

Supplementary Figures

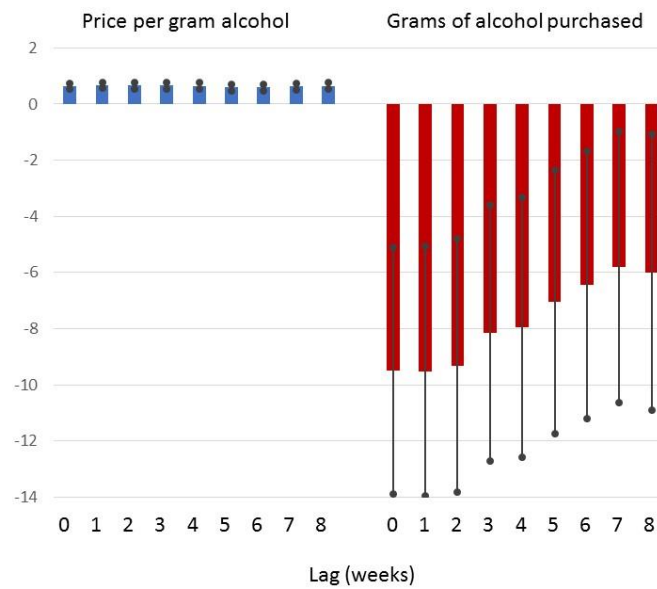


Figure I: Impact of lag (0 to 8 weeks) on impact of MUP on price per gram of alcohol (pence) and grams of alcohol purchased per adult per household aggregated by week, difference Scotland minus England.

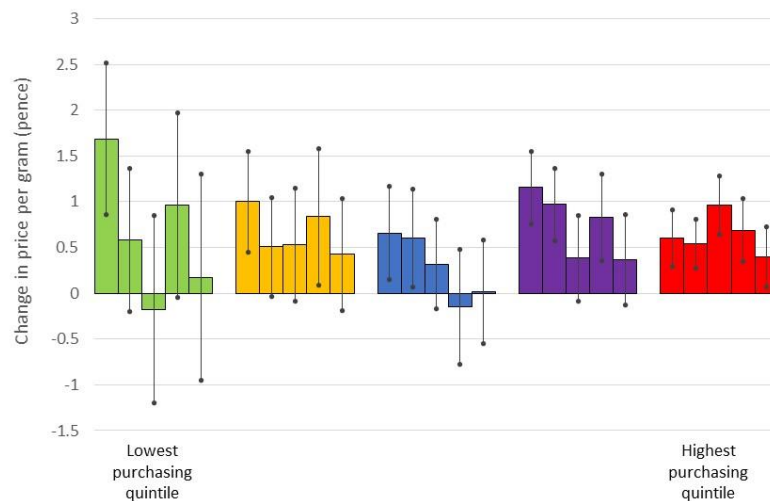


Figure II: Coefficients (95% CI) for changes in price per gram of alcohol purchased (main analysis, Scotland minus England) by income quintile (lowest to highest within each colour group) within purchasing quintiles, green lowest to red highest.

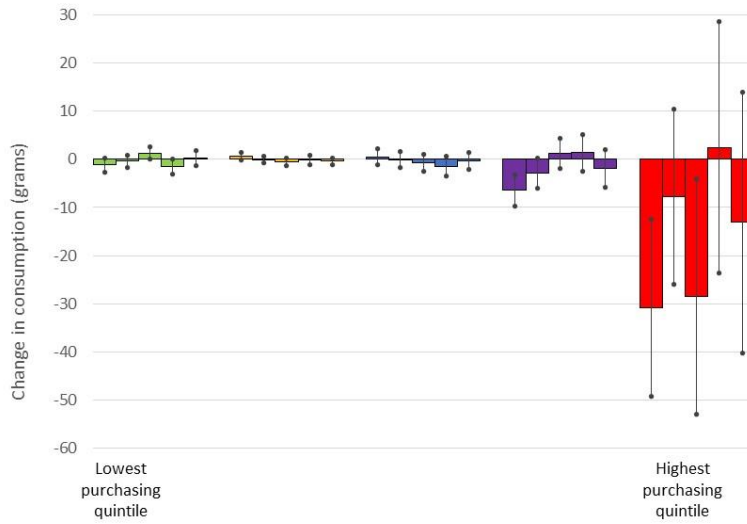


Figure III: Coefficients (95% CI) for changes in grams of alcohol purchased per adult per household, aggregated by week (main analysis, Scotland minus England) by income quintile (lowest to highest) within purchasing quintiles, green lowest, to red highest.

