



# Evaluating the impact of minimum unit pricing (MUP) on sales-based alcohol consumption in Scotland: controlled interrupted time series analyses – briefing paper

## Introduction

Minimum unit pricing (MUP) came into effect in Scotland on 1 May 2018. From that date every drink containing alcohol has a minimum price based on the amount of pure alcohol it contains. The minimum price in Scotland is currently set at 50 pence per unit of alcohol (ppu).

The Monitoring and Evaluating Scotland's Alcohol Strategy (MESAS) MUP Evaluation Portfolio comprises a number of research studies that are being undertaken to assess the impact of MUP. The portfolio contains studies assessing compliance with and implementation of MUP, its impact on the alcoholic drinks industry in Scotland, changes in alcohol consumption, and changes in health and social harms.

This briefing focuses on our work looking at the impact of MUP on population alcohol consumption.

## The aim of this report

This report builds on an earlier descriptive analysis of off-trade alcohol sales data (alcohol sold in supermarkets and off-licences) for the 12-month period following the implementation of MUP.<sup>1</sup> We use a controlled interrupted time series design to advance and strengthen our interpretations of the descriptive analysis, by estimating the impact of MUP on off-trade alcohol sales while controlling for underlying trends and other potentially important factors.

## **What we did**

We used weekly alcohol sales data to estimate off-trade alcohol consumption at a population level. The volume of alcoholic beverages (natural volume) sold from most supermarkets and a sample of convenience stores was collated and aggregated from electronic point of sale (EPOS) data. Natural volumes were converted to pure alcohol volume using category-specific percentage alcohol by volume (ABV). Per adult alcohol sales were calculated using mid-year population estimates for the adult population aged 16 years and over and presented in litres of pure alcohol per adult. Weekly per adult estimates were calculated overall (total alcohol) and by drink category. The total time period covered in this report is from January 2013 to May 2019, providing us with data for over five years before, and one year after, the implementation of MUP.

We used a statistical method that is good for estimating the impact of population level interventions using time series data (controlled interrupted time series regression, which is described in the main report). The method enabled underlying trends and seasonal patterns in the sales data to be taken into account. For example, we know that off-trade alcohol sales increase sharply over Christmas and our method incorporated that 'seasonality'. Importantly, we were able to use the method to calculate the net effect of MUP by incorporating data from England & Wales. When presenting the results we refer to this as the 'controlled' analysis. Finally, the method allowed us to take into account other factors that could affect our results: household income, alcohol sales through outlets such as pubs and clubs (the 'on-trade'), and switching between drink types. In the results this is referred to as the 'adjusted' analysis.

We performed several additional analyses to test whether our results would be affected by changes to our method. These included:

- using the difference in per adult off-trade sales between Scotland and England & Wales as our outcome
- adjusting off-trade alcohol sales data to account for the market share of discount retailers Aldi and Lidl
- using off-trade alcohol sales in the north of England as a potentially more appropriate control group for Scotland
- using only 12 months of pre-implementation data
- using total alcohol sales (on and off-trade combined) as our outcome series.

