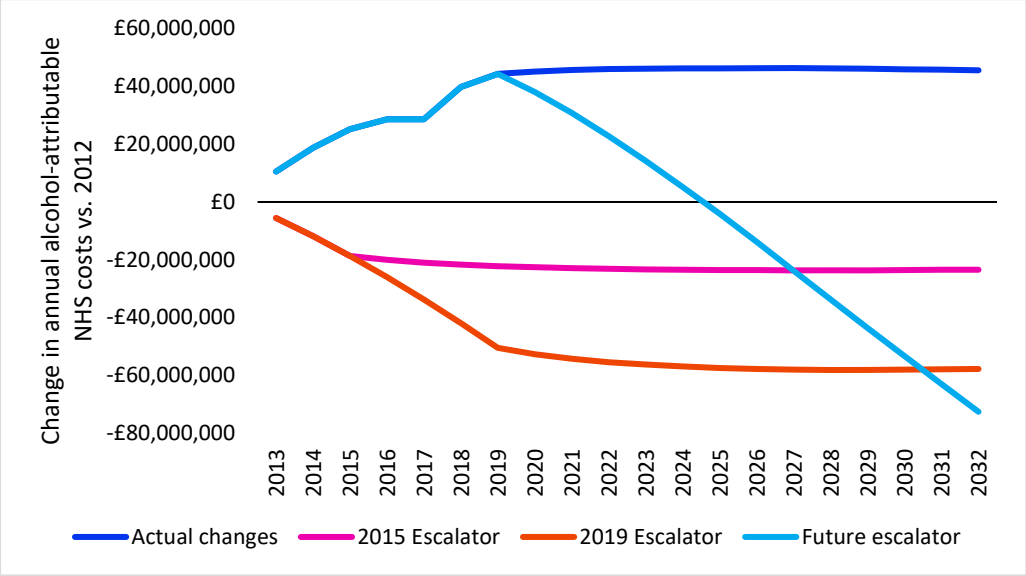
The estimated impact of all modelled scenarios on NHS costs attributable to alcohol is shown in Table 7 and Figure 7. Alcohol-related ill health is estimated to have cost the NHS £2.62bn in 2012. Government duty policies between 2012 and 2019 are estimated to have increased this burden by £196 million, a 1.1% increase, compared to a scenario where alcohol duties were instead increased in line with inflation. Comparing recent policies to the duty escalator having remained in place to 2015 shows an estimated increase in NHS costs of £317m (+1.7%) between 2012 and 2019, rising to £1.2bn (+2.3%) when you consider the period between 2012 and 2032. Retaining the duty escalator

until 2019 would have led to savings of £384m (-2.1%) up to 2019 and £1.7bn (-3.3%) up to 2032 compared to actual changes in duty. Introducing a duty escalator in 2020 would save an estimated £794m over the period to 2032.

Table 7: Changes in NHS costs due to alcohol under modelled scenarios

	Total NHS costs due to alcohol 2012-19 (£m)	Difference from no change (£m)		Total NHS costs due to alcohol 2012-32 (£m)	Difference from no change (£m)	
No real-terms change	£18,338			£52,394		
Actual changes	£18,534	£196	1.1%	£53,188	£793	1.5%
2015 Escalator	£18,217	-£121	-0.7%	£51,970	-£425	-0.8%
2019 Escalator	£18,150	-£188	-1.0%	£51,467	-£927	-1.8%
Future escalator	£18,534	£196	1.1%	£52,393	-£1	0.0%

Figure 7: Changes in annual NHS costs due to alcohol



Criminal offences and associated costs

Alcohol is estimated to have been implicated in 1.9 million criminal offences in England in 2012, with an associated cost to society of £6.5bn. Note that this cost is based on Home Office estimates of the cost of crime [13] which includes a financial valuation of lost quality and length of life and lost economic productivity as a result of crime. As such this figure should not be interpreted as the expected cost savings to the police and criminal justice system. The impact of each modelled scenario on offence levels and societal costs is presented in Table 8 and Table 9 respectively. Recent cuts and freezes to alcohol duty are estimated to have led to an additional 67,547 criminal offences since 2012 at a cost of £229m compared to a policy of increasing alcohol duties in line with inflation and an additional 111,063 offences at a cost of £377m compared to the duty escalator continuing until 2015. Reintroducing the escalator in 2020 is estimated to lead to 263,084 fewer offences up to 2032, saving £901m compared to maintaining duties constant in real terms.

Table 8: Estimated changes in criminal offence volumes under modelled scenarios

	Alcohol-attributable criminal offences 2012-19	Difference from no-change		Alcohol-attributable criminal offences 2012-32	Difference from no-change	
No real-terms change	13,425,727			38,359,219		
Actual changes	13,493,274	67,547	0.5%	38,626,908	267,689	0.7%
2015 Escalator	13,382,212	-43,515	-0.3%	38,221,118	-138,101	-0.4%
2019 Escalator	13,356,364	-69,363	-0.5%	38,058,872	-300,347	-0.8%
Future escalator	13,493,274	67,547	0.5%	38,363,824	4,605	0.0%

Table 9: Estimated changes in criminal costs under modelled scenarios

	Alcohol-attributable criminal costs 2012-19 (£m)	Difference from no change		Alcohol-attributable criminal costs 2012-32 (£m)	Difference from no change	
No real-terms change	£45,538			£130,107		
Actual changes	£45,766	£229	0.5%	£131,013	£906	0.7%
2015 Escalator	£45,389	-£149	-0.3%	£129,635	-£472	-0.4%
2019 Escalator	£45,300	-£237	-0.5%	£129,080	-£1,027	-0.8%
Future escalator	£45,766	£229	0.5%	£130,112	£5	0.0%

Workplace absence and associated costs

Alcohol consumption is estimated to have led to 9.6 million days of missed work in England in 2012, at a cost of £985m, based on lost salary costs. The impact of each modelled scenario on these figures is presented in Table 10 and Table 11. Subsequent alcohol duty policy is estimated to have increased days of absence by 257,308 between 2012 and 2019 at a cost of £33m compared to having increased duties in line with inflation. Compared to the original intention of maintaining the duty escalator until 2015, actual changes in alcohol duty are estimated to have increased alcohol-attributable workplace absence by 484,726 days between 2012 and 2019 at a cost of £58m. Reintroducing the duty escalator in the 2019 budget would lead to an estimated reduction in absences of 1.4m days, worth £156m to the economy between now and 2032.

Table 10: Estimated changes in workplace absence under modelled scenarios

	Alcohol-attributable days absence 2012-19	Difference from no change		Alcohol-attributable days absence 2012-32	Difference from no change	
No real-terms change	66,940,258			191,257,881		
Actual changes	67,197,566	257,308	0.4%	192,285,520	1,027,639	0.5%
2015 Escalator	66,712,840	-227,419	-0.3%	190,536,148	-721,732	-0.4%
2019 Escalator	66,577,758	-362,500	-0.5%	189,688,160	-1,569,721	-0.8%
Future escalator	67,197,566	257,308	0.4%	190,875,302	-382,579	-0.2%

Table 11: Estimated changes in productivity costs under modelled scenarios

	Lost productivity costs 2012-19 (£m)	Difference from no change (£m)		Lost productivity costs 2012-32 (£m)	Difference from no change (£m)	
No real-terms change	£6,895			£19,699		
Actual changes	£6,928	£33	0.5%	£19,829	£130	0.7%
2015 Escalator	£6,869	-£25	-0.4%	£19,618	-£81	-0.4%
2019 Escalator	£6,854	-£41	-0.6%	£19,523	-£176	-0.9%
Future escalator	£6,928	£33	0.5%	£19,673	-£26	-0.1%

Impacts on health inequalities

Previous research has demonstrated that alcohol pricing policies can have significant impacts on health inequalities and also that these impacts can vary widely between different policy approaches [14,15]. Figure 8 presents the estimated differential impact of actual UK duty policies since 2012 on alcohol consumption by IMD quintile. This demonstrates that consumption is estimated to have increased in the most deprived quintile to a much greater degree than in other groups, with the least deprived quintile seeing the smallest effect. These differentials arise through a combination of different alcohol consumption patterns across the population, but particularly because recent duty changes have reduced the real-terms price of beer, which is drunk disproportionately by more deprived groups, to a much greater extent than the price of wine.

