Model-based appraisal of minimum unit pricing for alcohol in Northern Ireland

An adaptation of the Sheffield Alcohol Policy Model version 3

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2 EXECUTIVE SUMMARY

2.1 MAIN CONCLUSIONS

Estimates from the Northern Ireland (NI) adaptation of the Sheffield Alcohol Policy Model - version 3 - (SAPM3) suggest:

1. Minimum Unit Pricing (MUP) policies would be effective in reducing alcohol consumption, alcohol related harms (including alcohol-related deaths, hospitalisations, crimes and workplace absences) and the costs associated with those harms.
2. A ban on below-cost selling (implemented as a ban on selling alcohol for below the cost of duty plus the VAT payable on that duty) would have a negligible impact on alcohol consumption or related harms.
3. A ban on price-based promotions in the off-trade, either alone or in tandem with an MUP policy would be effective in reducing alcohol consumption, related harms and associated costs.
4. MUP and promotion ban policies would only have a small impact on moderate drinkers at all levels of income. Somewhat larger impacts would be experienced by increasing risk drinkers, with the most substantial effects being experienced by high risk drinkers.
5. MUP and promotion ban policies would have larger impacts on those in poverty, particularly high risk drinkers, than those not in poverty. However, those in poverty also experience larger relative gains in health and are estimated to marginally reduce their spending due to their reduced drinking under the majority of policies.

2.2 RESEARCH QUESTIONS

- What is the estimated impact of MUP policies ranging from 35p-75p per unit?
- What is the estimated impact of a ban on below-cost selling?
- What is the estimated impact of a ban on price-based promotions in the off-licensed trade?
- How do these impacts vary by drinker group (moderate, increasing risk, high risk) and by income group (in poverty, not in poverty)?

2.3 METHODS USED

The Sheffield Alcohol Policy Model (SAPM) has been used previously in England and in Scotland to analyse the potential effects of pricing policies. We have developed a new version of the model to incorporate data and evidence relating to the NI population.

This research has obtained data and evidence from available sources as follows:

- Alcohol consumption – Health Survey for Northern Ireland (HSNI)
- Alcohol prices in supermarkets and other off-trade outlets – Living Costs and Food Survey (LCF) and Nielsen Ltd

- Alcohol prices in pubs, bars and other on-trade outlets –LCF
- Alcohol preferences and prices paid for different types of beverages by different population subgroups – HSNI combined with LCF
- Price elasticities – previously published research
- Hospital admission rates for alcohol-related diseases – Department of Health, Social Services and Public Safety (DHSSPS) hospital admissions data
- Mortality rates for alcohol-related diseases – DHSSPSNI mortality data
- Costs of healthcare for alcohol-related diseases – DHSSPSNI hospital admissions data
- Crime rates – Police Service of Northern Ireland (PSNI) figures on recorded crime and Department of Justice data on conviction rates by population subgroup
- Costs of policing and justice – Home Office estimates of unit costs of crime
- Work absence rates, work participation rates and average salary rates by population subgroups – Quarterly Labour Force Survey (LFS)

The model synthesises all of this data and evidence and models the estimated impact of possible future pricing policies on alcohol consumption patterns, spending and health (both short-term and over a long-term 20 year horizon).

2.4 SUMMARY OF MODEL FINDINGS

2.4.1 Patterns of drinking and expenditure

F1. The evidence estimates that within the overall NI population aged 16+, the proportion of people who drink at moderate (less than 21 units per week for men and 14 for women), increasing risk (21-50 units per week for men and 14-35 for women) and high risk (more than 50 units per week for men and 35 for women) levels are 80.9%, 13.3% and 5.8% respectively.

F2. Moderate drinkers consume on average 5.3 units per week, spending £377 per year on alcohol. Increasing risk drinkers consume 26.8 units per week, spending £1344 per annum and high risk drinkers consume on average 86.5 units per week, spending £3471 per annum. These patterns differ somewhat when examined by income group, with high risk drinkers in poverty (1.3% of the population) estimated to drink 95.7 units per week, spending £2688 per annum, whilst high risk drinkers above the defined poverty line (4.5% of the population) consume 83.8 units per week and spend £3702 a year.

F3. Overall, increasing risk and high risk drinkers combined (19.1% of the population) account for 67% of all alcohol consumption and 56% of all spending on alcohol. High risk drinkers alone (5.8% of the population) are responsible for 39% of consumption and 29% of all spending.

F4. Prices vary by type of beverage. When examining a potential minimum price for a standard drink (a floor price below which no alcohol may legally be sold) of 50p, the evidence suggests that 74.2% of all off-trade beer, 77.1% of off-trade cider, 39.5% of off-trade wine and 67.3% of off-trade spirits sold in the year 2013 would be affected and incur a price rise.

2.4.2 Effect of modelled policies on consumption and expenditure

F5. For a 50p MUP, the estimated per person reduction in alcohol consumption for the overall population is 5.7%. In absolute terms this equates to an annual reduction of 46 units per drinker per year. The lower modelled MUP policies are estimated to have relatively small impacts, with effectiveness increased more sharply above 45p per unit (45p = -3.8%, 50p = -5.7%, 55p = -7.9%)

F6. High risk drinkers have much larger estimated consumption reductions for MUP policies than increasing risk or moderate drinkers. For a 50p MUP the estimated reductions are 8.6% for high risk drinkers, 5.0% for increasing risk drinkers and 1.6% for moderate drinkers. Differences in absolute consumption reductions are considerably larger again, with high risk drinkers reducing their consumption by 386 units per year (7.4 per week) for a 50p MUP, compared to a reduction of 70 for increasing risk drinkers and 4.3 units per year for moderate drinkers. Absolute reductions are also substantially larger for high risk drinkers in poverty (e.g. a reduction of 650.1 units per year vs. 308.5 on average for those not in poverty).

F7. A ban on below-cost selling is estimated to have almost no impact on population consumption (-0.0%), spending (-50p per drinker per year), health outcomes (4 fewer hospital admissions per year) or crime (14 fewer crimes per year).

F8. Under these policies, drinkers are estimated to reduce consumption but pay slightly more on average per unit consumed, and so estimated percentage changes in spending are smaller than estimated changes in consumption. For almost all modelled policies (excluding a 35p and 40p MUP), spending across the whole population is estimated to increase, for example by £6.30 (0.8%) per drinker per year for a 50p MUP alongside a consumption change of -5.7%. Spending changes also differ across the population, with high risk drinkers estimated to have a marginal saving of £1.50 (-0.04%) per year whilst moderate drinkers' spending increases by £4.70 (1.3%). Those in poverty are also estimated to reduce their spending under the majority of policies, whilst those not in poverty increase theirs (e.g. -£6.10 and +£9.20 per year respectively for a 50p MUP).

F9. The impact of the policies examined on income subgroups differs hugely. For moderate drinkers, whether those above or below the defined poverty level, the impact is very small. For a 50p MUP, for example, moderate drinkers are estimated to reduce consumption by 4.3 units per year (e.g. just over two pints of beer in the year), with a change in spending of on average £4.70 per year (around 9p per week). The effects on moderate drinkers in poverty are even smaller in spending terms e.g. £0.50 estimated additional spending per annum for 50p MUP, compared with £5.70 for moderate drinkers not in poverty, though they are slightly higher in consumption terms (a reduction of 9.4 units per year for moderate drinkers in poverty versus 3.1 units per year for moderate drinkers not in poverty). The contrast with high risk drinkers is stark. High risk drinkers in poverty spend on average almost £2,700 per year on alcohol, and the modelling estimates that a 50p MUP would reduce consumption in this group by 650 units per annum.

F10. Under all modelled policies (except a ban on below-cost selling), the estimated revenue to the Exchequer (from duty and VAT receipts on alcohol) is estimated to decrease slightly, with a 2.6% reduction (equivalent to £8.2million) for a 50p MUP. Revenue to retailers is estimated to increase across all policies, with an increase of £25.3million (4.8%) for a 50p MUP. The vast majority of this is accrued in the off-trade, although on-trade retailers are estimated to gain slightly under most

policies (e.g. £3.1million or 0.8% under a 50p MUP). Under a ban on off-trade promotions, off-trade retailers are estimated to gain substantially (£23million or 15.8%) while on-trade revenues remain unchanged.

2.4.3 Effects of modelled policies on alcohol-related harms

F11. There are substantial estimated reductions in alcohol-related harms from all modelled policies, with an estimated reduction of 63 deaths and 2,425 fewer hospital admissions per year for a 50p MUP. Equivalent figures for an off-trade promotion ban are less than half of this level, at 25 and 1,043. As there is evidence of a time lag between changes in consumption and changes of rates of harm for some alcohol-related health conditions (e.g. various cancer rates increase 10 to 20 years after consumption increases), annual changes in health outcomes are reported accruing over the long-term (using the 20th year following implementation of the policy as a proxy for this).

F12. For all policies, the majority of the reductions in deaths and hospitalisations are experienced by those above the poverty line; however, this group also makes up a large majority (79.6%) of the population. Accounting for this difference, all modelled policies are estimated to have greater reductions in deaths and hospital admissions per 100,000 population for those in poverty than those not in poverty (e.g. 10 fewer deaths and 317 fewer hospital admissions per 100,000 population for those in poverty under a 50p MUP vs. 3 fewer deaths and 132 fewer hospital admissions for those not in poverty).

F13. Direct costs to healthcare services are estimated to reduce under all modelled policies, with savings of at least £0.8million in year 1 and £177million over the first 20 years following implementation of a promotion ban and all MUP thresholds of at least 45p. The savings for a 50p MUP are £1.8million in the first year and £397million over 20 years.

F14. Crime is expected to fall, with an estimated 5,293 fewer offences per year under a 50p MUP policy. High risk drinkers, who comprise 5.8% of the population, account for 51% of this reduction. Costs of crime are estimated to reduce by £19.9million in the first year under this policy and £292million over 20 years, with higher MUP thresholds providing even greater savings (e.g. £60.4million and £888million respectively for a 70p MUP).

F15. Workplace absence is estimated to fall under all modelled policies, with a reduction of 35,000 days absent per year for a 50p MUP and 17,100 for a ban on off-trade price-based promotions.

F16. For a 50p MUP policy, the total societal value of the harm reductions for health, crime and workplace absence is estimated at £956million over the 20 year period modelled. This figure includes reduced direct healthcare costs, savings from reduced crime and policing, savings from reduced workplace absence and a financial valuation of the health benefits measured in terms of Quality-Adjusted Life Years (QALYs – valued at £60,000 in line with Department of Health guidelines [1]). The equivalent figure for the total societal value of harm reductions from a promotions ban is estimated to be £201million.

3 INTRODUCTION

3.1 BACKGROUND

In 2009, the Sheffield Alcohol Research Group (SARG) at Sheffield University developed the Sheffield Alcohol Policy Model version 2.0 (SAPM) to appraise the potential impact of alcohol policies, including different levels of MUP, for the population of England [2]. This model has subsequently been adapted to a range of international settings, including Scotland, Canada and Italy [3]–[5].