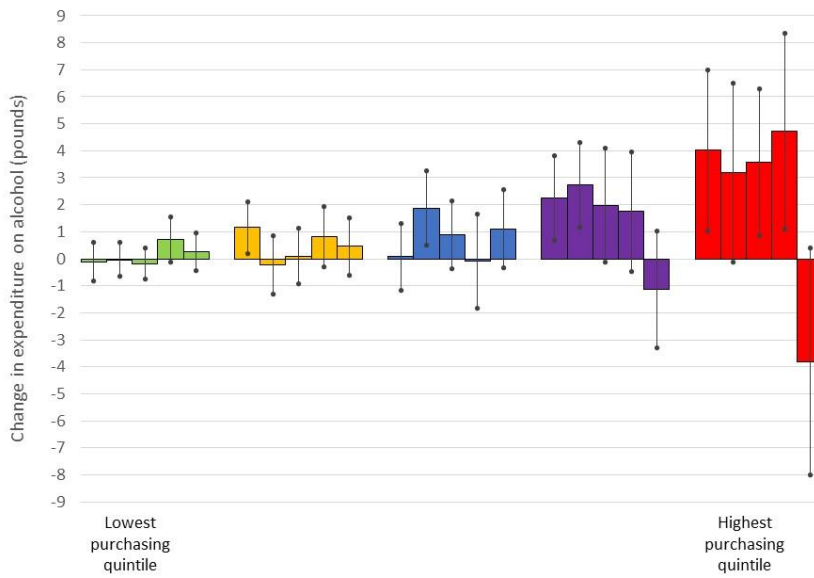


Figure IV: Changes in weekly expenditure (pounds) (main analysis, Scotland minus England) by income quintile (lowest to highest) within purchasing quintiles, green lowest to red highest.

Supplementary Tables

Table 1: Comparison of demographic variables between households from (all of) England, North England and Scotland

	England n 54807	North England n 10040	Scotland n 5325	Significance of differences ¹
Mean (95% confidence intervals) weeks of purchase ²	67.6 (67.1 to 68.1)	69.3 (68.1 to 70.5)	67.5 (65.8 to 69.2)	Eng ^{ns} NEng ^{ns}
Mean (95% confidence intervals) number of adults in household	2.16 (2.15 to 2.17)	2.16 (2.14 to 2.17)	2.08 (2.05 to 2.10)	Eng ^{***} NEng ^{***}
Proportion (%) of households with one adult	18.4	18.8	21.8	Eng ^{***} NEng ^{***}
Median weekly household income (pounds) ³	673	481	481	Eng ^{***} NEng ^{ns}
Mean (95% confidence intervals) age (years) shopper	48.9 (48.7 to 49.0)	49.6 (49.3 to 49.8)	49.6 (49.3 to 50.0)	Eng ^{***} NEng ^{ns}
Proportion class DE ⁴ (%)	21.0	22.7	24.9	Eng ^{***} NEng ^{**}

¹ Scotland with England (Eng); and, Scotland with North England (NEng)

² Difference (number of weeks) between week of last purchase and week of first purchase (n.b., this is not necessarily the same as the length of time that the household is in the panel)

³ Estimated as household income reported in bands; 15.2% of households did not report income

⁴ Based on NRS social grades. D: Semi-skilled and unskilled manual workers, E: State pensioners, casual and lowest grade workers, unemployed with state benefits only

ns, not significant

** , p<0.01

*** , P<0.001

Table II: Comparative data between Scottish and UK government sources and KWP household panel data.