Figure 8: Modelled impact of recent duty policies on alcohol consumption by IMD quintile

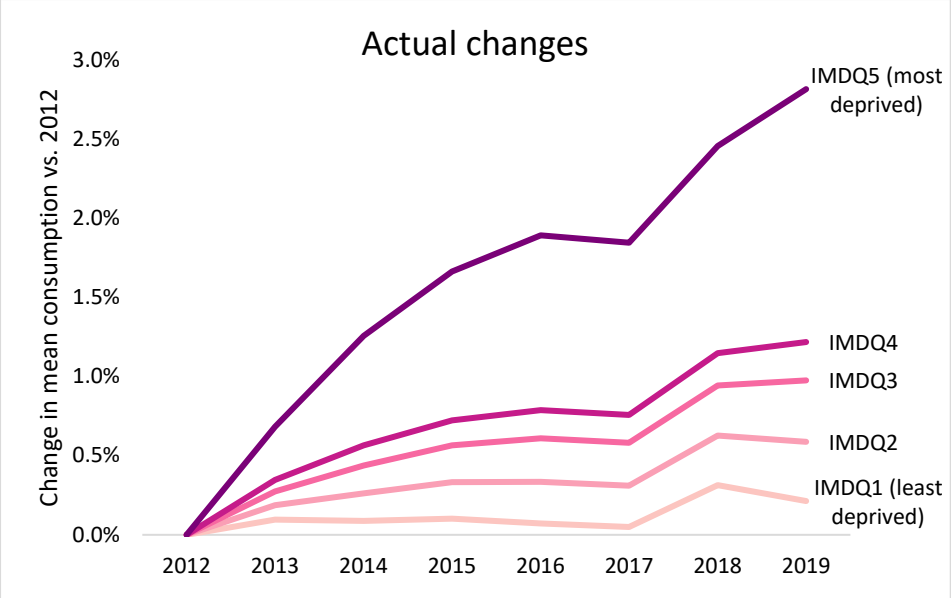
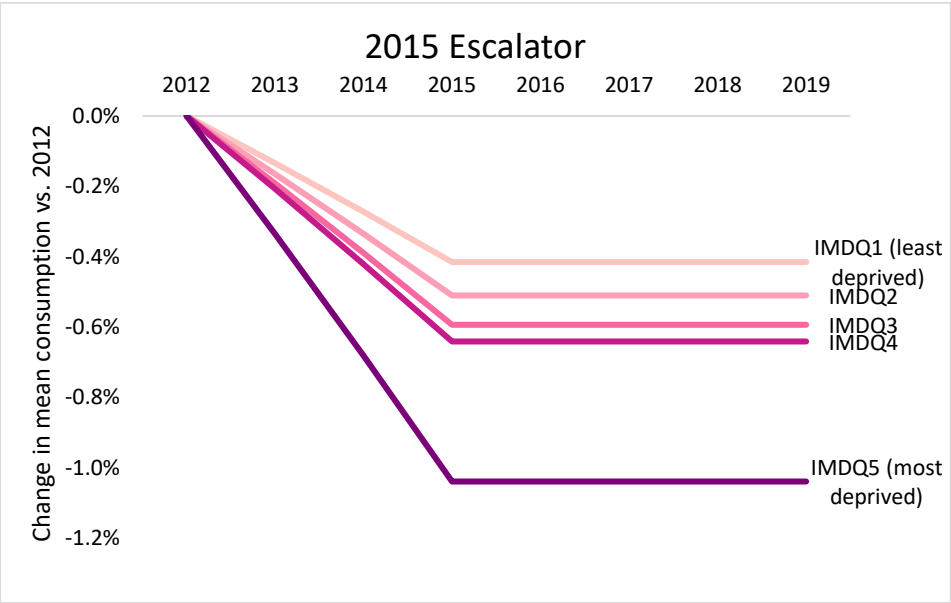


Figure 9 shows the estimated impacts of continuing the alcohol duty escalator until 2015 on alcohol consumption by IMD quintile. This shows that the greatest reduction in consumption would have occurred among the most deprived groups. This arises primarily because a greater proportion of the price of cheaper products is made up of duty, and drinkers in more deprived groups purchase more cheap alcohol. As a result, more deprived drinkers face a larger proportional increase in price when duty rises under an escalator and consequently reduce their consumption to a greater extent. Taken together, these two figures demonstrate that the decision to abolish the duty escalator has had the greatest impact on the drinking of the most deprived group in society who would have seen the largest reductions in consumption under the escalator, but have instead seen the greatest increases.

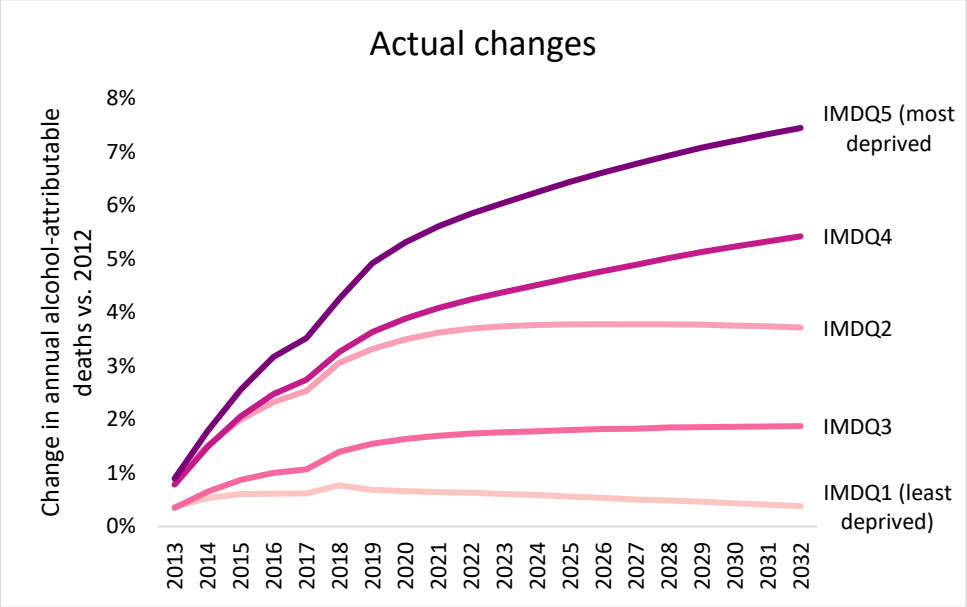
Figure 9: Modelled impact of planned alcohol duty policy on alcohol consumption by IMD quintile



The impact of these differential changes in alcohol consumption on health are illustrated in Figure 10 and Figure 11. These demonstrate that recent UK alcohol policies are estimated to have increased alcohol-attributable deaths among the most deprived groups in society by more than the least