Since 2009, the methodology that underpins SAPM has been further developed and refined. Some of these methodological advances have previously been described elsewhere [6], [7]; however, this report incorporates a number of additional improvements which are described here. In order to avoid confusion with previous versions of the model, the current version is referred to as SAPM3 throughout this report.

In 2013, SARG were commissioned by the DHSSPS and the Department for Social Development to adapt the Sheffield Model to NI in order to appraise the potential impact of a range of alcohol pricing policies. The present report represents the results of this work.

3.2 RESEARCH QUESTIONS ADDRESSED

The primary set of policies analysed in this report are MUP policies with thresholds of 35p, 40p, …, 75p per unit of alcohol. This analysis uses 2013 as the baseline year and we assume that these price thresholds are held constant in real terms over the length of the 20 year modelling period. The main research questions are concerned with the likely effects of introducing an MUP on: alcohol consumption, spending, sales, health, crime and workplace absenteeism in NI.

This report also provides analysis of the impact of the following additional policy options:

1. A ban on price-based promotions in the off-licensed trade in NI
2. A ban on 'below-cost selling' – i.e. selling below the cost of duty plus the VAT payable on the duty – in NI
3. A combination of the analysed MUP policies with a ban on price-based promotions in the off-licensed trade in NI.

For comparative purposes the report also presents the effects of a 10% price rise on all alcohol products.

4 METHODS

4.1 OVERVIEW OF SAPM3

The aim of SAPM3 is to appraise pricing policy options via cost-benefit analyses. The aims have been broken down into a linked series of policy impacts to be modelled:

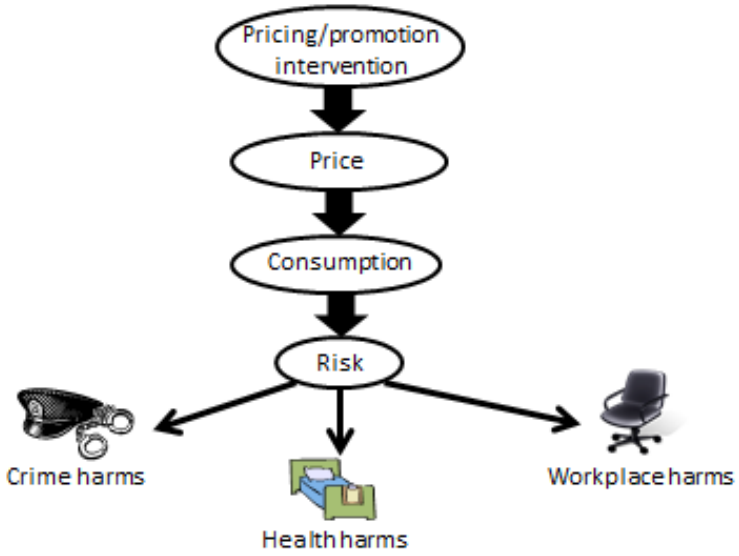
- The effect of the policy on the distribution of prices for different types of alcohol
- The effect of changes in price distributions on patterns of both on-trade and off-trade alcohol consumption
- The effect of changes in alcohol consumption patterns on revenue for retailers and the exchequer
- The effect of changes in alcohol consumption patterns on consumer spending on alcohol
- The effect of changes in alcohol consumption patterns on levels of alcohol-related health harms
- The effect of changes in alcohol consumption patterns on levels of crime
- The effect of changes in alcohol consumption patterns on levels of workplace absenteeism.

To estimate these effects, two connected models have been built:

1. A model of the relationship between alcohol prices and alcohol consumption which accounts for the relationship between: average weekly alcohol consumption, the patterns in which that alcohol is drunk and how these are distributed within the population considering gender, age, income and consumption level.
2. A model of the relationship between: (1) both average level and patterns of alcohol consumption, and (2) harms related to health, crime and workplace absenteeism and the costs associated with these harms.

Figure 4.1 illustrates this conceptual framework.

Figure 4.1: High-level conceptual framework of SAPM3



4.2 MODELLING THE LINK BETWEEN INTERVENTION AND CONSUMPTION

4.2.1 Overview

The pricing model uses a simulation framework based on classical econometrics. The fundamental concept is that: (i) a current consumption dataset is held for the population, (ii) a policy gives rise to a change in price, (iii) a change in consumption is estimated from the price change using the price elasticity of demand, and (iv) the consumption change is used to update the current consumption dataset. Due to data limitations (discussed in Section 4.2.3), the change in patterns of drinking is estimated indirectly via a change in mean consumption.

As is the case in England, no single dataset exists for NI which contains the necessary data on both prices paid and consumption. Therefore the link between price and consumption was modelled using different datasets. This section provides an overview of the data sources on alcohol consumption and pricing which were used, before detailing the procedures for modelling the effect that price-based policy interventions have on consumption.

4.2.2 Consumption data

HSNI is an annual survey of around 4,000 individuals carried out by the Central Survey Unit on behalf of DHSSPSNI. It records a range of demographic data on respondents, including: age, sex, income and mean weekly consumption of alcohol. Data from the 2010/11 and 2011/12 surveys were pooled to produce the baseline population for the model (N=8,407). Figure 4.2 and Figure 4.3 present the distribution of mean weekly consumption by age and sex.

Figure 4.2: Distribution of mean weekly consumption by age group (HSNI 2010-12)

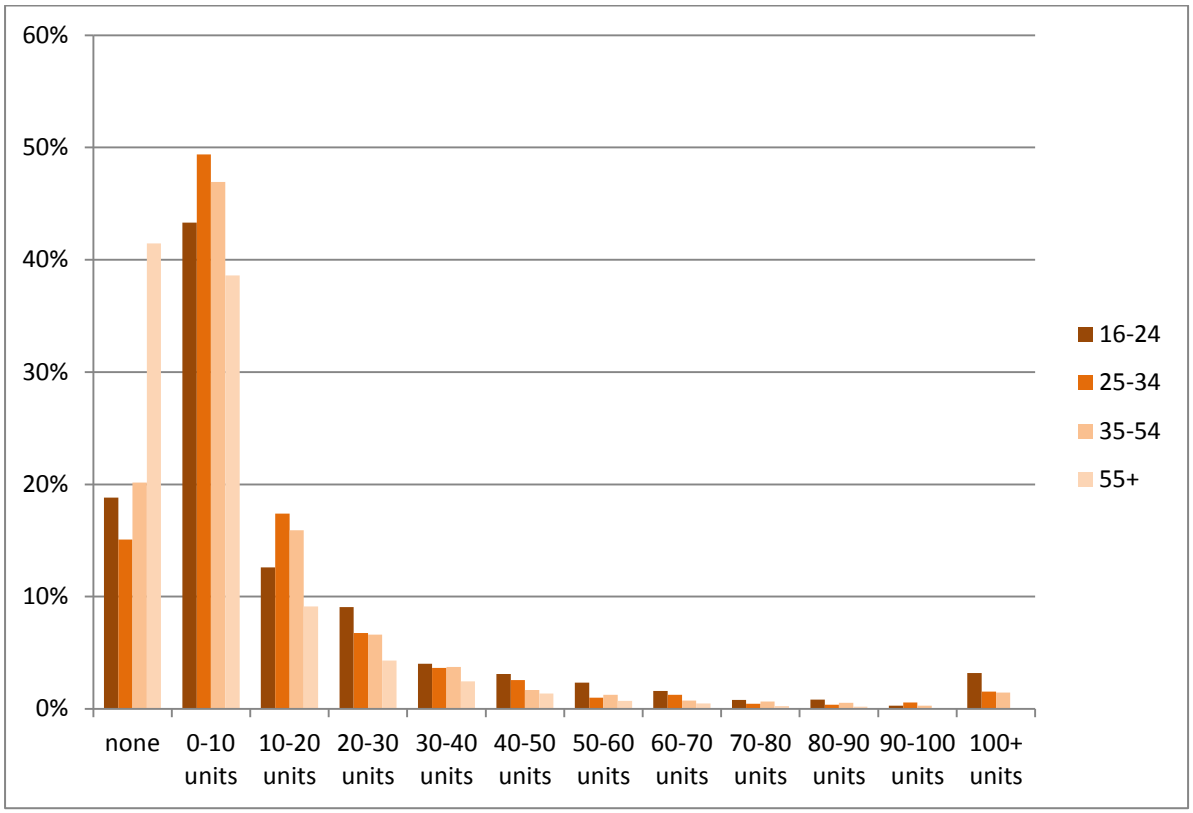
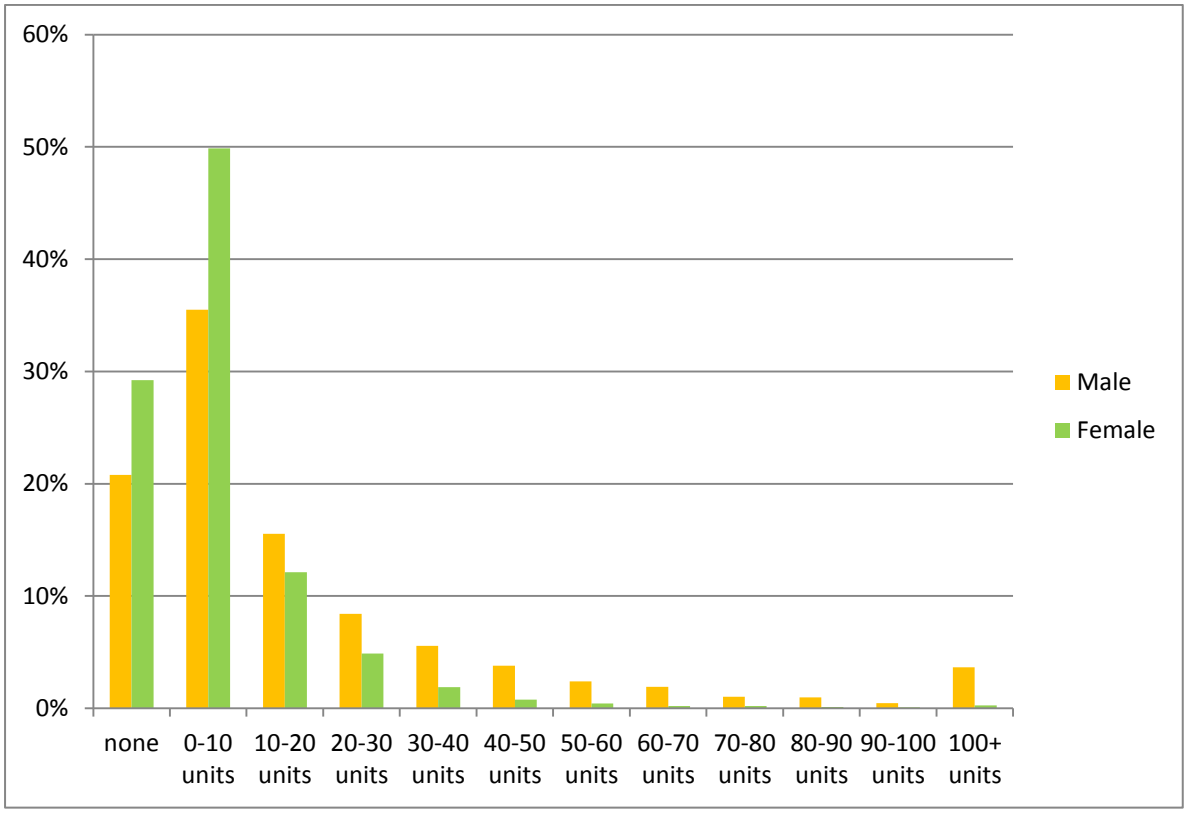