	Scottish Government data sources	Scottish household panel data
Weekly median household income (£)	485 ¹	481 ²
Proportion households with gross household income < £500/week (%)	Gross income ³ : 44%	Household income ² (approximate estimate from bands): 52%
Proportion households with gross household income > £1,000/week	Gross income ³ : 24%	Household income ² (approximate estimate from bands): 19%
Proportion households in AB using NRS classification	2011 census ⁴ : Persons aged 16-64 years: 19%	Households main shopper age <65 years, 2015-2018 data: 19%
Proportion households in DE using NRS classification	2011 census ⁴ : Persons aged 16-64 years: 28%	Households main shopper age <65 years, 2015-2018 data: 24%
Proportion of households with 1 adult	2016 data ⁵ : 37%	2016 data: 23%
Proportion of population aged 65+ years	2016 data ⁶ : 28%	Households main shopper age, 2016 data: 19%
Mean grams alcohol/week	Mean grams of alcohol consumed per week for drinkers aged 16+ years, 2017 data ⁷ : 100 grams	Mean grams of alcohol purchased per week per adult per household, 2017 data ⁸ : 83 grams
Proportion heavy drinkers/purchasers	Proportion of all adults (including non-drinkers) consuming > 112 grams/week, 2017 data ⁷ : 24%	Proportion of all purchases per week per adult per household purchasing >112 grams/week, 2017 data ⁸ : 21% Purchasing >350 grams/week: 3.6%

¹ <https://www.gov.scot/publications/poverty-income-inequality-scotland-2015-18/>

² Household panel data reports household income in bands. The median and proportions were estimated from mid-band incomes. 15.6% of households declined to report income.

³ <https://www.gov.uk/government/collections/family-resources-survey--2>

⁴ <https://www.scotlandscensus.gov.uk/news/census-2011-key-results-households-and-families-and-method-travel-work-or-study-scotland>

⁵ <https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/households/household-estimates/2017>

⁶ <https://www.nrscotland.gov.uk/files/statistics/rgar/16/16rgar.pdf>

⁷ <https://www2.gov.scot/Topics/Statistics/Browse/Health/scottish-health-survey>

⁸ The data were calculated by summing all purchases per household in grams of alcohol, adjusted per adult in the household, and inflated by dividing by 0.73 to adjust for excluding on-sales [32], divided by the total number of weeks between the first and last recorded purchase of alcohol per household.

Table III: Price (pence) per gram of alcohol purchased, grams purchased per adult per household aggregated by week, and money spent (pounds per household per week) before and after introduction of minimum unit price for England, North England and Scotland.