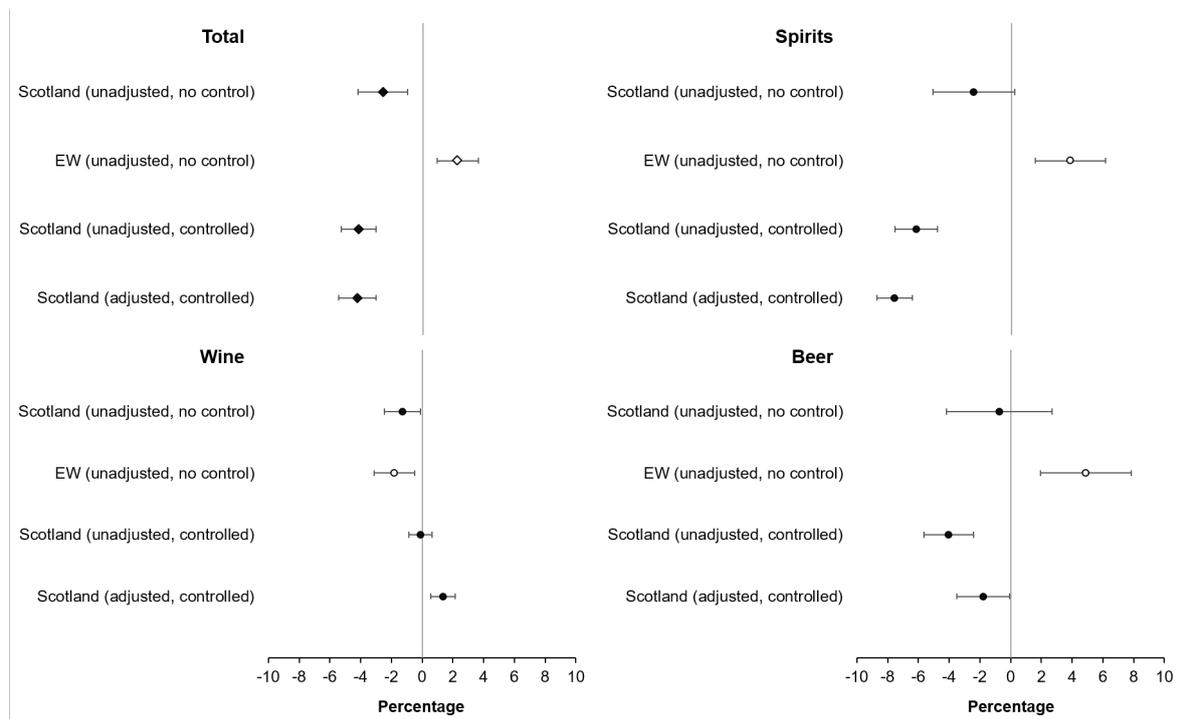
We present the results of all the main models (uncontrolled and unadjusted, controlled and unadjusted, controlled and adjusted). The description of the results in this briefing focuses on the controlled and adjusted analyses.

## **What we found**

The controlled and adjusted model found the introduction of MUP to be associated with a reduction of 4.2% in the total volume of pure alcohol sold per adult through the off-trade in Scotland in the first 12 months (95% confidence interval (CI): -5.4% to -3.0%) (Figure 1a, Table 1). In England & Wales, where the legislation was not introduced, per adult alcohol sales increased over the same time period (Figure 1a).

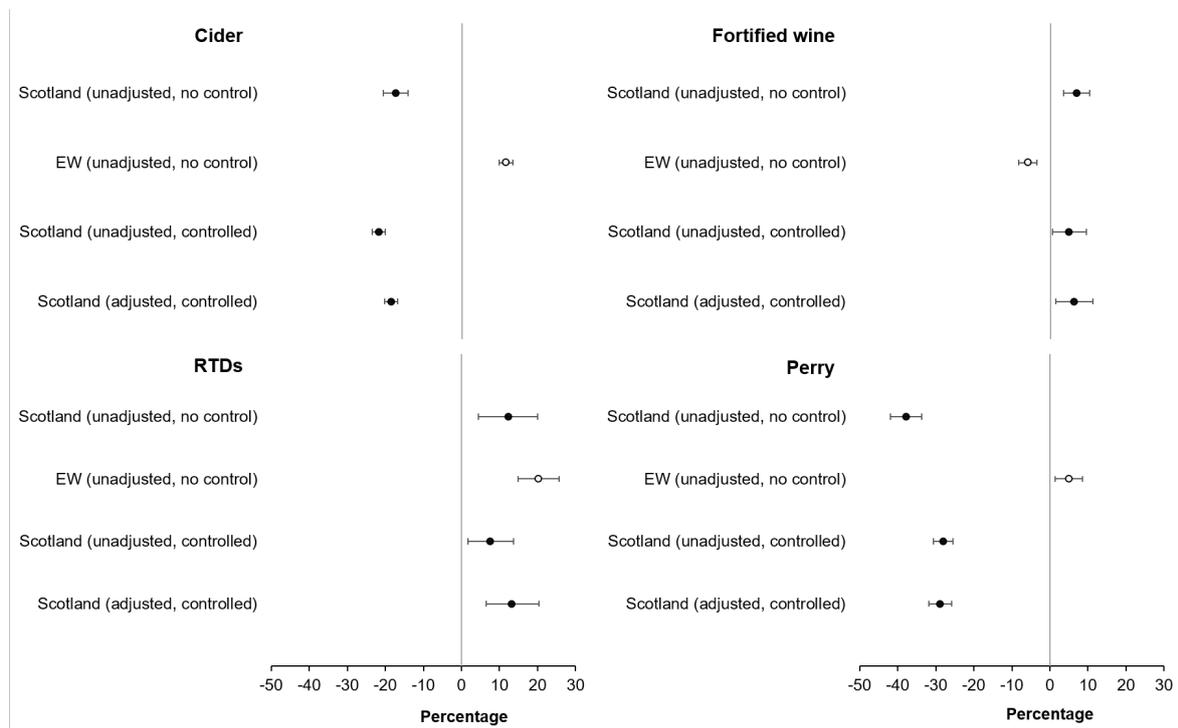
Analyses by drink category revealed that the largest relative net reductions in per adult off-trade sales were observed for cider (-18.8% (-20.5% to -17.1%)) and perry (-28.9% (-31.8% to -25.8%)) (Figure 1b, Table 1), with smaller relative net reductions also being observed for spirits (-4.7% (-6.7% to -2.5%)) and beer (-1.9% (-3.6% to -0.2%)) (Figure 1a, Table 1). Net increases were observed in wine (1.3% (0.4% to 2.2%)) (Figure 1a, Table 1), fortified wine (5.7% (1.3% to 10.3%)) and ready-to-drink beverages (RTDs) (13.4% (6.8% to 20.5%)) (Figure 1b, Table 1).