Figure 4.3: Distribution of mean weekly consumption by sex (HSNI 2010-12)

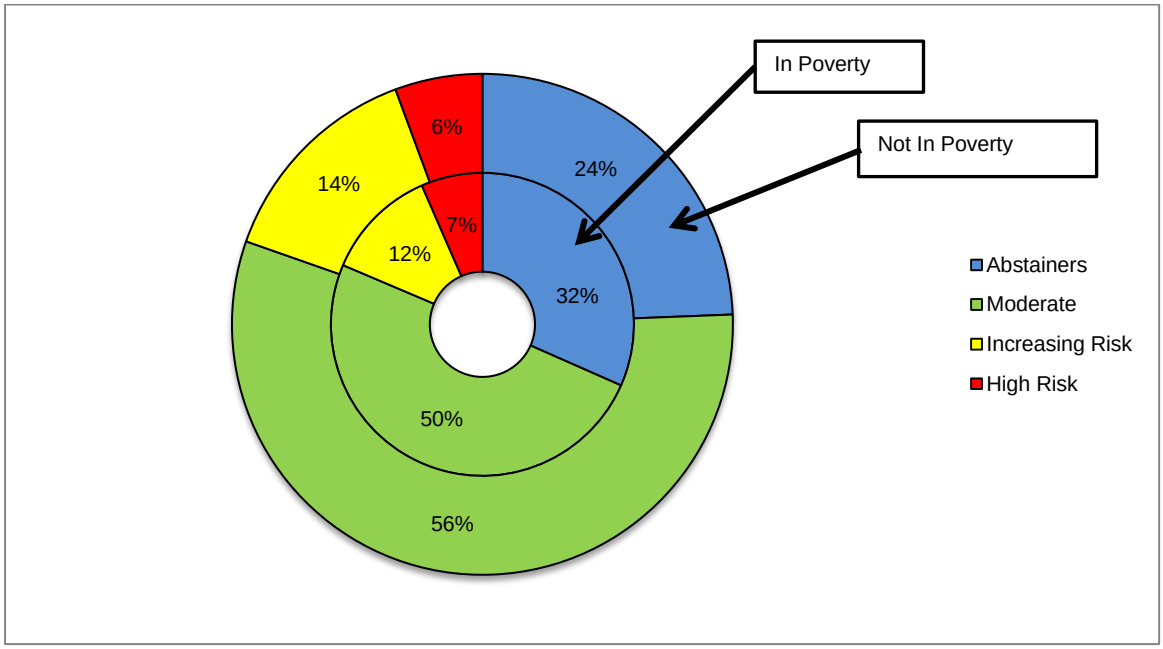


This population is divided into three drinker groups:

- Moderate drinkers – those whose usual alcohol intake is no more than 21/14 units per week for men/women (1 unit = 8g of ethanol)
- Increasing risk drinkers – those drinkers consuming 21-50 units per week for men or 14-35 units per week for women
- High risk drinkers – drinkers whose usual alcohol intake exceeds 50/35 units per week for men/women.

Overall, from the HSNI data, 25.9% of the adult population (16+) are abstainers, 55.0% are moderate drinkers, 13.3% are increasing risk drinkers and 5.8% are high risk drinkers. On average moderate drinkers consume 5.3 units per week, increasing risk drinkers consume 26.8 units and high risk drinkers consume 86.5 units. Figure 4.4 illustrates how consumption patterns differ between those in poverty and those out of poverty.[1] Individuals below the poverty line are more likely to be abstainers (31.6% vs. 24.4%), while at the upper end of the spectrum they are also more likely to drink at high risk levels (6.5% vs. 5.6%). Within the moderate and increasing risk drinker groups, those below the poverty line drink less on average (4.8 and 25.1 units per week vs. 5.4 and 27.2 units respectively), whereas high risk drinkers in poverty drink more than those above the poverty line (95.7 units per week on average vs. 83.8 units).

Figure 4.4: Population distribution by drinker and income group (HSNI 2010-12)



4.2.3 Patterns of consumption

In addition to mean weekly consumption of alcohol, a significant number of the harms modelled in SAPM3 are a function of intoxication; that is to say that they are related to the patterns in which

[1] Being in poverty is defined here, as elsewhere in this report and in the model, as an individual having an equivalised household income below 60% of the population median.

alcohol is drunk, not just the overall volume consumed. Previous versions of the Sheffield Model in England have used peak consumption in the previous week as a proxy measure for these patterns, a variable which is available in the baseline consumption data. Unfortunately, no similar measure of drinking patterns is available the HSNI data. The Adult Drinking Patterns Survey, commissioned by the DHSSPSNI does include data on drinking patterns; however, it asks only about consumption in the week preceding the survey and does not include any measure of usual consumption.

Therefore, a new measure is developed in this analysis to replace the peak day consumption to represent intoxication. One of the advances in SAPM3 over previous iterations of the Sheffield Model is a new model which predicts an individual's drinking patterns across the entire year in order to better estimate their risk of suffering harms related to intoxication. In the method, the following three measures are estimated for each individual to define single occasion drinking: the frequency of drinking occasions (defined as *n*, or number of drinking occasions per week), mean level of alcohol consumption for a given drinking occasion (defined as μ, or units of alcohol) and the variability of alcohol consumption for a given drinking occasion (defined as σ, or standard deviation of units of alcohol consumed in drinking occasions). Based on these measures and assuming a normal distribution for amount of alcohol consumed in a given drinking occasion, the expected number of heavy drinking occasions, defined as single drinking occasion over 8/6 units for men/women, per week is imputed for each individual in the HSNI survey and used as the proxy for heavy single occasion drinking (see Equation 1).

$$E(BingeOccasionPerWeek) = n \cdot p \quad and \quad p = 1 - F(x, \mu, \sigma) \quad \textit{Equation 1}$$

where p represents the probability of a given drinking occasion being heavy drinking occasion, $F(x, \mu, \sigma)$ represents the normal cumulative distribution function with μ and σ being the mean and standard deviation, and x being the threshold for binge drinking (i.e., 8/6 for men/women).

4.2.4 Prices

Data on the prices paid for alcohol beverages are taken from the Living Costs and Food Survey, formerly the Expenditure and Food Survey (LCF/EFS). Via a special data request to the Department for the Environment, Food and Rural Affairs (DEFRA), anonymised individual-level diary data on 25 categories of alcohol (e.g. off-trade beers, see Table 4.1 for a full list) detailing both expenditure (in pence) and quantity (in natural volume of product) were made available to the authors. All transactions from NI for the period from 2001/2 to 2009 were pooled (adjusting prices for inflation using alcohol-specific RPIs [8]) to give a total sample size of 17,616 purchasing transactions. These transactions were used for constructing the baseline empirical price distributions for each modelled subgroup and each modelled beverage type.

Table 4.1 also shows the matching of the LCF/EFS categories and the 10 modelled categories, as well as the alcohol by volume (ABV) assumptions used in the LCF 2009 for converting the natural volume of beverages to ethanol contents.

Off-trade price distributions for NI based on aggregated sales data were obtained from the Nielsen Company by the DHSSPSNI for the purposes of this project. These distributions, giving the total sales volume for 2013 in each of 42 beverage categories (e.g. malt whisky, premium beer) at each of 15 price bands (<20p/unit, 20-25p/unit,…,>85p/unit) were used to adjust the LCF/EFS off-trade prices using the same methodology as previous versions of the Sheffield Model [2]. The adjustment of LCF/EFS is undertaken because sales data from Nielsen is generally more accurate than self-reported purchasing data obtained from LCF/EFS. No price distributions were available for the on-trade and so the raw distributions from the LCF/EFS data were used. Figure 4.5 illustrates the unadjusted and adjusted price distributions for the off-trade, while Figure 4.6 presents the final price on- and off-trade price distributions used in the model.

Table 4.1: Matching of LCF/EFS product categories to modelled categories and ABV estimates

LCF/EFS off/on trade	LCF/EFS category	Modelled category	ABV estimate
Off-trade	Beers	off-trade beer	3.9%
Off-trade	Lagers and continental beers	off-trade beer	3.9%
Off-trade	Ciders and perry	off-trade cider	4.8%
Off-trade	Champagne, sparkling wines and wine with mixer	off-trade wine	11.2%
Off-trade	Table wine	off-trade wine	12.7%
Off-trade	Spirits with mixer	off-trade spirits	7.3%
Off-trade	Fortified wines	off-trade wine	14.3%
Off-trade	Spirits	off-trade spirits	39.6%
Off-trade	Liqueurs and cocktails	off-trade spirits	33.3%
Off-trade	Alcopops	off-trade RTD	4.6%
On-trade	Spirits	on-trade spirits	41.8%
On-trade	Liqueurs	on-trade spirits	29.9%
On-trade	Cocktails	on-trade spirits	13.2%
On-trade	Spirits or liqueurs with mixer	on-trade spirits	7.7%
On-trade	Wine (not sparkling) including unspecified 'wine'	on-trade wine	11.1%
On-trade	Sparkling wines and wine with mixer (e.g. Bucks Fizz)	on-trade wine	9.5%
On-trade	Fortified wine	on-trade wine	17.3%
On-trade	Cider or perry - half pint or bottle	on-trade cider	4.8%
On-trade	Cider or perry - pint or can or size not specified	on-trade cider	4.8%
On-trade	Alcoholic soft drinks (alcopops), and ready-mixed bottled drinks	on-trade RTDs	4.6%
On-trade	Bitter - half pint or bottle	on-trade beer	4.3%
On-trade	Bitter - pint or can or size not specified	on-trade beer	4.3%
On-trade	Lager or other beers including unspecified 'beer' - half pint or bottle	on-trade beer	5.0%
On-trade	Lager or other beers including unspecified 'beer' - pint or can or size not specified	on-trade beer	5.0%
On-trade	Round of drinks, alcohol not otherwise specified	on-trade beer	4.8%

Figure 4.5: LCF/EFS (raw) and Neilsen (adjusted) price distributions for off-trade beverages (RTDs not shown)