	Price (pence) per gram of alcohol purchased (95% confidence intervals)						Grams purchased per adult per household aggregated by week (95% confidence intervals)						Money spent (pounds per household per week) (95% confidence intervals)					
	Before MUP			After MUP			Before MUP			After MUP			Before MUP			After MUP		
	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland
All alcohol	8.26 (8.24 to 8.29)	8.09 (8.05 to 8.12)	8.11 (8.08 to 8.14)	8.58 (8.53 to 8.63)	8.43 (8.36 to 8.50)	9.03 (8.97 to 9.09)	104.10 (102.50 to 105.69)	110.78 (108.96 to 112.59)	124.84 (122.91 to 126.77)	106.85 (102.77 to 110.93)	116.03 (111.60 to 120.46)	117.88 (113.01 to 122.75)	16.32 (16.01 to 16.62)	16.67 (16.33 to 17.01)	17.63 (17.31 to 17.95)	17.54 (16.73 to 18.34)	18.21 (17.37 to 19.05)	19.39 (18.43 to 20.36)
Beer	8.43 (8.41 to 8.45)	8.22 (8.18 to 8.26)	8.18 (8.14 to 8.22)	8.53 (8.49 to 8.56)	8.33 (8.27 to 8.39)	8.92 (8.85 to 8.99)	19.36 (18.99 to 19.73)	20.72 (20.26 to 21.18)	18.96 (18.55 to 19.37)	20.17 (19.32 to 21.02)	21.52 (20.57 to 22.47)	18.34 (17.47 to 19.21)	3.12 (3.07 to 3.18)	3.22 (3.15 to 3.28)	2.63 (2.58 to 2.69)	3.38 (3.25 to 3.52)	3.50 (3.36 to 3.65)	3.17 (3.01 to 3.33)
Wine	8.32 (8.29 to 8.35)	8.21 (8.18 to 8.25)	8.18 (8.14 to 8.22)	8.66 (8.60 to 8.73)	8.54 (8.47 to 8.62)	9.01 (8.92 to 9.09)	39.94 (39.50 to 40.37)	40.51 (40.02 to 41.00)	46.52 (45.90 to 47.13)	37.24 (36.09 to 38.40)	38.23 (37.14 to 39.32)	42.87 (41.59 to 44.14)	7.18 (7.08 to 7.29)	7.10 (6.98 to 7.21)	7.52 (7.40 to 7.63)	7.19 (6.87 to 7.51)	7.19 (6.90 to 7.49)	7.85 (7.49 to 8.21)
Spirits	5.77 (5.76 to 5.78)	5.71 (5.70 to 5.73)	5.77 (5.76 to 5.79)	5.93 (5.90 to 5.96)	5.89 (5.85 to 5.93)	6.54 (6.51 to 6.56)	30.55 (29.81 to 31.28)	35.69 (34.81 to 36.58)	46.34 (45.31 to 47.38)	33.86 (31.73 to 35.98)	39.18 (36.67 to 41.69)	44.92 (42.25 to 47.59)	3.71 (3.61 to 3.81)	4.10 (3.98 to 4.22)	5.44 (5.31 to 5.58)	4.24 (3.95 to 4.52)	4.71 (4.37 to 5.05)	5.96 (5.58 to 6.35)