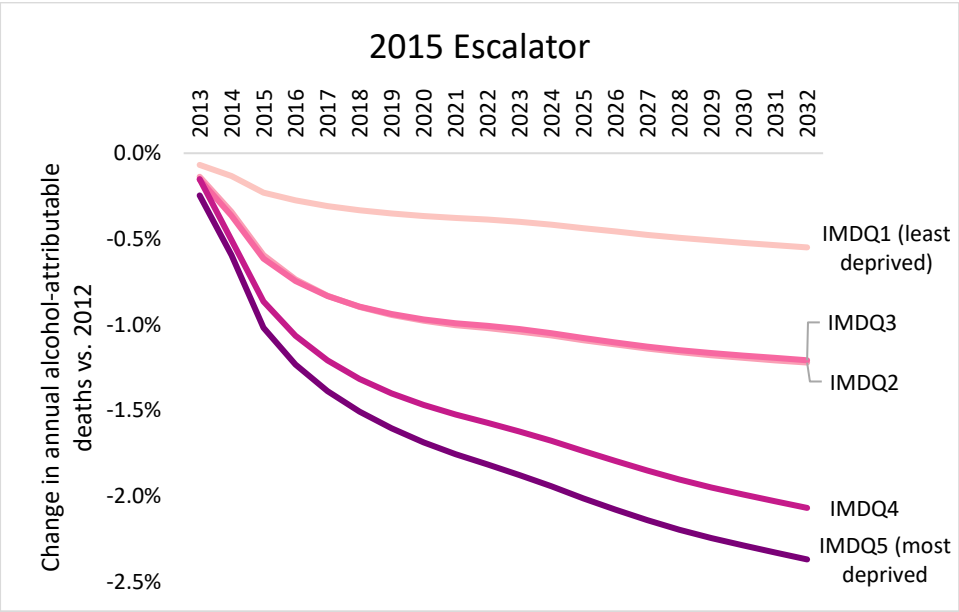
deprived, with mortality rates in the most deprived quintile rising by 4.9% by 2019 and 7.4% in 2032 from their 2012 levels, compared to increases of 0.7% and 0.4% respectively in the least deprived group.

Figure 10: Modelled impact of recent duty policies on alcohol-attributable mortality by IMD quintile



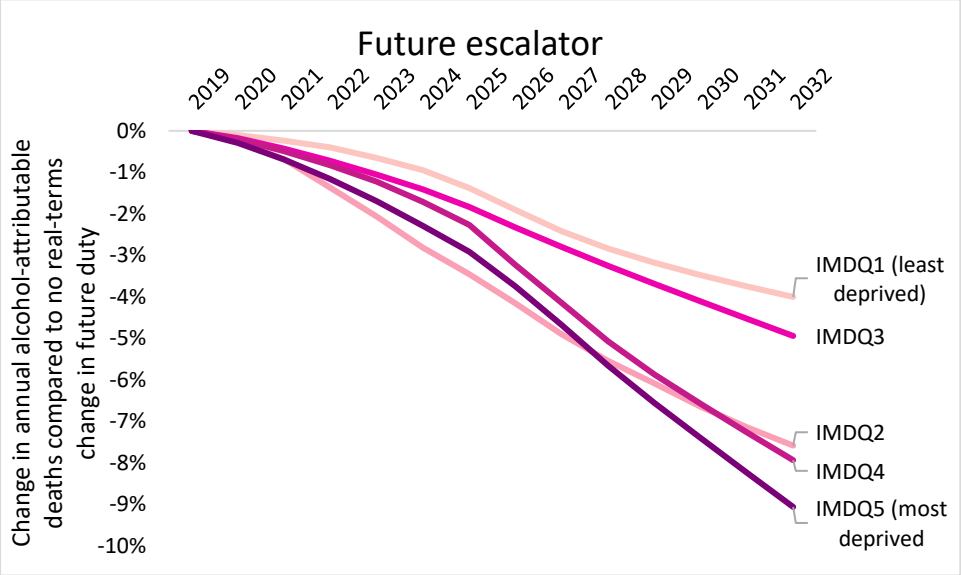
Retaining the duty escalator until 2015 as originally planned would, in contrast, have reduced health inequalities, with alcohol-attributable deaths falling by 3.3% in the most deprived group by 2019 and 5.6% by 2032 compared to 0.8% and 1.5% respectively in the least deprived group. Taken together these results illustrate that the decision to abolish the duty escalator is estimated to have widened the existing inequalities in health caused by alcohol.

Figure 11: Modelled impact of planned duty policies on alcohol-attributable mortality by IMD quintile



Finally, compared to maintaining future alcohol duty levels constant in real terms, reintroducing a duty escalator duty is estimated to lead to the largest reductions in alcohol-attributable mortality in the most deprived groups, as illustrated in Figure 12.

Figure 12: Modelled impact of reintroducing a duty escalator, compared to holding duty constant in real terms, on alcohol-attributable mortality by IMD quintile

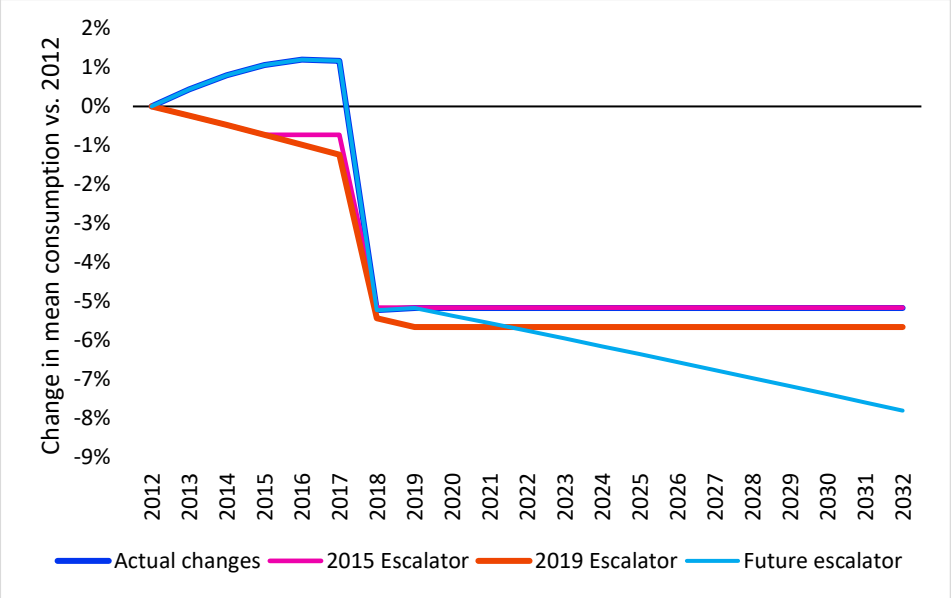


Scotland

Alcohol consumption

The impact of historic and alternative alcohol duty policies on average population alcohol consumption is shown in Figure 13. As in England, the abolition of the duty escalator and subsequent cuts and freezes to duty are estimated to have led to a rise in consumption. However, the introduction of Minimum Unit Pricing (MUP) in Scotland in 2018 is estimated to have more than offset these increases, leading to a net fall in consumption of 5.2% (40.8 units per drinker per year) compared to 2012. The estimated impact of MUP dominates the differential impact of different duty policies, meaning that there is relatively little difference in the estimated changes in consumption under scenarios where the duty escalator remained in place. However, if an alcohol duty escalator was reinstated in 2020 alongside MUP, we estimate that this would lead to a further reduction in consumption of 2.8% (20.8 units per drinker per year) by 2032.