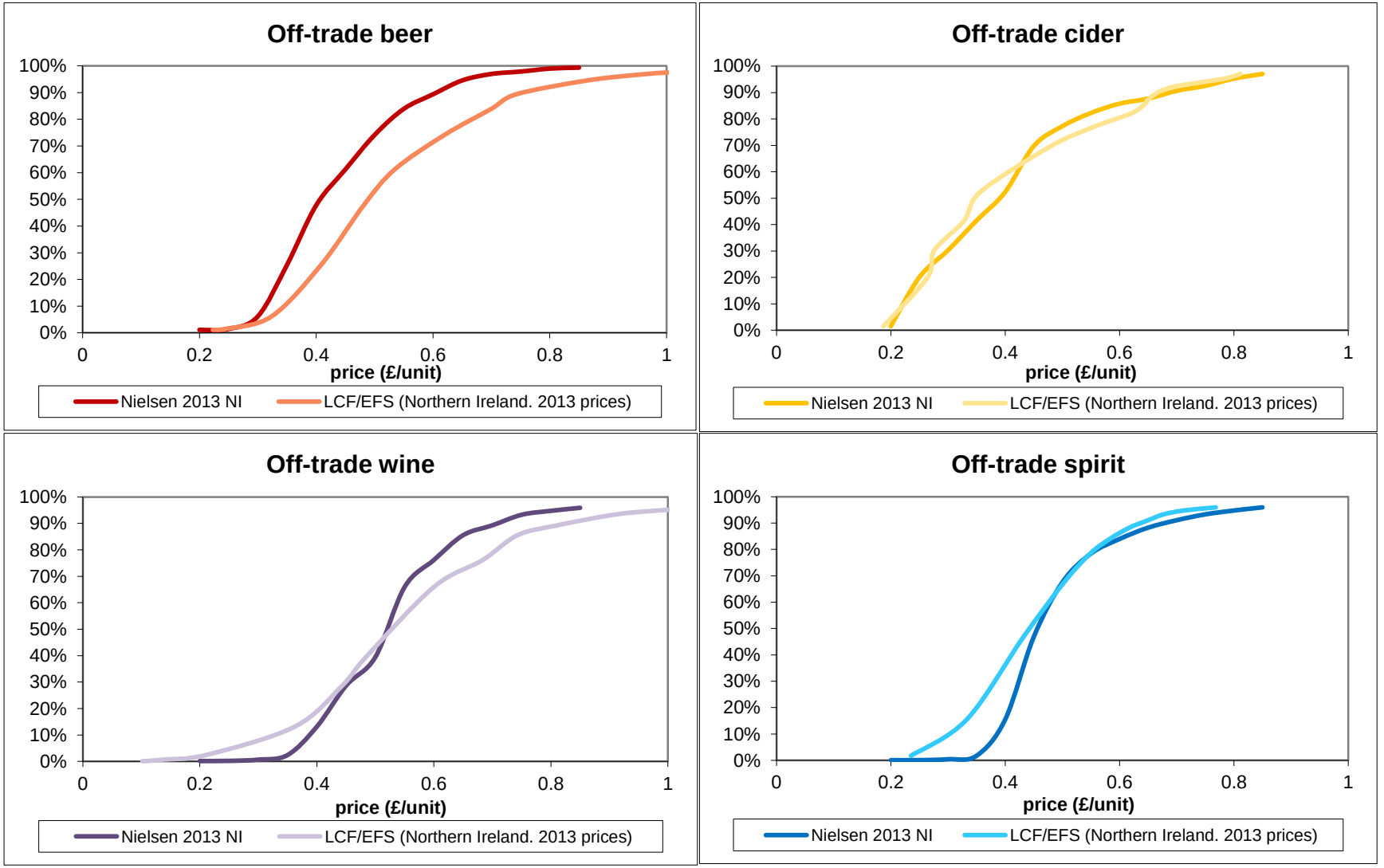


Figure 4.6: Final on- and off-trade price distributions used in SAPM3

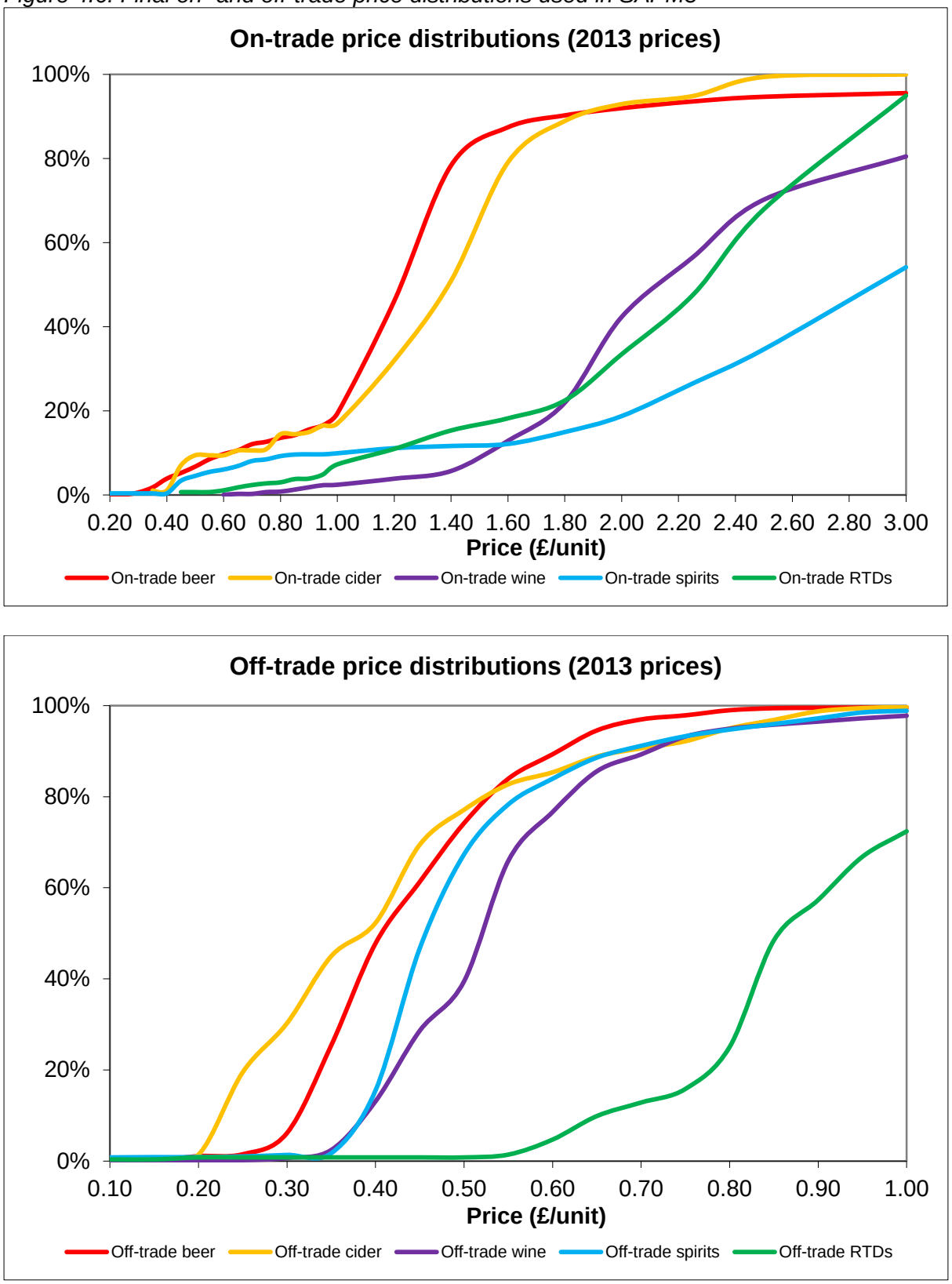


Table 4.2 shows the proportion of alcohol within each category sold below several price thresholds. Although SAPM works on subgroup-specific price distributions, these figures provide an approximation of the overall proportion of alcohol within each category which would be affected by differing levels of MUP. It is apparent that these policies have a minimal impact on on-trade prices and mainly target off-trade prices, particularly for cider and beer (and, to a lesser extent, spirits).

Table 4.2: Proportion of alcohol sold in Northern Ireland below a range of MUP thresholds

	Proportions sold below thresholds (2013 prices)		
	40p	45p	50p
Off-trade beer	47.8%	61.3%	74.2%
Off-trade cider	52.3%	69.5%	77.1%
Off-trade wine	13.1%	28.6%	39.5%
Off-trade spirits	15.5%	46.7%	67.3%
Off-trade RTDs	0.8%	0.8%	0.8%
On-trade beer	3.9%	5.2%	6.7%
On-trade cider	0.0%	0.0%	9.4%
On-trade wine	0.0%	0.0%	0.0%
On-trade spirits	0.4%	3.4%	4.5%
On-trade RTDs	0.0%	0.0%	0.7%

The price data in Figure 4.5, Figure 4.6 and Table 4.2 are for the whole population of NI; however, purchasing behaviour varies across the drinking and income spectra. Figure 4.7 shows the proportion and quantity of each drinker groups' units which would be affected by a 50p MUP stratified by those above and below the poverty line. It shows that moderate drinkers, irrespective of their income, purchase very little alcohol for below 50p per unit in absolute terms. This alcohol also makes up a smaller proportion of moderate drinkers' purchases compared to increasing risk or higher risk drinkers. Alcohol sold for less than 50p per unit makes up the majority of alcohol purchased by high risk drinkers and those high risk drinkers in poverty purchase more than those not in poverty in both absolute (59 units per week vs. 44 units per week) and relative (62% vs. 53%) terms. This indicates that moderate drinkers would be largely unaffected by a 50p MUP, irrespective of their income. Increasing and particularly high drinkers will be more affected with low income high risk drinkers the most affected.

Figure 4.7: Number and proportion of units purchased at below 50p/unit by income and drinker group