Fortified wines	7.60 (7.55 to 7.64)	7.63 (7.57 to 7.69)	7.60 (7.53 to 7.67)	8.43 (8.32 to 8.54)	8.58 (8.44 to 8.72)	8.98 (8.84 to 9.11)	7.05 (6.56 to 7.54)	6.61 (6.11 to 7.10)	6.48 (6.07 to 6.89)	7.49 (6.27 to 8.70)	7.25 (6.08 to 8.42)	6.35 (5.36 to 7.34)	1.11 (1.02 to 1.19)	1.08 (.99 to 1.16)	.94 (.87 to 1.01)	1.31 (1.09 to 1.53)	1.31 (1.09 to 1.53)	1.11 (.93 to 1.30)
Cider	8.16 (8.11 to 8.21)	7.89 (7.82 to 7.96)	8.51 (8.43 to 8.59)	8.50 (8.39 to 8.60)	8.31 (8.16 to 8.46)	10.09 (9.92 to 10.27)	7.10 (6.94 to 7.27)	7.14 (6.97 to 7.31)	6.42 (6.23 to 6.62)	7.96 (7.56 to 8.36)	9.71 (9.24 to 10.18)	5.28 (4.90 to 5.65)	1.00 (.97 to 1.03)	.97 (.95 to 1.00)	.88 (.86 to .91)	1.16 (1.08 to 1.24)	1.22 (1.14 to 1.30)	1.05 (.97 to 1.12)
Ready-to-drink	17.39 (17.26 to 17.52)	17.35 (17.13 to 17.58)	18.03 (17.78 to 18.28)	17.69 (17.47 to 17.90)	17.96 (17.58 to 18.35)	18.03 (17.56 to 18.50)	.10 (.10 to .11)	.10 (.10 to .11)	.12 (.11 to .12)	.13 (.12 to .15)	.14 (.12 to .16)	.13 (.12 to .15)	.20 (.19 to .21)	.21 (.19 to .22)	.22 (.20 to .23)	.26 (.24 to .29)	.28 (.24 to .31)	.25 (.22 to .27)
All alcohol by household income quintiles	1	7.87 (7.79 to 7.95)	7.76 (7.67 to 7.85)	7.80 (7.70 to 7.89)	8.22 (8.03 to 8.40)	8.19 (7.97 to 8.40)	103.68 (97.29 to 110.06)	102.56 (96.26 to 108.85)	106.00 (99.31 to 112.68)	104.60 (90.01 to 119.19)	105.39 (90.53 to 120.24)	102.55 (88.37 to 116.73)	15.90 (15.16 to 16.64)	15.57 (14.84 to 16.30)	15.16 (14.41 to 15.91)	16.54 (14.86 to 18.21)	16.47 (14.75 to 18.19)	16.88 (15.10 to 18.66)
	2	7.94 (7.86 to 8.01)	7.95 (7.87 to 8.03)	7.90 (7.81 to 7.99)	8.31 (8.14 to 8.48)	8.28 (8.10 to 8.46)	100.55 (94.51 to 106.59)	100.27 (94.26 to 106.28)	105.56 (98.90 to 112.22)	101.08 (87.40 to 114.75)	99.90 (86.50 to 113.29)	101.43 (87.48 to 115.38)	18.13 (17.24 to 19.01)	17.51 (16.65 to 18.36)	17.53 (16.67 to 18.39)	19.31 (17.20 to 21.41)	18.88 (16.86 to 20.89)	20.05 (17.83 to 22.27)
	3	8.27 (8.19 to 8.35)	8.14 (8.05 to 8.23)	8.40 (8.29 to 8.52)	8.62 (8.42 to 8.82)	8.41 (8.21 to 8.61)	9.06 (8.83 to 9.28)	109.70 (102.65 to 116.75)	110.61 (103.43 to 117.79)	118.86 (110.60 to 127.12)	108.28 (92.78 to 123.78)	110.43 (94.44 to 126.42)	115.15 (97.55 to 132.75)	15.05 (14.39 to 15.71)	14.74 (14.10 to 15.38)	14.31 (13.67 to 14.95)	15.90 (14.31 to 17.49)	15.10 (13.59 to 16.61)