Figure 13: Estimated changes in mean alcohol consumption under modelled scenarios

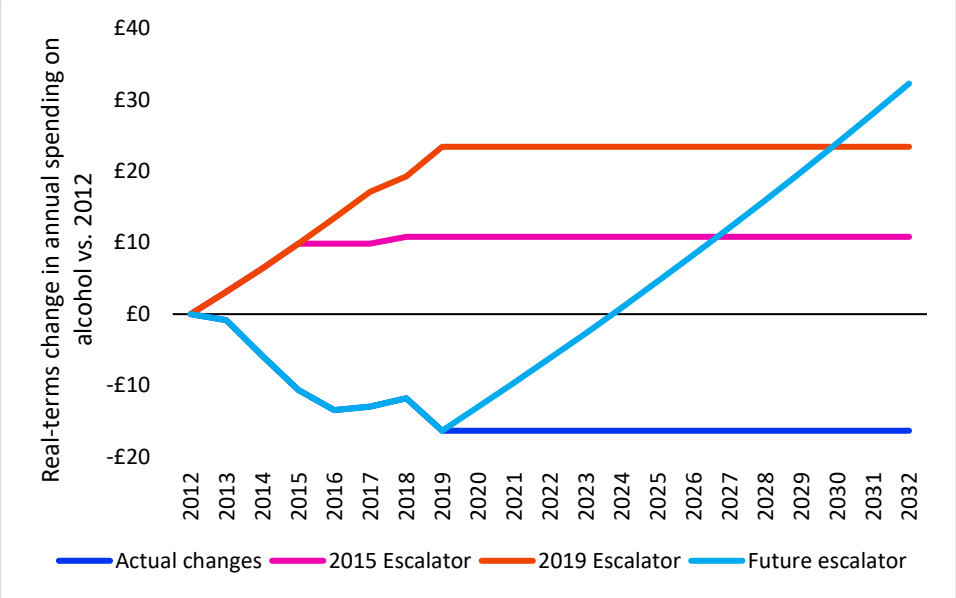


Consumer spending on alcohol

Whilst the impacts on alcohol consumption of the modelled scenarios are very different for Scotland than England, the impacts on consumer spending are very similar. This is because MUP is estimated to have a significant impact on alcohol consumption, but a relatively small impact on consumer spending, as increases in price are offset by reductions in consumption. This can be seen by comparing Figure 14 for Scotland with Figure 4 for England.

The average spend on alcohol per drinker in 2012 was an estimated £858 per year. As a result of the duty changes enacted up to 2019 this fell by £16.32 (-1.9%). Had the duty escalator remained in place until 2015, spending would have been £10.83 (+1.3%) higher per drinker in 2019 than in 2012, while continuing the escalator to 2019 would have increased spending by £23.43 per year (+2.7%) compared to 2012 levels.

Figure 14: Estimated changes in mean annual spending on alcohol under modelled scenarios



Alcohol-attributable deaths

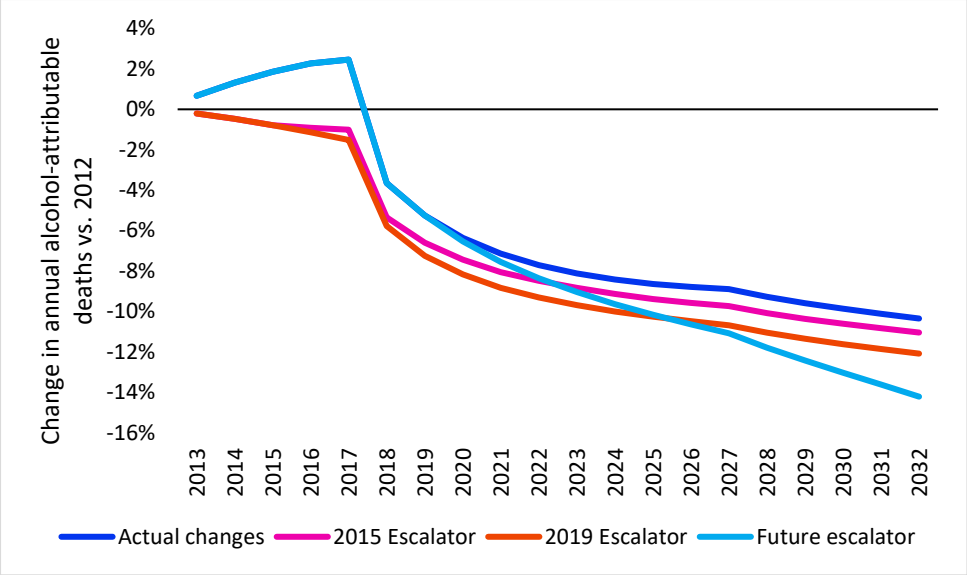
SAPM estimates that there are 1,694 deaths in Scotland each year caused directly by alcohol consumption. The impact of the four modelled policies on this figure are presented in Table 12 and visualised in Figure 15. Recent changes in alcohol policy are estimated to have had almost no net effect on alcohol-attributable deaths between 2012 and 2019 compared to a policy of increasing alcohol duties in line with inflation and not introducing MUP. This is because increases in deaths prior to the introduction of MUP are almost exactly offset by the reduction in deaths post-MUP. However, comparing historic policy with the duty escalator having remaining in place until 2015, duty cuts and freezes are estimated to have led to an additional 254 deaths between 2012 and 2019 and an additional 429 deaths between 2012 and 2032. The introduction of a duty escalator in 2020 is estimated to lead to 420 fewer deaths by 2032 compared to a policy of increasing duty in line with inflation.

Table 12: Estimated changes in alcohol-attributable deaths under modelled policies

	Alcohol-attributable deaths 2012-19	**Difference from no change**		**Alcohol-attributable deaths 2012-32**	**Difference from no change**	
No real-terms change[3]	11,861			33,887		
Actual changes	11,855	-5	0.0%	31,964	-1,923	-5.7%
2015 Escalator	11,601	-260	-2.2%	31,535	-2,352	-6.9%
2019 Escalator	11,570	-290	-2.4%	31,305	-2,582	-7.6%
Future escalator	11,855	-5	0.0%	31,544	-2,343	-6.9%

[3] Unlike the other 4 scenarios, the 'No real-terms change' approach does not involve modelling the impact of MUP

Figure 15: Estimated impact of modelled policies on alcohol-attributable deaths



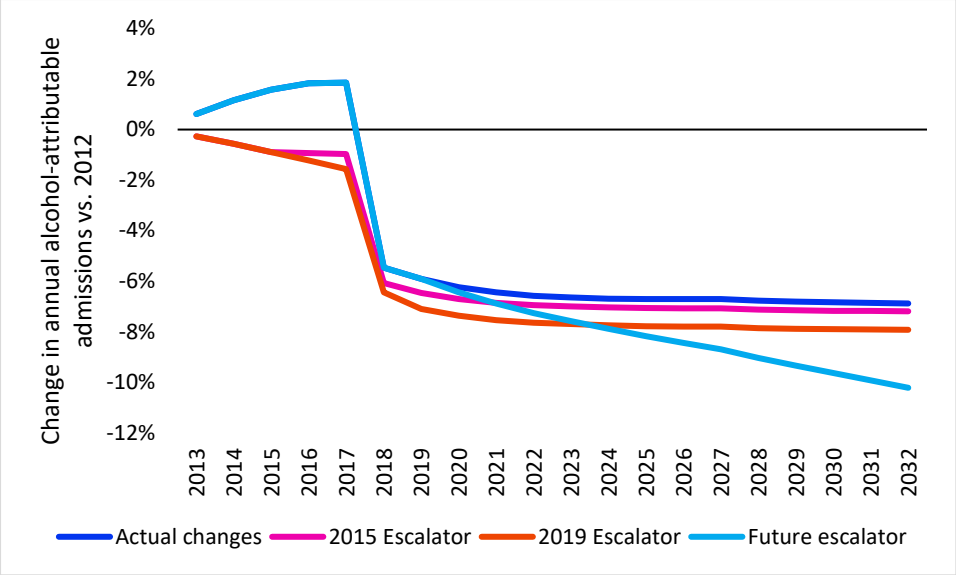
Alcohol-attributable hospital admissions

Alcohol is estimated to be responsible for 38,505 hospital admissions annually in Scotland. The impact of alcohol policies on this figure is presented in Table 13 and Figure 16. These illustrate that historic alcohol policy since 2012 is estimated to have led to 4,556 additional hospital admissions due to alcohol between 2012 and 2019 compared to the alcohol duty escalator having remained in place until 2015. This rises to an additional 6,368 admissions when considering the full effect of these policy changes up to 2032. Reintroducing the duty escalator in 2020 is estimated to reduce admissions by 8,719 over the following 12 years.