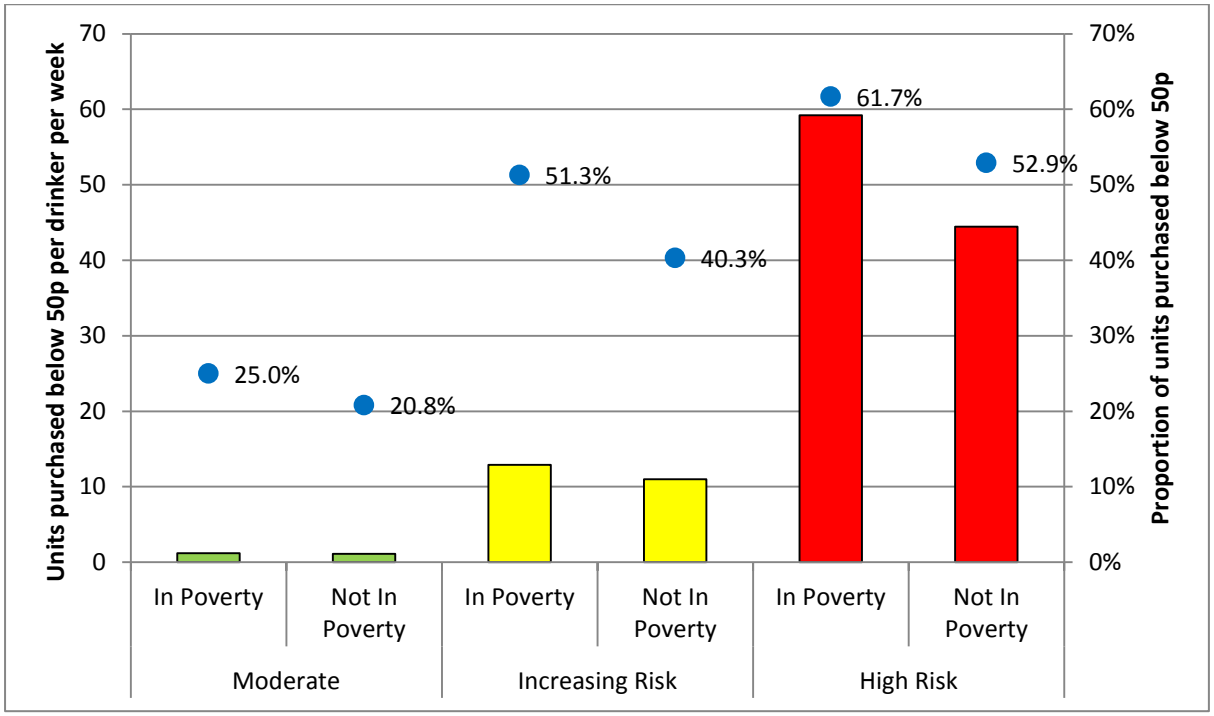


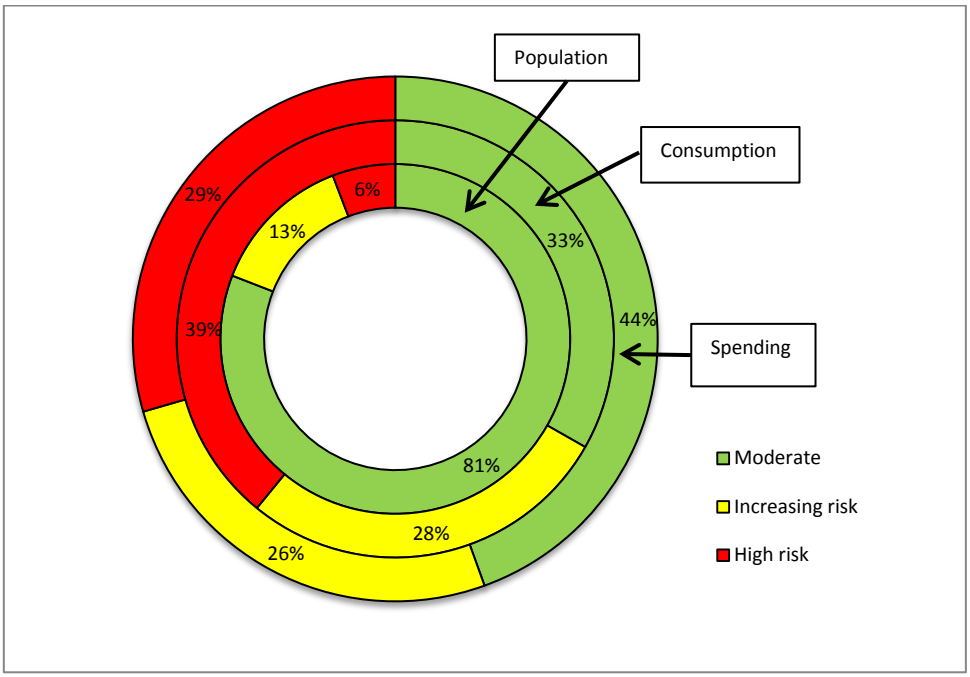
Table 4.3 provides a summary of the proportion of off-trade sales for each beverage type which would be affected by a ban on price-based promotions. This shows that while on promotion, wine is the product which is most frequently sold and experiences the largest price reductions.

Table 4.3: Summary of off-trade promotional sales by beverage category

	% of units sold on promotions	**% of spending on promoted items**	**Mean discount per unit when on promotion**
Beer	35.4%	32.8%	15.7%
Cider	29.9%	30.7%	19.6%
Wine	46.9%	47.9%	34.2%
Spirits	37.3%	35.8%	18.9%
RTDs	31.7%	29.2%	17.5%
Total	**39.6%**	**39.3%**	**26.3%**

Figure 4.8 illustrates how the proportion of total alcohol consumption and total spending on alcohol is attributable to each drinker group. It shows that whilst increasing risk and high risk drinkers combined constitute only 19% of the population, they consume 67% of all alcohol and account for 56% of all spending on drink.

Figure 4.8: Proportion of total consumption and spending by drinker group



4.2.5 Beverage preferences

As illustrated by Figure 4.6 and Table 4.2, the impact of pricing policies will vary substantially between beverage categories (as defined by beverage type: beer, cider, wine, spirits and RTDs and by purchase location – on- or off-trade). Therefore, it is crucial to capture the heterogeneity of beverage preferences between different subgroups of the population. For each individual HSNI respondent, their preferences for beer (incorporating cider), wine, spirits and RTDs are captured by the beverage-specific quantity-frequency questions which are asked in the survey. Beer and cider are then separated out using the subgroup level LCF/EFS purchasing data for that subgroup. On- and off-trade preferences for each beverage are similarly separated using the same LCF/EFS data. This produces a 10-element 'preference vector' for each individual. Figure 4.9, Figure 4.10, Figure 4.11 and Figure 4.12 show how these preferences vary across the population and some population subgroups, both in terms of beverage category and location. For example, Figure 4.11 shows that a much larger proportion of high risk drinkers' consumption is beer, than is the case for moderate drinkers (62% vs. 37%), while Figure 4.12 shows that people living in poverty drink more cider (8% vs. 3%) and less wine (15% vs. 24%) than those above the poverty line and that more of their drinking takes place at home rather than in the on-trade (64% vs. 54%). When interpreting these figures it is important to note that they indicate the proportion of units drunk which are of each beverage type and in each location. So, for example, whilst spirits make up a decreasing proportion of total consumption as total consumption increases (22% for moderate drinkers, 21% for increasing risk drinkers and 16% for high risk drinkers), the actual volume of spirits consumed increases with consumption (62 units per year for moderate drinkers, 298 for increasing risk drinkers and 727 for high risk drinkers).