		Price (pence) per gram of alcohol purchased (95% confidence intervals)						Grams purchased per adult per household aggregated by week (95% confidence intervals)						Money spent (pounds per household per week) (95% confidence intervals)					
		Before MUP			After MUP			Before MUP			After MUP			Before MUP			After MUP		
		England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland	England	North England	Scotland
								116.76)	117.79)	127.11)	123.77)	126.41)	132.76)	15.71)	15.39)	14.96)	17.48)	16.62)	17.94)
	4	8.46 (8.38 to 8.54)	8.55 (8.46 to 8.63)	8.46 (8.36 to 8.56)	8.77 (8.59 to 8.95)	8.88 (8.68 to 9.07)	9.16 (8.95 to 9.37)	107.07 (100.34 to 113.80)	109.95 (102.87 to 117.02)	109.53 (102.45 to 116.62)	108.17 (92.68 to 123.65)	113.32 (96.27 to 130.38)	110.74 (94.48 to 127.00)	16.64 (15.90 to 17.38)	16.94 (16.17 to 17.71)	15.60 (14.87 to 16.33)	17.86 (16.08 to 19.63)	19.15 (17.13 to 21.18)	18.12 (16.12 to 20.11)
	5	8.91 (8.82 to 9.01)	8.84 (8.73 to 8.94)	8.75 (8.65 to 8.86)	9.12 (8.91 to 9.32)	9.22 (9.00 to 9.43)	9.40 (9.18 to 9.62)	106.49 (99.82 to 113.16)	107.86 (100.99 to 114.73)	115.45 (107.60 to 123.30)	106.63 (91.59 to 121.67)	107.26 (91.99 to 122.54)	113.19 (96.20 to 130.17)	16.43 (15.64 to 17.21)	15.92 (15.15 to 16.68)	17.45 (16.50 to 18.40)	17.14 (15.31 to 18.98)	17.22 (15.37 to 19.07)	18.20 (15.95 to 20.45)
All alcohol by household purchasing quintiles	1	10.42 (10.38 to 10.46)	10.42 (10.35 to 10.48)	10.54 (10.45 to 10.63)	10.78 (10.69 to 10.86)	10.79 (10.66 to 10.92)	11.27 (11.10 to 11.44)	14.56 (14.50 to 14.62)	14.66 (14.56 to 14.77)	13.92 (13.80 to 14.05)	14.04 (13.92 to 14.16)	14.41 (14.19 to 14.63)	13.14 (12.90 to 13.39)	5.04 (5.01 to 5.07)	5.10 (5.05 to 5.16)	4.55 (4.49 to 4.61)	5.26 (5.18 to 5.34)	5.30 (5.18 to 5.41)	4.98 (4.83 to 5.13)
	2	8.27 (8.25 to 8.30)	8.18 (8.13 to 8.22)	8.29 (8.24 to 8.35)	8.60 (8.55 to 8.65)	8.58 (8.48 to 8.68)	9.15 (9.04 to 9.26)	36.63 (36.61 to 36.65)	36.60 (36.55 to 36.64)	36.68 (36.61 to 36.75)	36.59 (36.54 to 36.64)	36.58 (36.47 to 36.68)	36.66 (36.52 to 36.80)	8.10 (8.05 to 8.14)	7.92 (7.85 to 8.00)	7.92 (7.82 to 8.01)	8.68 (8.57 to 8.78)	8.64 (8.46 to 8.83)	8.77 (8.58 to 8.96)
	3	8.12 (8.09 to 8.14)	8.01 (7.97 to 8.05)	8.13 (8.08 to 8.18)	8.41 (8.35 to 8.46)	8.29 (8.21 to 8.38)	8.90 (8.81 to 9.00)	67.43 (67.35 to 67.50)	67.48 (67.37 to 67.60)	68.05 (67.89 to 68.21)	67.35 (67.20 to 67.50)	67.56 (67.31 to 67.80)	67.94 (67.59 to 68.29)	12.68 (12.60 to 12.76)	12.37 (12.26 to 12.47)	11.99 (11.84 to 12.14)	13.40 (13.22 to 13.58)	13.39 (13.11 to 13.68)	13.69 (13.35 to 14.02)
	4	7.48 (7.45 to 7.51)	7.44 (7.40 to 7.48)	7.37 (7.32 to 7.41)	7.76 (7.71 to 7.82)	7.76 (7.68 to 7.85)	8.32 (8.23 to 8.40)	120.16 (120.03 to 120.28)	120.15 (119.92 to 120.38)	121.56 (121.26 to 121.87)	120.27 (120.03 to 120.52)	119.92 (119.45 to 120.40)	120.45 (119.76 to 121.15)	20.12 (20.03 to 20.22)	19.93 (19.79 to 20.06)	19.66 (19.47 to 19.85)	21.27 (21.05 to 21.49)	20.97 (20.67 to 21.27)	22.02 (21.60 to 22.45)
	5	7.11 (7.09 to 7.14)	7.02 (6.99 to 7.05)	6.95 (6.92 to 6.98)	7.37 (7.32 to 7.42)	7.32 (7.24 to 7.39)	7.92 (7.86 to 7.98)	286.90 (285.66 to 288.14)	292.81 (290.88 to 294.74)	312.51 (310.00 to 315.02)	291.07 (288.39 to 293.74)	307.92 (302.21 to 313.64)	304.59 (298.92 to 310.25)	36.62 (36.34 to 36.90)	35.88 (35.55 to 36.22)	36.98 (36.57 to 37.39)	38.63 (37.95 to 39.31)	39.07 (38.23 to 39.92)	42.21 (41.15 to 43.27)