Table 13: Estimated changes in alcohol-attributable hospital admissions under modelled policies

	Alcohol-attributable admissions 2012-19	**Difference from no change**		**Alcohol-attributable admissions 2012-32**	**Difference from no change**	
No real-terms change	269,537			770,106		
Actual changes	267,872	-1,666	-0.6%	735,013	-35,093	-4.6%
2015 Escalator	263,316	-6,222	-2.3%	728,646	-41,460	-5.4%
2019 Escalator	262,591	-6,946	-2.6%	724,354	-45,753	-5.9%
Future escalator	267,872	-1,666	-0.6%	726,294	-43,812	-5.7%

Figure 16: Estimated impact of modelled policies on alcohol-attributable hospital admissions



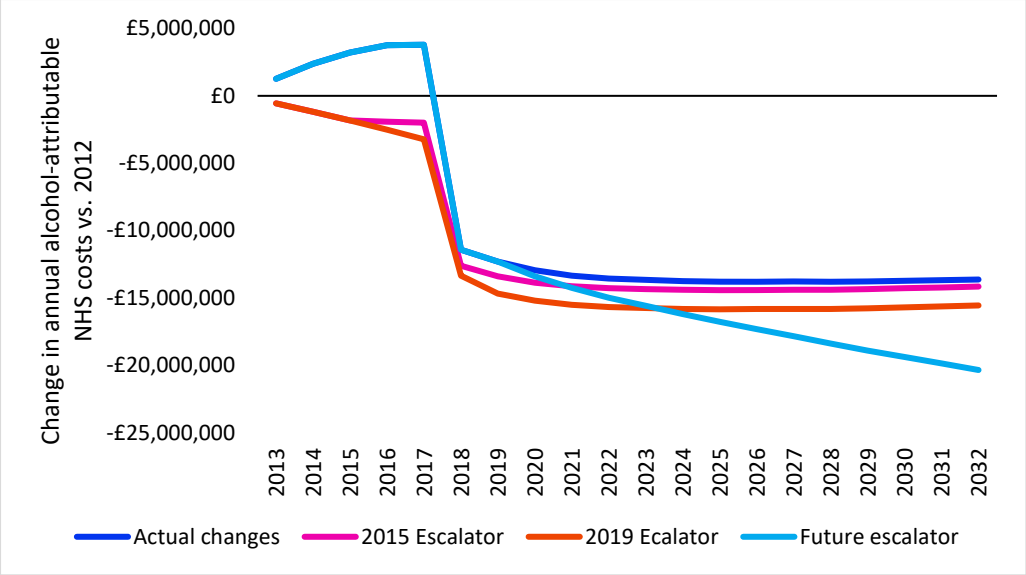
Healthcare costs

The annual cost of alcohol to the NHS in Scotland in 2012 is estimated to have been £182 million. The effects of each modelled scenario on these costs are shown in Table 14 and Figure 17 and follow a similar pattern to the changes in hospital admissions. Abolishing the duty escalator is estimated to have increased NHS costs by £24m between 2012 and 2019 compared to retaining the escalator until 2015. By the time the full effect of these policy decisions will have been seen in 2032, the total cost will have risen to £33m. In contrast, the reintroduction of the escalator in 2020 is estimated to lead to a saving of £46m between 2020 and 2032.

Table 14: Changes in NHS costs due to alcohol under modelled scenarios

	Total NHS costs due to alcohol 2012-19 (£m)	**Difference from no change (£m)**		**Total NHS costs due to alcohol 2012-32 (£m)**	**Difference from no change (£m)**	
No real-terms change	£1,275			£3,642		
Actual changes	£1,266	-£9	-0.7%	£3,456	-£186	-5.1%
2015 Escalator	£1,241	-£33	-2.6%	£3,423	-£219	-6.0%
2019 Escalator	£1,238	-£37	-2.9%	£3,401	-£241	-6.6%
Future escalator	£1,266	-£9	-0.7%	£3,410	-£232	-6.4%

Figure 17: Changes in annual NHS costs due to alcohol



Criminal offences and associated costs

Alcohol is estimated to have been implicated in 332,620 criminal offences in Scotland in 2012, with an associated cost of £2.9bn. The impact of each modelled scenario on offence levels and societal costs is presented in Table 15 and Table 16 respectively. Recent duty policies are estimated to have led to an additional 10,979 criminal offences since 2012, at a cost of £92m compared to having retained the duty escalator until 2015. Reintroducing the escalator in 2020 is estimated to lead to 31,992 fewer offences up to 2032, reducing the societal cost by £279m compared to maintaining duties constant in real terms over this period.

Table 15: Estimated changes in criminal offence volumes under modelled scenarios

	Alcohol-attributable criminal offences 2012-19	**Difference from no-change**		**Alcohol-attributable criminal offences 2012-32**	**Difference from no-change**	
No real-terms change	2,328,339			6,652,398		
Actual changes	2,317,879	-10,460	-0.4%	6,534,169	-118,229	-1.8%
2015 Escalator	2,306,900	-21,439	-0.9%	6,522,917	-129,481	-1.9%
2019 Escalator	2,304,272	-24,067	-1.0%	6,508,973	-143,424	-2.2%
Future escalator	2,317,879	-10,460	-0.4%	6,502,177	-150,221	-2.3%

Table 16: Estimated changes in criminal costs under modelled scenarios

	Alcohol-attributable criminal costs 2012-19 (£m)	Difference from no change		Alcohol-attributable criminal costs 2012-32 (£m)	Difference from no change	
No real-terms change	£20,307			£58,021		
Actual changes	£20,213	-£94	-0.5%	£56,979	-£1,042	-1.8%
2015 Escalator	£20,121	-£186	-0.9%	£56,898	-£1,123	-1.9%
2019 Escalator	£20,098	-£209	-1.0%	£56,777	-£1,244	-2.1%
Future escalator	£20,213	-£94	-0.5%	£56,700	-£1,321	-2.3%

Workplace absence and associated costs

Alcohol consumption is estimated to have led to 973,584 days of missed work in Scotland in 2012, at a cost of £101m to the economy. The impact of each modelled scenario on these figures is shown in Table 17 and Table 18. Subsequent alcohol duty policies are estimated to have increased this burden by 37,252 days costing £3m over the period 2012-19 compared to a scenario where the duty escalator remained in place until 2015. Reintroducing the duty escalator in the 2019 budget would lead to an estimated reduction in absences of 115,296 days, adding £13m to the economy between now and 2032.

Table 17: Estimated changes in workplace absence under modelled scenarios

	Alcohol-attributable days absence 2012-19	Difference from no change		Alcohol-attributable days absence 2012-32	Difference from no change	
No real-terms change	6,815,087			19,471,678		
Actual changes	6,782,838	-32,249	-0.5%	19,094,823	-376,855	-1.9%
2015 Escalator	6,745,586	-69,501	-1.0%	19,061,297	-410,381	-2.1%
2019 Escalator	6,735,730	-79,357	-1.2%	19,007,797	-463,881	-2.4%
Future escalator	6,782,838	-32,249	-0.5%	18,979,527	-492,151	-2.5%

Table 18: Estimated changes in productivity costs under modelled scenarios

	Lost productivity costs 2012-19 (£m)	Difference from no change (£m)		Lost productivity costs 2012-32 (£m)	Difference from no change (£m)	
No real-terms change	£706			£2,016		
Actual changes	£702	-£3	-0.5%	£1,976	-£41	-2.0%
2015 Escalator	£698	-£8	-1.1%	£1,971	-£46	-2.3%
2019 Escalator	£697	-£9	-1.2%	£1,965	-£51	-2.6%
Future escalator	£702	-£3	-0.5%	£1,963	-£53	-2.6%

Impacts on health inequalities

Figure 18 presents the estimated differential impact of actual UK duty policies since 2012 on alcohol consumption in Scotland by SIMD quintile. This demonstrates that the cuts and freezes in alcohol duty prior to the introduction of MUP led to the largest increases in consumption among the most deprived groups. However, the introduction of MUP reversed this gradient in effect meaning that overall between 2012 and 2019, alcohol consumption is estimated to have fallen more in the most deprived groups compared to the least deprived.