Figure 4.9: Consumption preferences by gender

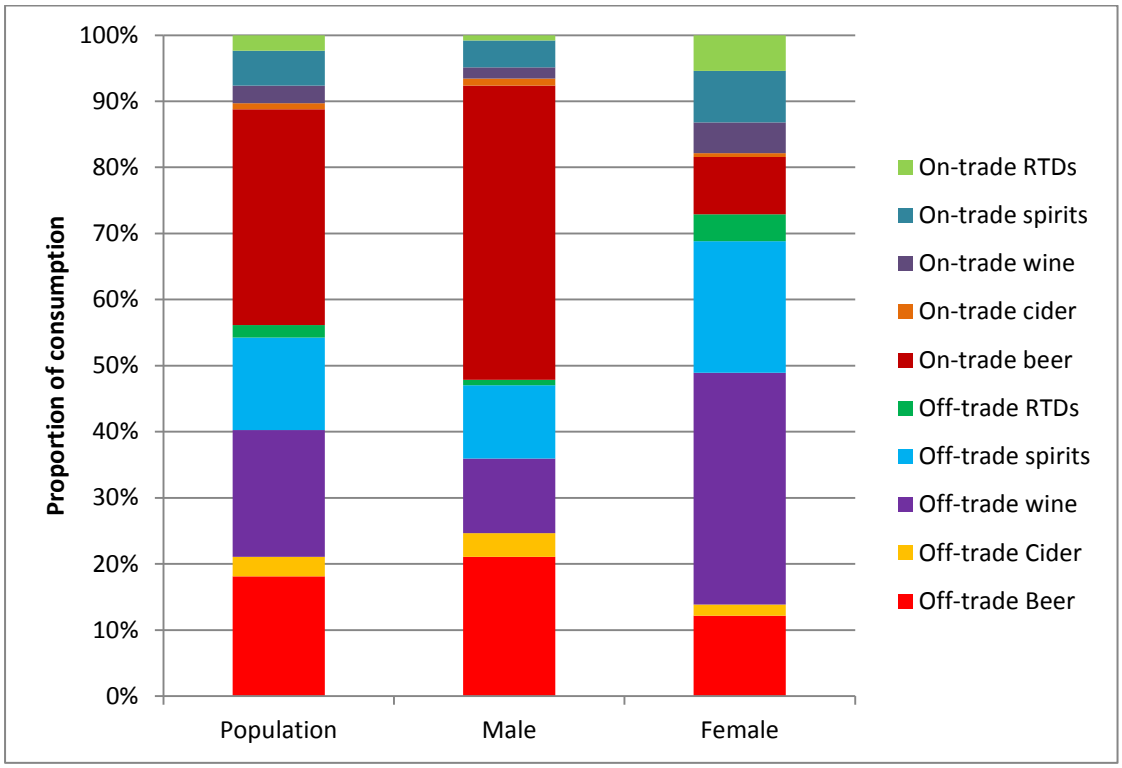


Figure 4.10: Consumption preferences by age

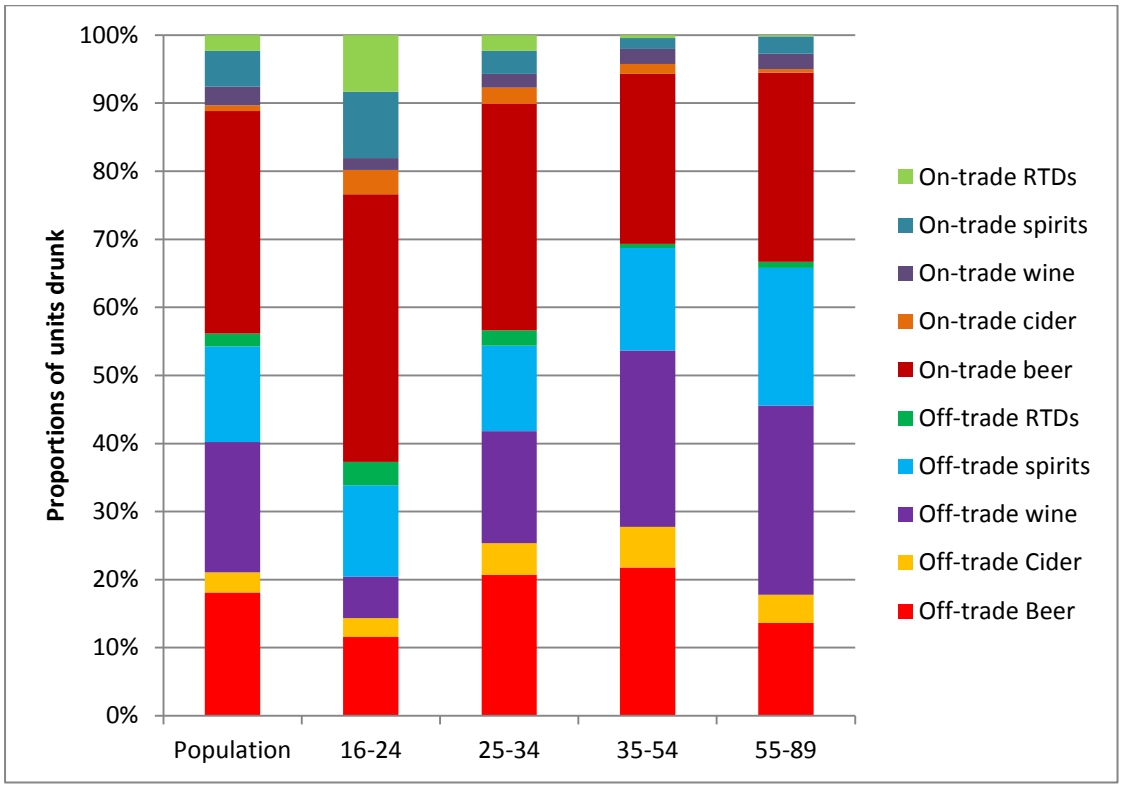


Figure 4.11: Consumption preferences by drinker category

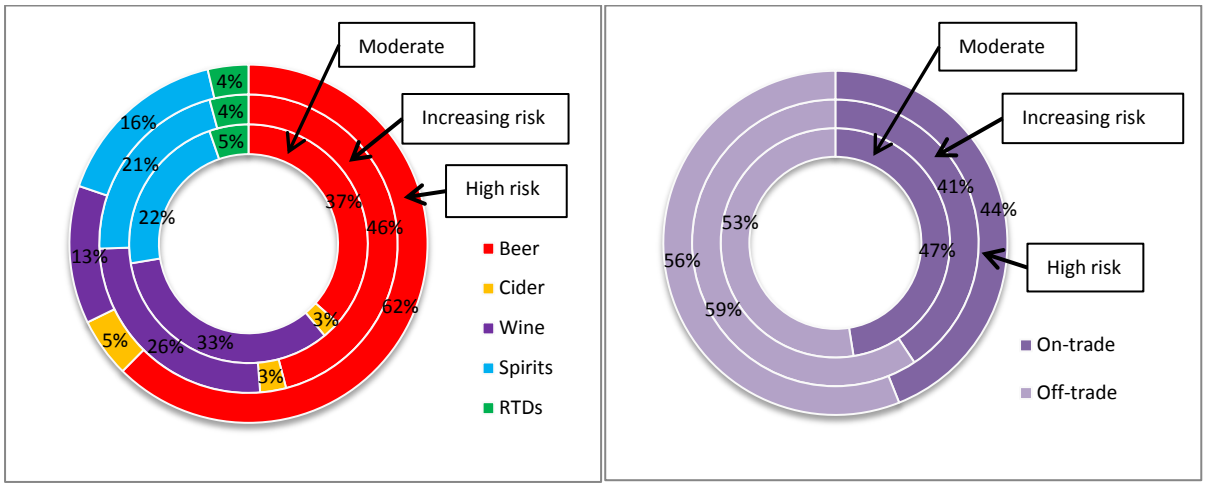
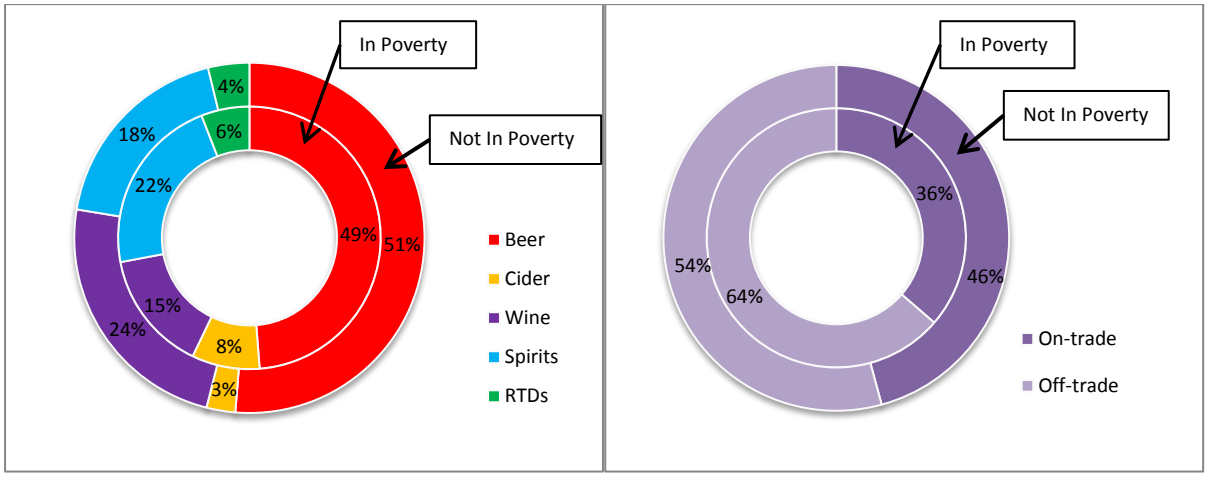


Figure 4.12: Consumption preferences by income group



4.2.6 Price elasticities of alcohol demand

The Sheffield Alcohol Research Group have recently utilised the LCF/EFS data described in Section 4.2.4, for the whole of the UK including England, Scotland, Wales and NI (N=227,933 transactions) to provide new estimates of the price elasticities of demand for alcohol. Full details of this model have been described elsewhere [9]. The size of the LCF/EFS dataset for NI only is too small to allow this methodology to be applied to estimate NI-specific elasticities; therefore, the whole-UK elasticities (which are estimated, in part, on NI data) are utilised in SAPM3.

Table 4.4 summaries the key result of this econometric analysis as a 10x10 elasticity matrix, with values on the diagonal representing own-price elasticities and remaining values representing cross-price elasticities. Elasticities are available for 10 categories of beverage: beer, cider, wine, spirits, and RTDs, split by off-trade (e.g. supermarkets) and on-trade (e.g. pubs). For example, the estimated own-price elasticity for off-trade beer is -0.98, indicating the demand for off-trade beer is estimated to reduce by 9.8% when the price of off-trade beer is increased by 10%, all other things being equal. The estimated cross-price elasticity of demand for on-trade wine with regard to off-trade beer price

is 0.25, indicating the demand for on-trade wine increases by 2.5% when the price for off-trade beer is increased by 10% (i.e. a substitution effect).

Table 4.4: Estimated own- and cross-price elasticities for off- and on-trade beer, cider, wine, spirits and RTDs in the UK

		Purchase									
		Off-beer	Off-cider	Off-wine	Off-spirits	Off-RTDs	On-beer	On-cider	On-wine	On-spirits	On-RTDs
Price	Off-beer	-0.980*	-0.189	0.096	-0.368	-1.092	-0.016	-0.050	0.253	0.030	0.503
	Off-cider	0.065	-1.268*	0.118	-0.122	-0.239	-0.053	0.093	0.067	-0.108	-0.194
	Off-wine	-0.040	0.736*	-0.384*	0.363	0.039	-0.245	-0.155	0.043	-0.186	0.110
	Off-spirits	0.113	-0.024	0.163	-0.082	-0.042	0.167	0.406	0.005	0.084	0.233
	Off-RTDs	-0.047	-0.159	-0.006	0.079	-0.585*	-0.061	0.067	0.068	-0.179*	0.093
	On-beer	0.148	-0.285	0.115	-0.028	0.803	-0.786*	0.867	1.042*	1.169*	-0.117
	On-cider	-0.100	0.071	0.043	0.021	0.365	0.035	-0.591*	0.072	0.237*	0.241
	On-wine	-0.197	0.094	-0.154	-0.031	-0.093	-0.276	-0.031	-0.871*	-0.021	-0.363
	On-spirits	0.019	-0.117	-0.027	-0.280	-0.145	-0.002	-0.284	0.109	-0.890*	0.809*
	On-RTDs	0.079	0.005	-0.085	-0.047	0.369	0.121	-0.394	-0.027	-0.071	-0.187

Remarks *: p-value <0.05

4.2.7 Modelling the impact of interventions on price

In order to estimate the impact of a price-based intervention on alcohol consumption it is first necessary to estimate the effect of the policy on the beverage-specific price distributions described in Section 4.2.4. This is done by applying appropriate assumptions to the adjusted LCF/EFS transaction data as follows:

4.2.7.1 Impact of a minimum price on the price distribution

For each price observation that is below the defined minimum price threshold, the price is inflated to the level of the threshold.

4.2.7.2 Impact of a ban on 'below-cost selling' on the price distribution

Below-cost selling is assumed to refer to a ban on selling any alcoholic drinks for below the cost of duty plus the VAT payable on the duty. In practical terms the policy is modelled as being equivalent to setting a minimum price equal to duty plus VAT for each beverage type (i.e. any price observations below the beverage-specific minimum price are inflated to the level of that threshold).

Table 4.5 summarises the estimated average duty plus VAT payable on the duty per unit of alcohol for beer, cider, wine, spirits and RTDs in the UK based on the current duty rates set by Her Majesty's Revenue and Customs (HMRC), effective from 25th March 2013. A number of assumptions are used to estimate these thresholds, as: 1) different duty rates exist for the same modelled beverage type (e.g. there are currently three duty rates for beer which increase with alcohol content) and 2) duty rates for cider and wine are calculated based on product volume rather than ethanol content. When multiple duty rates exist (for beer, cider and wine), we choose the average duty rate as this is the duty rate which is most widely applied. The ABV assumptions for cider and wine are based on the average ABV used by HMRC (personal communication with HMRC in March 2013). The estimated duty plus VAT per unit of alcohol is 22.9p, 9.4p, 24.5p, 33.9p and 33.9p for beer, cider, wine, spirits and RTDs respectively.

Table 4.5: Method and assumptions to estimate threshold prices under BBCS: estimated duty plus VAT per unit of alcohol for beer, cider, wine, spirits and RTDs in the UK (based on duty rates from 25th March 2013)

Beverage type	Duty rates as set by HMRC from 25th March 2013 (£)	Assumed duty rate for SAPM3	Assumed average ABV for wine and cider	Estimated duty in pence per unit of alcohol	Estimated duty plus VAT in pence per unit of alcohol
Beer	9.17 to 24.21 per hectolitre per cent of alcohol in the beer (varies according to ABV: general - 19.12, lower strength - 9.17, higher strength - 24.21)	**£19.12** per hectolitre per cent of alcohol in product (general duty rate)	n/a	19.1	22.9
Cider	39.66 to 258.23 per hectolitre of product (still cider - 39.66 to 59.52, sparking cider - 39.66 to 258.23)	**£39.66** per hectolitre of product (still cider with ABV 1.2% to 7.5% and sparkling cider with ABV 1.2% to 5.5%)	5.06%	7.8	9.4
Wine	82.18 to 355.59 per hectolitre of product (wine, still wine and made wine - 82.18 to 355.59, sparkling wine and made wine - 258.23 to 341.63) or 28.22 per litre of pure alcohol (wine with ABV > 22%)	**£266.72** per hectolitre of product (still wine with ABV 5.5% to 15%)	13.05%	20.4	24.5
Spirits	28.22 per hectolitre of pure alcohol	**£28.22** per hectolitre of pure alcohol	n/a	28.2	33.9
RTDs	28.22 per hectolitre of pure alcohol (spirits based)	**£28.22** per hectolitre of pure alcohol (spirits based)	n/a	28.2	33.9

4.2.7.3 Impact of a discount ban on the price distribution

For each price observation that is at a discounted price, the price is inflated to the corresponding list price. Since individual price observations are not defined as promoted or otherwise (rather this is based on separate evidence), some detailed manipulation of the distribution is required as described below:

- For every off-trade price observation (with price *P*, purchase Volume *V* and sample weight *W*) for beverage *Y*:
    - Find the corresponding promotional price range *R*
    - Look up the proportion of sales of beverage *Y* in range *R* that are promoted ($0 \leq d \leq 1$, where $d=0$ indicates zero sales on promotion in this price range and $d=1$ indicates all sales are on promotion in this price range)
    - If $d>0$, split price observations into two separate observations: {*P, d*V, d*W*} and {*P, (1-d)*V, (1-d)*W*}
    - For the first observation, look up the conditional distribution of list prices associated with promotions at this sales price $[c_R,\ldots,c_n]$ where n is the total number of price ranges, where $0 \leq c_i \leq 1$ with associated multipliers to list price $[m_R,\ldots,m_n]$. Split the observation into further separate observations if $c_i>0$
    - For each new observation, *i*, adjust the price *P* to the minimum permitted price $P=P*m_i$
    - Replace the original observation with the new set of observations in the price distribution.