**Figure 1a: Change (%) in off-trade alcohol sales in the year after MUP was implemented in Scotland for all alcohol, spirits, wine and beer.**



Note: EW = England & Wales. 'Controlled' models include trends in off-trade alcohol sales in England & Wales as a covariate. 'Adjusted' models include trends in household disposable income, on-trade sales and, for analyses of specific drink types, off-trade alcohol sales of other drink types as covariates. All models are adjusted for underlying seasonal and secular trends.

**Figure 1b: Change (%) in off-trade alcohol sales in the year after MUP was implemented in Scotland for cider, fortified wine, RTDs and perry**



Note: EW = England & Wales. 'Controlled' models include trends in off-trade alcohol sales in England & Wales as a covariate. 'Adjusted' models include trends in household disposable income, on-trade sales and, for analyses of specific drink types, off-trade alcohol sales of other drink types as covariates. All models are adjusted for underlying seasonal and secular trends.

Repeating the controlled analyses using the difference in off-trade alcohol sales between Scotland and England & Wales as the outcome series produced very similar results to our main controlled model (-4.5% (-5.5% to -3.5%)) (Figure 2, Table 1).

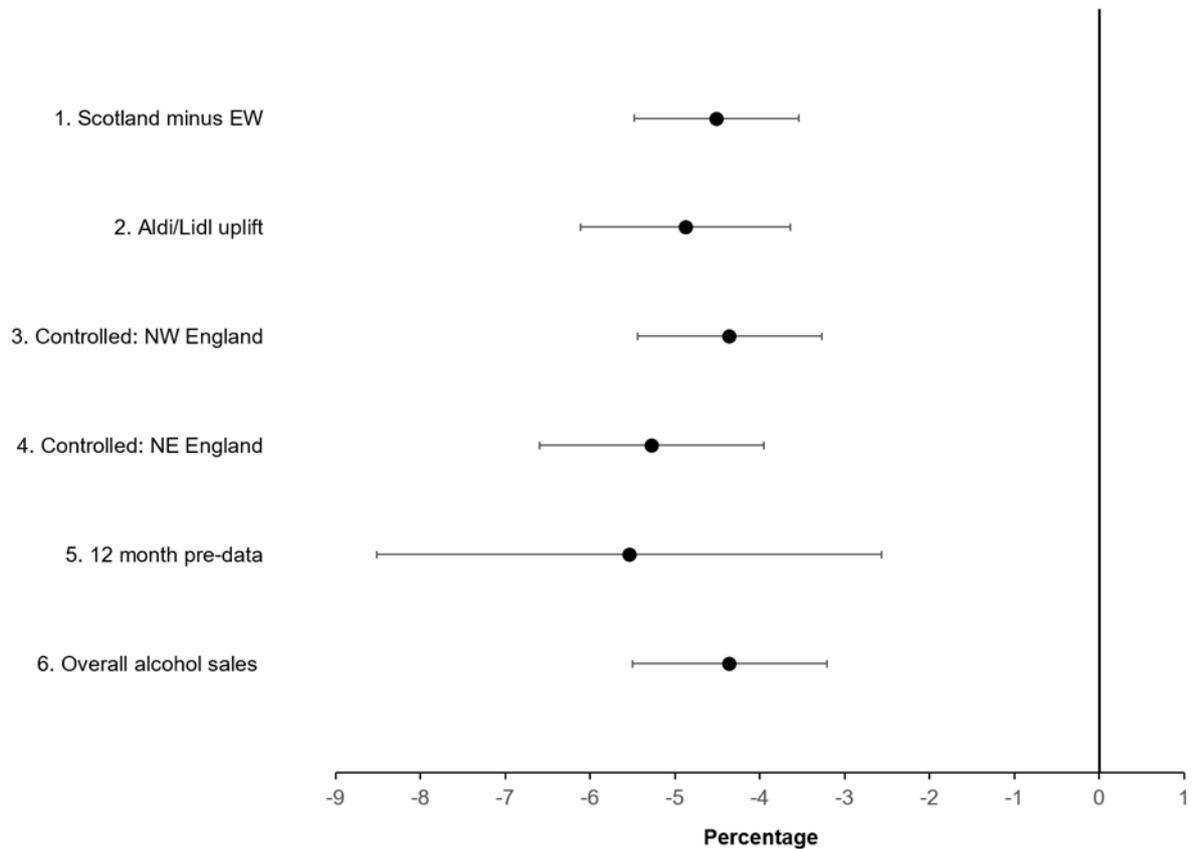
Taking into account the estimated volume market share of Aldi and Lidl in both Scotland and England & Wales resulted in a slightly larger net reduction in per-adult alcohol sales in Scotland in the 12 months following MUP implementation (-4.9% (-6.1% to -3.6%)) (Figure 2, Table 1).