Figure 18: Modelled impact of recent duty policies on alcohol consumption by SIMD quintile

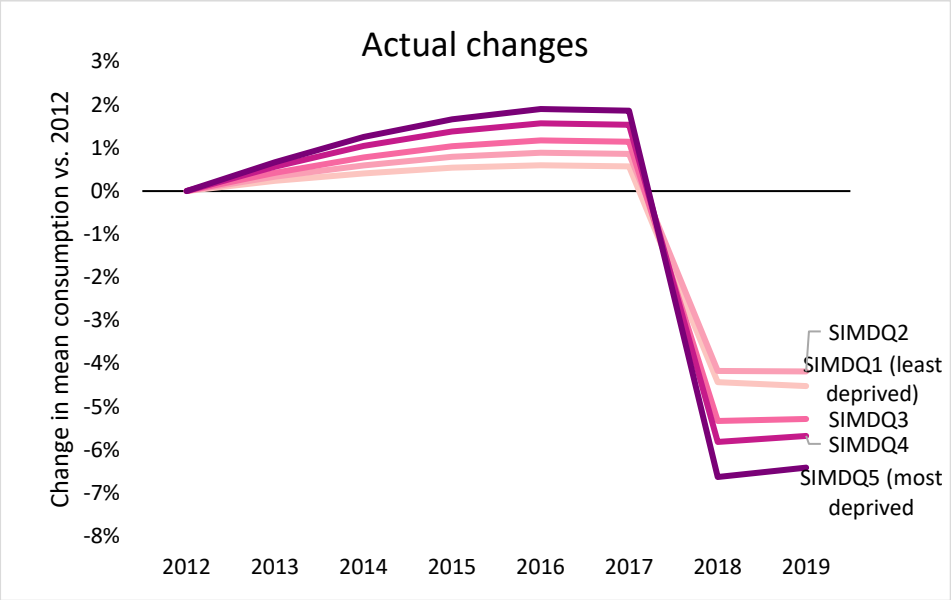
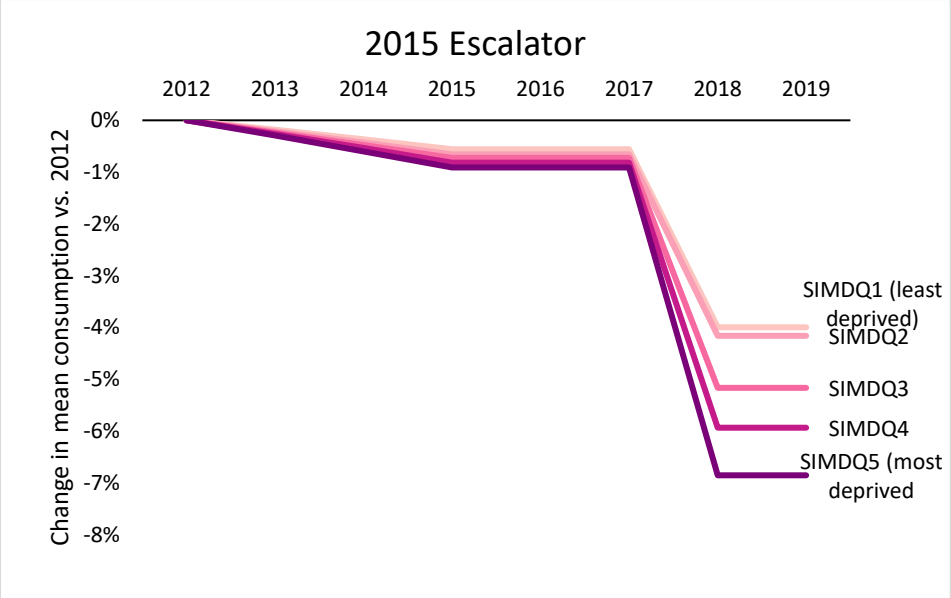


Figure 19 shows the estimated impacts of continuing the alcohol duty escalator until 2015 on alcohol consumption by SIMD quintile. This shows that prior to MUP the greatest reduction in consumption would have occurred among the most deprived groups, but that this effect would have been magnified by the introduction of MUP. These figures present a more complex picture of the impact of alcohol policies on inequalities in alcohol consumption than in England, as the inequality-reducing impact of MUP is substantially larger than any differential impacts of duty policies.

Figure 19: Modelled impact of planned alcohol duty policy on alcohol consumption by SIMD quintile



The impact of these differential changes in alcohol consumption on health are illustrated in Figure 20 and Figure 21. As for the consumption figures, the impact on health inequalities is quite different to that shown for England in Figure 10 and Figure 11 due to the inequality-reducing impact of MUP dominating the effects of duty.

Figure 20: Modelled impact of recent duty policies on alcohol-attributable mortality by SIMD quintile