4.2.8 Modelling the impact of price on consumption

After adjusting the price distributions as described in Section 4.2.4, the final step to estimating the impact of the intervention on alcohol consumption is to apply the price elasticities discussed in Section 4.2.6. For each modelled subgroup the impact of the change in prices caused by the policy on mean weekly alcohol consumption is estimated using the elasticity matrix described in Table 4.4. The formula used to apply the elasticity matrix is shown below:

$$\%\Delta C_i = (1 + e_{ii}\%\Delta p_i)(1 + \sum_{j \neq i}^{\forall j} e_{ij}\%\Delta p_j) - 1 \qquad \textit{Equation 2}$$

where, $\%\Delta C_i$ is the estimated percentage change in consumption for beverage i, e_{ii} is the own-price elasticity for beverage i, $\%\Delta p_i$ is the percentage change in price for beverage i, e_{ij} is the cross-price elasticities for the consumption of beverage i due to a change in the price of beverage j, and $\%\Delta p_j$ is the percentage change in price for beverage j.

As described in Section 4.2.3, the estimated relative change in weekly consumption for each individual is then used to predict the change in their drinking patterns.

4.3 MODELLING THE RELATIONSHIP BETWEEN CONSUMPTION AND HARM

4.3.1 Model structure

An epidemiological approach is used to model the relationship between consumption and harm, relating changes in the prevalence of alcohol consumption to changes in prevalence of risk of experiencing high risk outcomes. Risk functions relating consumption (however described) to level of risk are the fundamental components of the model.

The 'consumption to harm' model considers the impact of consumption on harms in three domains: health (including the impact on both mortality and morbidity), crime and the workplace.

4.3.2 Alcohol-related health conditions

The model aims to capture the policy impact for the large number of health conditions for which evidence suggests alcohol plays a contributory role. Table 4.6 presents a list of all included conditions, which has been adapted from recent global meta-analyses and burden of disease studies [10], [11]. These conditions are divided into four categories of attribution:

1) Wholly attributable (AAF=100%) chronic – meaning that the harm cannot occur in the absence of alcohol consumption, and risk of occurrence changes with chronic exposure to alcohol (eg. alcoholic liver disease, ICD10 code = K70)
2) Wholly attributable acute – meaning that the harm cannot occur without alcohol as its cause, and risk of occurrence changes with acute exposure to alcohol including intoxication (eg. Ethanol poisoning, ICD10 code = T51.0)
3) Partially attributable chronic – meaning that the harm can occur without alcohol but the risk of occurrence changes with chronic exposure to alcohol (eg. malignant neoplasm (cancer) of the oesophagus, ICD10 code = C15)
4) Partially attributable acute – meaning that the harm can occur without alcohol but the risk of occurrence changes with acute exposure to alcohol (eg. falls, ICD10 code = W00-W19, or assault, ICD10 = X85-Y09).

Table 4.6: Health conditions included in the model

	Condition	ICD-10 Code(s)	Source of Risk Function
Wholly attributable chronic conditions	Alcohol-induced pseudo-Cushing's syndrome	E24.4	Apply the PIF method based on mean consumption
	Degeneration of the nervous system	G31.2	
	Alcoholic polyneuropathy	G62.1	
	Alcoholic myopathy	G72.1	
	Alcoholic cardiomyopathy	I42.6	
	Alcoholic gastritis	K29.2	
	Alcoholic liver disease	K70	
	Chronic pancreatitis	K86.0	
Wholly attributable acute conditions	Mental and behavioural disorders due to use of alc.	F10	Apply the PIF method based on heaving drinking occasion measure
	Ethanol poisoning	T51.0	
	Methanol poisoning	T51.1	
	Toxic effect of alcohol, other	T51.2-T51.9	
	Accidental poisoning by exposure to alcohol (incl. 'undetermined intent')	X45, Y15	
	Excessive blood level of alcohol	R78.0	
Partially attributable chronic conditions	Malignant neoplasm of lip, oral cavity and pharynx	C00-C14	[12]
	Malignant neoplasm of oesophagus	C15	[13]
	Malignant neoplasm of colon	C18	
	Malignant neoplasm of rectum	C20	
	Malig. neoplasm of liver and intrahepatic bile ducts	C22	
	Malignant neoplasm of larynx	C32	[14]
	Malignant neoplasm of breast	C50	[15]
	Diabetes mellitus (type II)	E11	[16]
	Epilepsy and status epilepticus	G40-G41	[17]
	Hypertensive diseases	I10-I15	[13]
	Ischaemic heart disease	I20-I25	
	Cardiac arrhythmias	I47-I48	[18]
	Haemorrhagic stroke	I60-I62, I69.0-I69.2	[13]
	Ischaemic stroke	I66, I69.3, I69.4	
	Oesophageal varices	I85	
	Gastro-oesophageal laceration-haemorrhage synd.	K22.6	[19]
	Unspecified liver disease	K73, K74	[13]
	Cholelithiasis	K80	[16]
	Acute and chronic pancreatitis	K85, K86.1	[13]
	Psoriasis	L40 excludes L40.5	[16]
	Spontaneous abortion	O03	
Partially attributable acute conditions	Road traffic accidents - non pedestrian	V12-14, V19.4-V19.6, V19.9, V20-V28, V29-V79, V80.3-V80.5, V81.1, V82.1, V83-V86, V87.0-V87.9, V89.2, V89.3, V89.9	Annualised risk estimates derived from models of consumption patterns and occasion-based risk functions described in [20]
	Pedestrian traffic accidents	V02-V04, V06.1, V09.2, V09.3	
	Water transport accidents	V90-V94	
	Air/space transport accidents	V95-V97	
	Fall injuries	W00-W19	
	Work/machine injuries	W24-W31	
	Firearm injuries	W32-W34	
	Drowning	W65-W74	
	Inhalation of gastric contents	W78	
	Fire injuries	X00-X09	
	Accidental excessive cold	X31	
	Intentional self-harm	X60-X84	
	Assault	X85-Y09	

4.3.3 Alcohol-attributable fractions and potential impact fractions

The methodology is similar to that used in Gunning-Scheper's Prevent model [21], being based on the notion of the alcohol-attributable fraction (AAF) and its more general form, the potential impact fraction (PIF).

The AAF of a disease can be defined as the difference between the overall average risk (or incidence rate) of the disease in the entire population (drinkers and never-drinkers) and the average risk in those without the exposure factor under investigation (never-drinkers), expressed as a fraction of the overall average risk. For example, the AAF for female breast cancer is simply the risk of breast cancer in the total female population minus the risk of breast cancer in women who have never drank alcohol, divided by the breast cancer risk for the total female population. Thus, AAFs are used as a measure of the proportion of the disease that is attributable to alcohol. While this approach has traditionally been used for chronic health-related outcomes, it can in principle be applied to other harms (including those outside of the health domain).

The AAF can be calculated using the following formula:

$$AF = \frac{\sum_{i=1}^{n} p_i \left(RR_i - 1\right)}{1 + \sum_{i=1}^{n} p_i \left(RR_i - 1\right)}$$

Equation 3

where, RRi is the relative risk (RR) due to exposure to alcohol at consumption state i, pi is the proportion of the population exposed to alcohol at consumption state i, and n is the number of consumption states.

If the reference category is abstention from alcohol then the AAF describes the proportion of outcomes that would not have occurred if everyone in the population had abstained from drinking. Thus, the numerator is essentially the excess expected cases due to alcohol exposure and the denominator is the total expected cases. In situations where certain levels of alcohol consumption reduce the risk of an outcome (e.g. coronary heart disease) the AAF can be negative and would describe the additional cases that would have occurred if everyone was an abstainer.

Note that there are methodological difficulties with AAF studies. One problem is in defining the non-exposed group; in one sense 'never drinkers' are the only correct non-exposed group, but they are rare and usually quite different from the general population in various respects. However, current non-drinkers include those who were heavy drinkers in the past (and these remain a high-risk group, especially if they have given up due to alcohol-related health problems). Several studies show that findings of avoided coronary heart disease risk may be based on systematic errors in the way abstainers were defined in the underlying studies [22].

The PIF is a generalisation of the AAF based on arbitrary changes to the prevalence of alcohol consumption (rather than assuming all drinkers become abstainers). Note that a lag may exist between the exposure to alcohol and the resulting change in risk. The PIF can be calculated using the following formula:

$$PIF = 1 - \frac{\sum_{i=0}^{n} \overline{p_i} RR_i}{\sum_{i=0}^{n} p_i RR_i}$$

Equation 4

where $\overline{p_i}$ is the modified prevalence for consumption state i and state 0 corresponds to abstention.

In the model, alcohol consumption in a population subgroup is described non-parametrically by the associated observations from the HSNI. For any high risk outcome, risk levels are associated with consumption level for each of the observations (note that these are not person-level risk functions). The associated prevalence for the observation is simply defined by its sample weight from the survey. Therefore, the PIF is implemented in the model as:

$$PIF = 1 - \frac{\sum_{i=0}^{N} w_i \overline{RR_i}}{\sum_{i=0}^{N} w_i RR_i}$$

Equation 5

where w_i is the weight for observation i, $\overline{RR_i}$ is the modified risk for the new consumption level and N is the number of samples.

4.3.4 Applying potential impact fractions

The impact of a change in consumption on health harms was examined using the potential impact fraction framework and by three different methods for implementation:

1. Direct application of consumption measures to calculate potential impact fractions for wholly attributable chronic and health conditions.
2. Relative risk functions from the published literature for partial chronic conditions.
3. Relative risk functions from the published literature and derived individual annualised risk for partial acute conditions.

4.3.4.1 Wholly attributable chronic and acute conditions

Wholly attributable chronic and acute conditions, by definition, have AAF=1 and no relative risk function can be defined since reference group has no risk. In order to apply the potential impact fraction, relative risk in Equation 3 is replaced with alcohol consumption that is likely to lead to increasing risk for the health condition, denoted by $RiskAlc_i$. For wholly attributable chronic conditions, $RiskAlc_i$ is defined as the difference between mean daily consumption and recommend daily consumption in the UK (3/2 units for men/women) or 0 if mean daily consumption is below the threshold. For wholly attributable acute conditions, $RiskAlc_i$ is defined as the imputed heavy single occasion drinking measure, i.e., number of heavy drinking occasions in a week.