Using off-trade alcohol sales data for northern England as the geographical control, rather than England & Wales, produced similar results to our main analyses, particularly when using the north west of England as the control (-4.4% (-5.4% to -3.3%)) (Figure 2, Table 1). Using the north east of England resulted in a slightly higher estimated reduction in per adult off-trade alcohol sales in Scotland in the 12 months following MUP implementation (-5.3% (-6.6% to -3.9%)) (Figure 2, Table 1) than the main analyses.

Using 12 months of pre-implementation data estimated a slightly greater, but much less precise, reduction in per adult off-trade sales in Scotland following MUP implementation (-5.5% (-8.5% to -2.6%)) (Figure 2, Table 1).

Using all alcohol sales (off- and on-trade sales combined) as our outcome measure produced similar results (-4.4% (-5.5% to -3.2%)) (Figure 2, Table 1) to the controlled, adjusted model in the main analysis.

**Figure 2: Change (%) in off-trade alcohol sales in the year after MUP was implemented in Scotland estimated from sensitivity and supplementary analyses.**



Note: EW = England & Wales; NW = North West; NE = North East.

Based on results from the controlled interrupted time series, including those from the supplementary and sensitivity analyses, the best estimate of the net reduction in per adult off-trade sales of pure alcohol as a result of MUP implementation is between 4% and 5%. As we accounted for underlying trends and other important factors in our controlled analyses, it is reasonable to conclude that the introduction of MUP was responsible for these observed reductions.

**Table 1: Summary of results****Main analyses – Scotland (adjusted, controlled)**

<b>Drink type</b>	<b>Market share (%)</b>	<b>MUP effect (%)</b>	<b>95% CI (%)</b>	<b>p value</b>
All		-4.2	-5.4 to -3.0	<0.001
Spirits	32.5	-4.7	-6.7 to -2.5	<0.001
Wine	31.9	1.3	0.4 to 2.2	0.003
Beer	24.0	-1.9	-3.6 to -0.2	0.03
Cider	6.4	-18.8	-20.5 to -17.1	<0.001
Fortified wine	3.5	5.7	1.3 to 10.3	0.01
RTDs	1.2	13.4	6.8 to 20.5	<0.001
Perry	0.4	-28.9	-31.8 to -25.8	<0.001