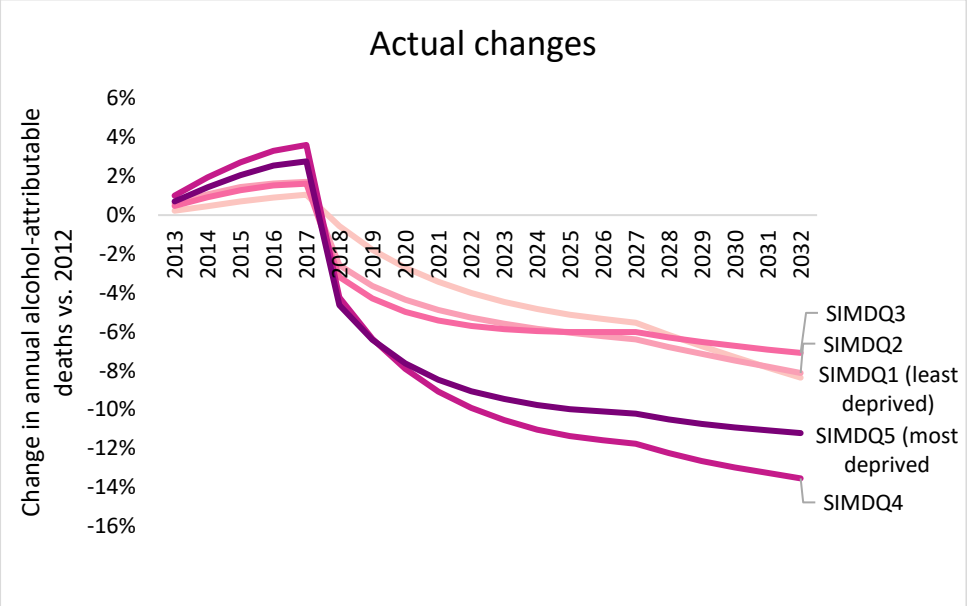
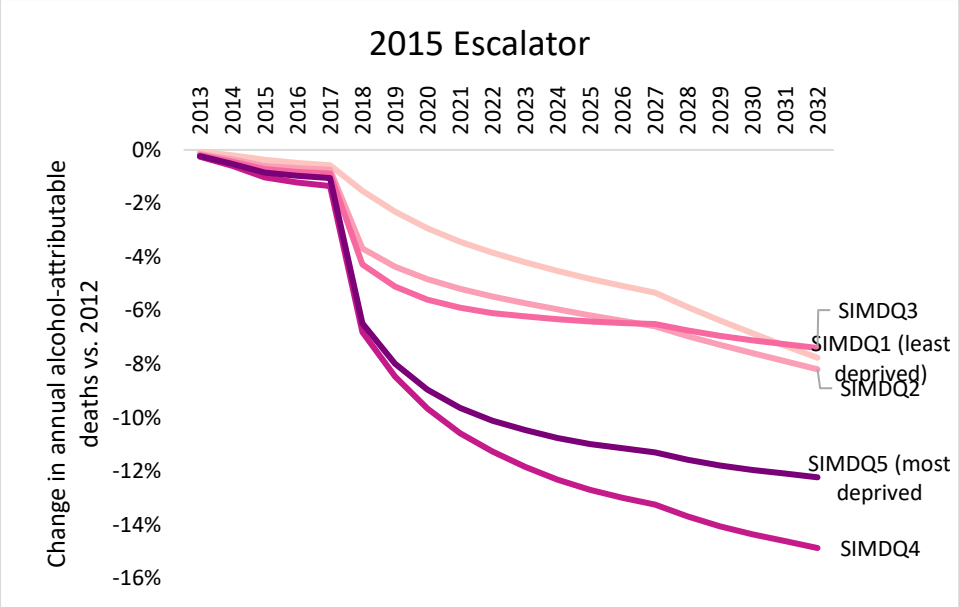
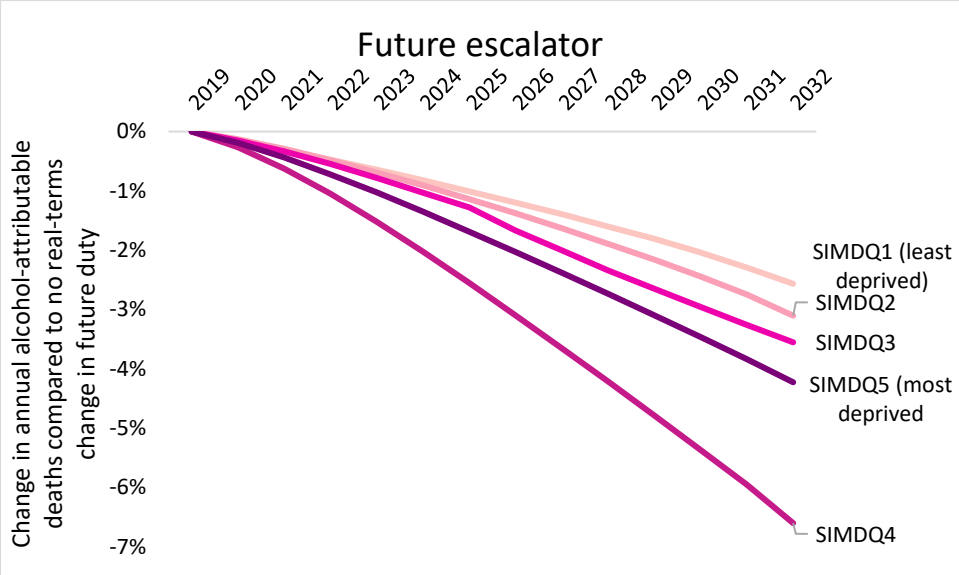


Figure 21: Modelled impact of planned duty policies on alcohol-attributable mortality by SIMD quintile



Finally, Figure 22 shows the estimated impact on health inequalities of reintroducing the duty escalator in 2020. This shows that the greatest relative reductions in harm would be seen in the second most deprived group, but overall the effect would be to reduce inequalities in health.

Figure 22: Modelled impact of reintroducing a duty escalator, compared to holding duty constant in real terms, on alcohol-attributable mortality by SIMD quintile



Discussion

Summary of results

The results of the modelling work presented in this report show that the decision to abolish the alcohol duty escalator in 2012/13 and the subsequent duty cuts and freezes have led to increased alcohol consumption and substantial increases in alcohol-related harms and associated costs. Comparing the effect of historic changes in alcohol duty from 2012-2019 against the original plan to continue the duty escalator until 2015 shows that this decision is estimated to have led to 1,969 additional deaths in England and 254 in Scotland over the same period, and is estimated to lead to a cumulative increase in deaths of 8,942 in England and 429 in Scotland by 2032. Comparing historic changes to a scenario where the duty escalator was continued until 2019 increases these estimates to an additional 11,535 deaths in England and 659 in Scotland by 2032.

These results also demonstrate that the reintroduction of an alcohol duty escalator in 2020 is estimated to lead to 4,710 fewer alcohol-attributable deaths in England and 420 fewer in Scotland by 2032 compared to a scenario where alcohol duties remain constant in real terms over the same period.

Table 19 summarises the modelled changes in all outcomes under these three comparisons for both England and Scotland.

Table 19: Summary of differences in cumulative model outcomes between historic duty changes, a duty escalator to 2015, a duty escalator to 2019 and the reintroduction of a duty escalator in 2020

	England					Scotland				
	Actual changes vs. 2015 Escalator		Actual changes vs. 2019 Escalator		Future escalator vs. no further changes	Actual changes vs. 2015 Escalator		Actual changes vs. 2019 Escalator		Future escalator vs. no further changes
	2012-2019	2012-2032	2012-2019	2012-2032	2020-2032	2012-2019	2012-2032	2012-2019	2012-2032	2020-2032
Alcohol-attributable deaths	1,969	8,942	2,222	11,535	-4,710	254	429	285	659	-420
	2.7%	4.4%	3.1%	5.7%	-2.2%	2.2%	1.4%	2.5%	2.1%	-1.3%
Alcohol-attributable hospital admissions	61,386	237,183	74,559	339,640	-160,760	4,556	6,368	5,280	10,660	-8,719
	1.4%	1.9%	1.7%	2.7%	-1.3%	1.7%	0.9%	2.0%	1.5%	-1.2%
Alcohol-related NHS costs (£m)	£317	£1,218	£384	£1,720	-£794	£24	£33	£28	£55	-£46
	1.7%	2.3%	2.1%	3.3%	-1.5%	1.9%	0.9%	2.3%	1.6%	-1.3%
Alcohol-attributable crimes	111,063	405,790	136,910	568,036	-263,084	10,979	11,252	13,606	25,195	-31,992
	0.8%	1.1%	1.0%	1.5%	-0.7%	0.5%	0.2%	0.6%	0.4%	-0.5%
Alcohol-related crime costs (£m)	377	1,378	466	1,933	-901	92	81	115	202	-279
	0.8%	1.1%	1.0%	1.5%	-0.7%	0.5%	0.1%	0.6%	0.4%	-0.5%
Alcohol-related workplace absences	484,726	1,749,371	619,808	2,597,360	-1,410,218	37,252	33,526	47,108	87,026	-115,296
	0.7%	0.9%	0.9%	1.4%	-0.7%	0.6%	0.2%	0.7%	0.5%	-0.6%
Alcohol-related workplace costs (£m)	58	211	73	306	-156	4	5	6	11	-13
	0.8%	1.1%	1.1%	1.6%	-0.8%	0.6%	0.3%	0.8%	0.6%	-0.6%

Strengths of this approach

This analysis represents the most comprehensive estimates to date of the short- and long-term impacts of recent alcohol duty policies in England and Scotland. The modelling synthesises a wide range of data on alcohol consumption, spending and harm for each country alongside international research evidence on the associations between alcohol consumption and harm. The Sheffield Alcohol Policy Model has been used extensively, both within the UK and internationally, to inform decisions around alcohol pricing policies and their potential effect and analyses using SAPM have been published widely in leading scientific journals.

Limitations of this approach

As with any model there are limitations alongside which the results of this analysis should be considered. These have been discussed at length elsewhere (e.g. [1,6,8]), however there are several specific limitations which relate to the modelling presented in this report.