Table IV: Quality Criteria for ITS Designs

Quality criteria ¹	Response	Page
1. Intervention occurred independently of other changes over time		
<ul style="list-style-type: none"> • DONE The intervention occurred independently of other changes over time • NOT CLEAR Not specified (will be treated as NOT DONE if information cannot be obtained from the authors) • NOT DONE Reported that intervention was not independent of other changes in time 	Given the short time frame of the post-intervention study period and effective three0year baseline as well as adjustment for seasonal effects, it is reasonable to conclude that the intervention is the major change for the period studied, in looking at the differences between household purchases in Scotland and England.	
2. Intervention was unlikely to affect data collection		
<ul style="list-style-type: none"> • DONE Reported that intervention itself was unlikely to affect data collection (for example, sources and methods of data collection were the same before and after the intervention) • NOT CLEAR Not specified (treated as NOT DONE if information cannot be obtained from the authors) • NOT DONE Intervention itself was likely to affect data collection (for example, any change in source or method of data collection reported) 	The safeguards around the collation of Kantar data provide sufficient reassurance that data collection is unlikely to be affected by the intervention.	
3. The primary outcome was assessed blindly or was measured objectively		
<ul style="list-style-type: none"> • DONE Stated explicitly that primary outcome variables were assessed blindly or outcome variables are objective e.g., length of hospital stay, drug levels assessed by a standardized test • NOT CLEAR Not specified (treated as NOT DONE if information cannot be obtained from the authors) • NOT DONE Outcomes were not assessed blindly 	Based on data collection methods there is no reason for any lack of objectivity in the process.	
4. The primary outcome was reliable or was measured objectively		
<ul style="list-style-type: none"> • DONE Two or more raters with agreement $\geq 90\%$ or kappa ≥ 0.8 or outcome assessment is objective, e.g., length of hospital stay, drug levels assessed by a standardized test • NOT CLEAR Reliability not reported for outcome measures obtained by chart extraction or collected by an Individual (will be treated as NOT DONE if information cannot be obtained from the authors) • NOT DONE Two or more raters with agreement $< 90\%$ or kappa < 0.8 	Agreement between different raters/observers is not applicable here. Confidence in the reliability of the impact of changes in purchasing is enhanced by the close comparability of the results in Table 2, looking at the overall impact and the outputs of robust analysis 1 and 2, as well as the sensitivity analysis for North of England, the latter being comparable in terms of socio-economic profile. The North of England comparison also provides reassurance about the lack of any dilution effect from cross-border trading.	
5. The composition of the data set at each time point covered at least 80% of the total number of participants in the study		
<ul style="list-style-type: none"> • DONE Data set covers 80–100% of total number of participants or episodes of 	KWP is recruited via stratified sampling, with targets set for region,	

¹ Ramsay, C.R., et al., INTERRUPTED TIME SERIES DESIGNS IN HEALTH TECHNOLOGY ASSESSMENT: LESSONS FROM TWO SYSTEMATIC REVIEWS OF BEHAVIOR CHANGE STRATEGIES. International Journal of Technology Assessment in Health Care, 2004. 19(4): p. 613-623.

Quality criteria ¹	Response	Page
<p>care in the study</p> <ul style="list-style-type: none"> • NOT CLEAR Not specified (will be treated as NOT DONE if information cannot be obtained from the authors) • NOT DONE Data set covers less than 80% of the total number of participants or episodes of care in the study 	<p>household size, age of main shopper, and occupational group. Precise participation rates are not available. However, attrition rates are estimated by looking at the number of weeks between the first and last recorded alcohol purchases of each household. There was no difference in mean number of weeks between English and Scottish households (reported in Table 1).</p>	
6. The shape of the intervention effect was prespecified		
<ul style="list-style-type: none"> • DONE A rational explanation for the shape of intervention effect was given by the author(s) • NOT CLEAR Not specified • NOT DONE Any of the conditions above are not met 	<p>The study hypothesis is stated explicitly in the methods section and the expected direction of the impact on purchasing is clear based on the background and policy context.</p>	
7. A rationale for the number and spacing of data points was described		
<ul style="list-style-type: none"> • DONE Rationale for the number of points stated (e.g., monthly data for 12 months post intervention was used because the anticipated effect was expected to decay) <i>or</i> sample size calculation performed • NOT CLEAR Not specified • NOT DONE Any of the conditions above are not met 	<p>Mean weekly household purchases for a period of 208 weeks are reported, providing a significant length of time to be able to detect any consistent underlying trends in the years preceding the introduction of the MUP policy in week 174.</p>	
8. The study was analyzed appropriately using time series techniques		
<ul style="list-style-type: none"> • DONE ARIMA models were used <i>or</i> time series regression models were used to analyze the data and serial correlation was adjusted/tested for • NOT CLEAR Not specified • NOT DONE Any of the conditions above are not met 	<p>Durbin Watson statistics are reported in Table 2, using the range 1.5 to 2.5 as acceptable for minimal autocorrelation.</p>	