**Supplementary and sensitivity analyses**

<b>Model</b>	<b>MUP effect (%)</b>	<b>95% CI (%)</b>	<b>p value</b>
Scotland minus EW – adjusted	-4.5	-5.5 to -3.5	<0.001
Aldi/Lidl uplift – Scotland (adjusted, controlled)	-4.9	-6.1 to -3.6	<0.001
NE England – Scotland (adjusted, NE control)	-5.3	-6.6 to -3.9	<0.001
NW England – Scotland (adjusted, NW control)	-4.4	-5.4 to -3.3	<0.001
12 month pre-implementation Scotland (adjusted, controlled)	-5.5	-8.5 to -2.6	<0.001
All alcohol sales – Scotland (adjusted, controlled)	-4.4	-5.5 to -3.2	<0.001

Note: EW = England & Wales; NW = North West; NE = North East.

## **Our understanding of the impact of MUP on alcohol sales and consumption so far**

We have previously shown that MUP has been successfully implemented and that compliance with the legislation has generally been good.<sup>2</sup> This is an important first step in ensuring that the policy has its intended impact.

In our earlier descriptive analysis of alcohol sales data we showed that the implementation of MUP in Scotland was followed by a step change in the average sales price of alcohol, rising by 5 pence per unit (ppu) from 55 ppu to 60 ppu immediately following MUP implementation. It is likely that the estimated net reduction in per adult alcohol sales in Scotland, demonstrated in the current work, is a result of the impact of the legislation on alcohol prices.

Our results are broadly consistent with O'Donnell et al (2019),<sup>3</sup> who assessed the impact of MUP on alcohol purchases recorded through shopping panel data. The study found an increase in price of 5.1 pence per unit of alcohol and a reduction in alcohol purchases of 1.2 units per adult per week (7.6%) in Scotland (relative to England) immediately following the implementation of MUP. O'Donnell et al observed reductions in the purchase of beer, spirits, cider and wine.

It has been suggested that an unintended consequence of MUP may be an increase in cross-border sales activity: residents of Scotland crossing the border to purchase alcohol in England at cheaper prices. Both the Compliance Study<sup>2</sup> and the Economic Impact Baseline and Short Term Impacts Study<sup>4</sup> examined perspectives on cross-border sales activity. Evidence from the Economic Impact Baseline and Short Term Impacts Study<sup>2</sup> suggests that some cross-border purchasing has taken place, although it was recognised that much of this purchasing activity pre-dated MUP implementation. Neither study was able to demonstrate substantial cross-border activity such as bulk purchasing or purchasing with intent to sell illegally in Scotland. We have not been able to directly examine cross-border sales activity in the current study but our earlier descriptive analyses of these data<sup>1</sup> showed that the increase in the northern English regions was broadly similar to the rest of England & Wales. We also showed that the ratio of per adult off-trade sales between northern England and

the rest of England & Wales in the post-MUP year was similar to that in the years prior to MUP.

We have also published evidence on the impact of MUP implementation on the consumption behaviour of children and young people.<sup>5</sup> This qualitative study involving interviews of children and young people found that MUP was not perceived to impact on participants' alcohol consumption either positively or negatively. While participants were largely price aware, they stated that price is only one factor that influenced them in their alcohol consumption. Furthermore, many of the products favoured by participants were not affected by MUP.

## **What other evidence on the impact of MUP on alcohol sales and consumption is still to come?**

This report presents a statistical analysis of off-trade alcohol sales data, using controlled interrupted time series analysis, for the 12-month period since the implementation of minimum unit pricing (MUP) in Scotland. A number of other studies will offer further insights into the impact of MUP on alcohol sales and consumption:

- The sales-based consumption study will provide a further statistical analysis of any change in population alcohol consumption (total, by market sector and by drink category) during the **three**-year period following the implementation of MUP. This is expected to report in mid-2022.
- A study evaluating the impact of MUP on those who drink at harmful levels is being carried out by the University of Sheffield, as part of the MESAS evaluation of MUP. This will use surveys and in-depth interviews to examine, amongst other things, changes in consumption behaviour. This study will first report in mid-2020 and again in mid-2021.
- While not a part of the MESAS portfolio of studies to evaluate MUP, the annual MESAS Monitoring Report will continue to present a wide range of alcohol indicators, including alcohol retail sales. The next MESAS Monitoring

Report, which will include analysis of off-trade alcohol sales data for 2019, will be published in June 2020.