Firstly, whilst we have modelled the impact of Minimum Unit Pricing in Scotland, we have not explicitly modelled the impact of the ban on below-cost sales in England and Wales, or the duty band for cider between 6.9% and 7.5% introduced in 2019. Both of these policies are likely to have had a very limited impact of the sales prices of a small proportion of the alcohol market and this omission is therefore unlikely to have any significant bearing on our findings.

Secondly, while the model accounts for differential levels of purchasing of different types of alcohol (beer, wine, cider, spirits and Ready To Drinks or alcopops), in different settings (pubs and bars or shops) and at different price points, we do not explicitly model differential rates of purchasing of alcohol within different duty bands between population groups. That is to say that while we account for the fact that heavy drinking men aged 55+ from the most deprived quintile of the population consume a greater proportion of their alcohol as off-trade beer and that this is purchased at cheaper prices, on average, than younger, moderate drinking men from less deprived groups, we do not account for the fact that they may have greater or lesser exposure to duty increases due to a different proportion of that beer being over 7.5% or below 2.8% and this attracting a different rate of duty.

Thirdly, as discussed on page 12, SAPM operates on a ceteris paribus, or 'all else being equal', basis. This means that we assume that alcohol consumption in the population will remain constant (after accounting for changes in the age composition of the population over time) in the absence of any policy intervention. We do not, therefore, attempt to model longer-term trends in alcohol consumption or other related factors, such as the decline in rates of cardiovascular disease. However, the effect that these underlying trends have on the model results is likely to be small, as we are examining the difference between two modelled scenarios and the effects on the results of any unaccounted-for trends are likely to be similar in both scenarios.

Fourthly, epidemiological evidence suggests that it can take up to 20 years for the full effect of a change in alcohol consumption on risks of some health harms to be experienced [12]. As a result, when modelling the impact of one-off policies such as a Minimum Unit Price using SAPM, we generally report the results 20 years after policy implementation as being the policy's 'full effect'. In the present study we have modelled a series of changes in duty policy over time, but have only reported results for the first 20 years after the *initial* change in duty rates (i.e. up to 2032). This means the results for health outcomes reported here are likely to be underestimates of the true 'full effect' of the policies as they do not account for changes in risk which may continue to develop beyond 2032.

Finally, although every effort has been made to ensure that the data used in both the English and Scottish models is as comparable as possible, there are a few limitations which affect the cross-comparability of results from the two models. One example of this is the way in which hospital admissions are recorded. In England, a greater number of secondary diagnoses can be recorded against a single admission than in Scotland, and there are also different incentive structures for hospital staff to record specific health conditions on patient records (e.g. diagnosing hypertension). As a result, a degree of caution should be exercise when comparing modelled estimates of changes in admissions between the two countries. A further example is in the way crimes are recorded in England and Scotland. Firstly, the two countries have separate criminal justice systems, which means that crimes are categories differently. For example, a common assault in Scotland is classed as a "miscellaneous offence" whereas in England it is classed as "violence against a person". The crime categories for Scotland used in this work have been matched as closely to the English categories as possible, within the confines of the available Scottish data, to try and limit these differences. Further, there are differences in the way that a single individual recording multiple offences in a single incident is recorded. In England, only the most serious crime is included in crime statistics (the so-called "principal crime rule" [16]) while in Scotland, all offences are included.

Conclusion

In this study we have used the Sheffield Alcohol Policy Model to estimate the impact of UK Government policies on alcohol duty from 2012 onwards on alcohol consumption and health and compared these with counterfactual scenarios where the duty escalator remained in place as had previously been intended. The results of the analysis suggest that, all else being equal, the abolition of the alcohol duty escalator has led to increased alcohol consumption and that this has increased levels of alcohol-attributable hospital admissions and deaths as well as elevated levels of crime and workplace absence. The study also estimates that these increases have brought with them significant rises in the costs of alcohol to the NHS, the criminal justice system and the wider economy. We also find that recent duty policies are likely to have increased the already large inequalities in health between the most and least well-off in society and that, due to the delayed nature of the relationship between alcohol consumption and health harms, the full effects of these policy decisions will not be seen for at least a decade.

Conversely, we estimate that the impact of Scotland's decision to introduce Minimum Unit Pricing for alcohol in May 2018 is likely to more than offset the negative impact on public health and social order of duty cuts and freezes in the preceding 6 years. We also estimate that the reintroduction of an alcohol duty escalator would reverse many of the negative effects of recent duty policy in England and further reduce alcohol-related harm in Scotland over and above the impact of Minimum Unit Pricing.

References

1 Brennan A, Meng Y, Holmes J, Hill-McManus D, Meier PS. Potential benefits of minimum unit pricing for alcohol versus a ban on below cost selling in England 2014: modelling study. *BMJ* 2014; **349**: g5452.

2 Angus C, Holmes J, Pryce R, Meier P, Brennan A. Model-based appraisal of the comparative impact of Minimum Unit Pricing and taxation policies in Scotland. Sheffield, 2016.

3 Black H, Gill J, Chick J. The price of a drink: levels of consumption and price paid per unit of alcohol by Edinburgh's ill drinkers with a comparison to wider alcohol sales in Scotland. *Addiction* 2011; **106**: 729–36.

4 Sheron N, Chilcott F, Matthews L, Challoner B, Thomas M. Impact of minimum price per unit of alcohol on patients with liver disease in the UK. *Clin Med* 2014; **14**: 396–403.

5 Angus C, Ally A. Modelling the potential impact of duty policies using the Sheffield Alcohol Policy Model Version 3. Sheffield, 2015.

6 Holmes J, Meng Y, Meier PS, *et al.* Effects of minimum unit pricing for alcohol on different income and socioeconomic groups: A modelling study. *Lancet* 2014; **383**. DOI:10.1016/S0140-6736(13)62417-4.

7 Brennan A, Meier P, Purshouse R, *et al.* The Sheffield Alcohol Policy Model - a mathematical description. *Health Econ* 2014; **24**. DOI:10.1002/hec.3105.

8 Meier PS, Holmes J, Angus C, Ally AK, Meng Y, Brennan A. Estimated Effects of Different Alcohol Taxation and Price Policies on Health Inequalities: A Mathematical Modelling Study. *PLOS Med* 2016; **13**: e1001963.

9 NHS Health Scotland. MESAS monitoring report 2019 - alcohol price and affordability. 2019. http://www.healthscotland.scot/publications/mesas-monitoring-report-2019 (accessed Sept 9, 2019).

10 Office for National Statistics. Consumer price inflation time series. 2019. https://www.ons.gov.uk/economy/inflationandpriceindices/datasets/consumerpriceindices (accessed Sept 9, 2019).

11 Ally AK, Meng Y, Chakraborty R, *et al.* Alcohol tax pass-through across the product and price range: do retailers treat cheap alcohol differently? *Addiction* 2014; **109**. DOI:10.1111/add.12590.

12 Holmes J, Meier PS, Booth A, Guo Y, Brennan A. The temporal relationship between per capita alcohol consumption and harm: a systematic review of time lag specifications in aggregate time series analyses. *Drug Alcohol Depend* 2012; **123**: 7–14.

13 Heeks M, Reed S, Tafsiri M, Prince S. The economic and social costs of crime: Second edition. London, 2018.

14 Wood S, Bellis M. Socio-economic inequalities in alcohol consumption and harm : Evidence for effective interventions and policy across EU countries. 2017; : 1–29.

15 Loring B. Alcohol and inequities: Guidance for addressing inequities in alcohol-related harm. Copenhagen, 2014.

16 Home Office. Home Office counting rules for recorded crime. 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/822471/count-general-jul-2019.pdf (accessed Sept 17, 2019).