- A study being led by the MRC/CSO Social and Public Health Sciences Unit, will collect data from those attending emergency departments and sexual health clinics to examine changes in alcohol consumption amongst this cohort. This study is expected to report in late 2020.
- A study using data from the Scottish Health Survey, being led by the MRC/CSO Social and Public Health Sciences Unit, will aim to correct survey estimates of self-reported alcohol consumption for non-response bias. The corrected data will then be used to examine the impact of MUP on the consumption behaviour of particular social groups. This separately funded study is part of the wider evaluation of MUP. It is expected to report in late 2021.

## Conclusion

The results from this study show that the introduction of MUP in Scotland was associated with a net reduction in per adult off-trade alcohol sales of between 4% and 5% in Scotland in the 12 months following the implementation of MUP. The greatest relative net reductions were seen in cider and perry. Smaller relative net reductions were seen for spirits and beer; as these account for a considerable share of the off-trade market they make an important contribution to the reduction overall. These reductions were partly offset by off-trade sales of wine, fortified wine and RTDs, which increased in the post-MUP year. We controlled for trends in England & Wales, for underlying trends and for other important factors (including income and on-trade sales) in our analyses; this therefore strengthens the likelihood that these effects were caused by the implementation of MUP. This builds on our earlier descriptive analysis of off-trade alcohol sales data that showed a rise in the average price of alcohol of 5 pence per unit (ppu) from 55 ppu to 60 ppu immediately following MUP implementation.<sup>1</sup>

## References

---

- <sup>1</sup> Giles L, Robinson M, Beeston C. Minimum unit pricing (MUP) evaluation. Sales-Based consumption: A Descriptive Analysis of One Year Post-MUP off-Trade Alcohol Sales Data. Edinburgh: NHS Health Scotland; 2020.  
[www.healthscotland.scot/publications/evaluating-the-impact-of-minimum-unit-pricing-mup-on-sales-based-consumption-in-scotland-a-descriptive-analysis-of-one-year-post-mup-off-trade-alcohol-sales-data](http://www.healthscotland.scot/publications/evaluating-the-impact-of-minimum-unit-pricing-mup-on-sales-based-consumption-in-scotland-a-descriptive-analysis-of-one-year-post-mup-off-trade-alcohol-sales-data)
- <sup>2</sup> Dickie E, Mellor R, Myers F, Beeston C. Minimum unit pricing (MUP) evaluation: Compliance (Licensing) study. Edinburgh: NHS Health Scotland; 2019.  
[www.healthscotland.scot/publications/minimum-unit-pricing-evaluation-compliance-study](http://www.healthscotland.scot/publications/minimum-unit-pricing-evaluation-compliance-study)
- <sup>3</sup> O'Donnell A, Anderson P, Jané-Llopis E et al. Immediate impact of minimum unit pricing on alcohol purchases in Scotland: controlled interrupted time series analysis for 2015-18. *BMJ*. 2019;366:l5274. doi:10.1136/bmj.l5274
- <sup>4</sup> Frontier Economics. Minimum unit alcohol pricing: Evaluating the impacts on the alcoholic drinks industry in Scotland: baseline evidence and initial impacts. London: Frontier Economics; 2019. Available online:  
[www.healthscotland.scot/media/2810/frontier-economics-mup-evaluating-the-impacts-on-the-alcoholic-drinks-industry-in-scotland.pdf](http://www.healthscotland.scot/media/2810/frontier-economics-mup-evaluating-the-impacts-on-the-alcoholic-drinks-industry-in-scotland.pdf)
- <sup>5</sup> Iconic Consulting. Minimum unit pricing in Scotland: A qualitative study of children and young people's own drinking and related behaviour. Edinburgh: Iconic Consulting; 2019. Available online: [www.healthscotland.scot/media/2947/iconic-mup-cyp-own-drinking-and-related-behaviour-english-jan2020.pdf](http://www.healthscotland.scot/media/2947/iconic-mup-cyp-own-drinking-and-related-behaviour-english-jan2020.pdf)