4.3.4.2 Partially attributable chronic conditions

The relative risk functions for all chronic conditions that are partially attributable to alcohol are taken from published literature and used in Equation 3. Compared to previous versions of SAPM [3],

[6], [7], relative risk functions for most partially attributable health conditions are updated in SAPM3 based on most recent published meta-analysis. Table 4.6 gives the sources for these risk functions.

4.3.4.3 Partially attributable acute conditions

Partially attributable acute conditions include various traffic and non-traffic injuries. The identified relative risk functions for these conditions are different from the relative risk functions for partially attributable chronic conditions and cannot be used directly in Equation 3. The input and outcome of the relative risk functions for partially attributable chronic conditions are usual alcohol consumption and relative risk over a certain period of time; however, the input and outcome of the identified relative risk functions traffic and non-traffic injuries are levels of drinking occasion prior to the injury and the relative risk for the drinking occasion [20]. As SAPM3 works on annual cycles, relative risk in Equation 3 is defined as annual relative risk. Therefore, to apply Equation 3, single drinking occasion based relative risk needs to be converted to long term (e.g., annual) relative risk of a surveyed individual.

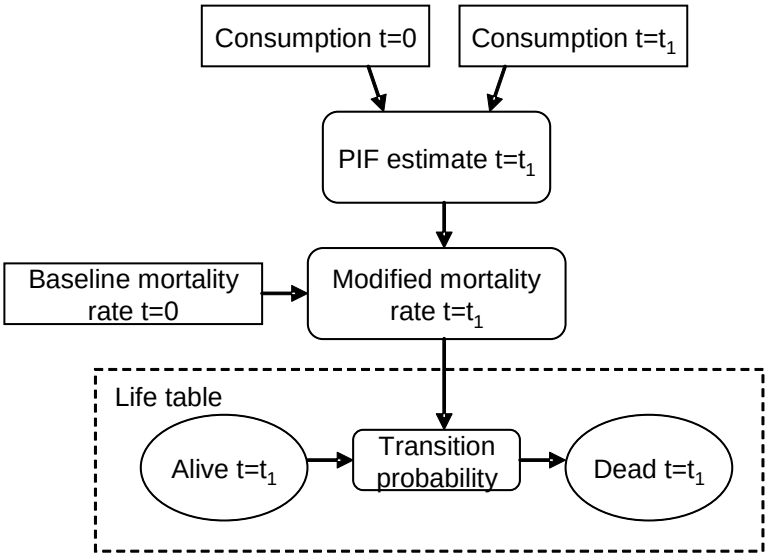
A new method to estimate annualised relative risk of alcohol-attributable traffic- and non-traffic injuries has been developed. Briefly, three measures are defined to represent drinking patterns based on single drinking occasions which are the frequency of drinking occasions (defined as n, or number of drinking occasions per week), mean level of alcohol consumption for a given drinking occasion (defined as μ, or units of alcohol) and the variability of alcohol consumption for a given drinking occasion (defined as σ, or standard deviation of units of alcohol consumed in drinking occasions). Using the ONS' National Diet and Nutrition Survey (NDNS), regression models were fitted to relate the three measures with mean consumption and a range of independent variables (e.g. age, gender, education, ethnicity, etc.)[23]. These regression models are used to impute the three measures for each individual in HSNI. For each individual, alcohol consumption in a given drinking occasion is assumed to follow a normal distribution with mean of μ and standard deviation of σ; the duration of intoxication for a given drinking occasion is calculated by applying the equation for estimating blood alcohol content. Finally, a series of integrations was performed to calculate the annualised relative risk for traffic and non-traffic accidents. Detailed description of the method can be found elsewhere [23], [24]. The annualised relative risk is used in Equation 5 to estimate the potential impact factor for partially attributable acute conditions.

4.4 CONSUMPTION TO HEALTH HARMS MODEL

4.4.1 Mortality model structure

A simplified version of the model structure for mortality is presented in Figure 4.13. The model is developed to represent the population of Northern Ireland in a life table. Separate life tables have been implemented for males and females.

Figure 4.13: Simplified mortality model structure



The life table is implemented as a linked set of simple Markov models with individuals of age *a* transitioning between two states – alive and dead – at model time step *t*. Those of age *a* still alive after the transition then form the initial population for age *a+1* at time *t+1* and the sequence repeats.

The transition probabilities from the alive to dead state are broken down by condition and are individually modified via potential impact fractions over time t, where the PIF essentially varies with consumption over time:

$$PIF_t = 1 - \frac{\sum_{i=1}^{N} r_{i,t} w_i}{\sum_{i=1}^{N} r_{i,0} w_i} \qquad \textit{Equation 6}$$

where PIF_t is the potential impact fraction relating to consumption at time t, i = HSNI sample number, N = number of samples in subgroup i, $RR_{i,t}$ is the risk relating to the consumption of HSNI sample i at time t, $RR_{i,0}$ is the risk at baseline, and w_i is the weight of sample i.

Note that the PIF can be decomposed to enable different population groups at baseline – for example, moderate, increasing risk and high risk drinkers or individuals in poverty and not in poverty– to be followed separately over the course of the model.

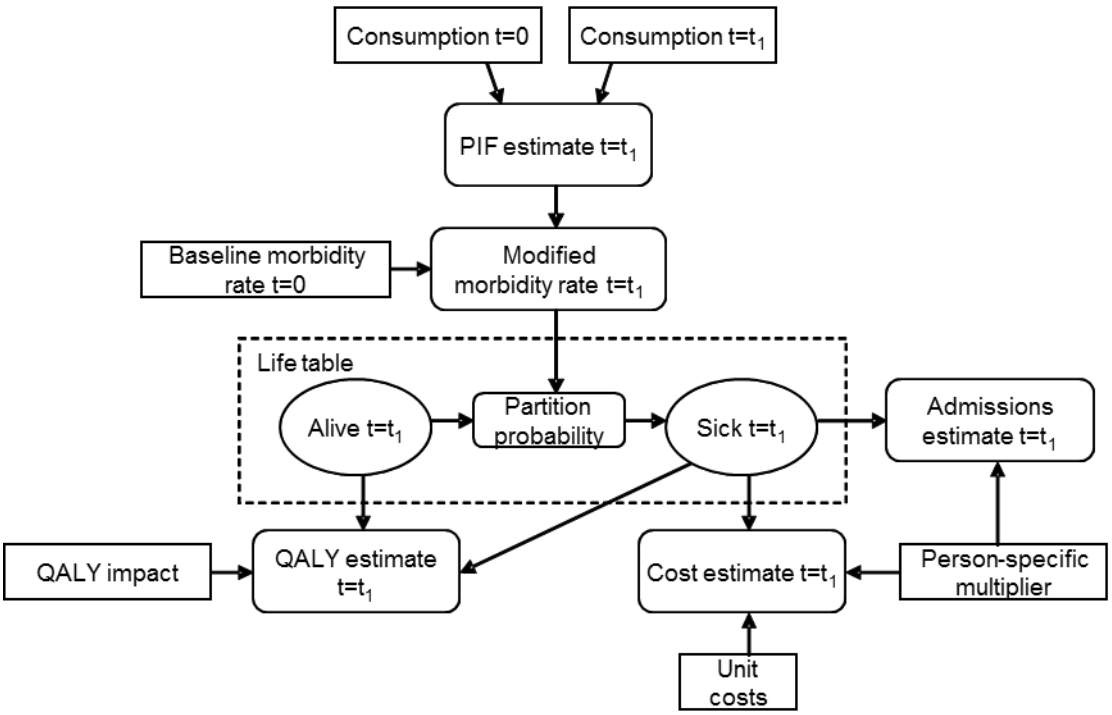
The model computes mortality results for two separate scenarios (a baseline – implemented as 'no change to consumption' in the analysis herein – and an intervention). The effect of the intervention is then calculated as the difference between the life tables of two scenarios: enabling the change in the total expected deaths attributable to alcohol due to the policy to be estimated.

Outcomes from the mortality modelling are expressed in terms of life years saved. Morbidity valuation is the purpose of a second model described below.

4.4.2 Morbidity model structure

A simplified schematic of the morbidity model is shown in Figure *4.14*. The model focuses on the expected disease prevalence for population cohorts. Note that if an incidence-based approach were used instead, then much more detailed modelling of survival time, cure rates, death rates and possibly disease progression for each disease for each population subgroup would be needed.

Figure 4.14: Simplified structure of the morbidity model



The morbidity model works by partitioning the alive population at time *t*, rather than using a transition approach between states as previously described for the mortality model. Alive individuals are partitioned between all 48 alcohol-related conditions (and a 49th condition representing overall population health, not attributable to alcohol).

As in the mortality model, the PIF is calculated based on the consumption distribution at time *0* and *t*. The PIF is then used to modify the partition rate (i.e. the distribution of the 48 conditions for alive individuals) to produce person-specific sickness volumes. These volumes then form the basis for estimating both health service costs and health related quality of life.

Quality Adjusted Life Years (QALYs) are examined using the difference in health-related quality of life (utility) in individuals with alcohol health harms and the quality of life measured in the general population (or "normal health"). Utility scores usually range between 1 (perfect health) and 0 (a state equivalent to death), though it is possible for some extreme conditions to be valued as worse than death. The utility scores are an expression of societal preference for health states with several different methods available to estimate them. Note that because a life table approach has been adopted, the method to estimate QALY change for morbidity also encompasses the mortality valuation.

4.4.3 Time lag effects for chronic harms

When modelling the link between consumption and harm, one important input is the assumption surrounding the 'time lag' – the time needed to achieve the full benefit (reduction in harms) associated with a reduction of consumption. Such data is necessary for chronic conditions where the development of diseases often occurs over many years.

Following a recent systematic review by members of the Sheffield Alcohol Research Group [25], SAPM3 incorporates new lag structures for all chronic harms based on the best available published evidence to estimate the temporal relationship between changes in consumption and changes in risk of harm. See Table 2 in Holmes et al. 2011 for full details of these relationships as implemented in the model.

4.4.4 Mortality model parameters

Baseline population data, used to populate the initial life tables described in Section 4.4.1 for NI was obtained from the Office for National Statistics' (ONS) mid-year population estimates for 2012 [26]. Age and gender subgroup-specific mortality rates for each of the 48 modelled health conditions as well as all-cause mortality were calculated from data supplied by the DHSSPSNI for 2007-2011. These rates were then apportioned between income categories using the income gradients for morbidity implied by the differential morbidity rates by income described in Section 4.4.5.2.

4.4.5 Morbidity model parameters

4.4.5.1 Life table data

As for the mortality model, the baseline population for the morbidity life table was derived from NI population estimates for 2012 from the ONS.

4.4.5.2 Morbidity prevalence rates

Morbidity data for NI was derived from hospital admission data provided by DHSSPSNI for 2009/10, 2010/11 and 2011/12. This data consisted of anonymised, individual admission level data containing all relevant diagnoses associated with the admission as well as the Index of Multiple Deprivation (IMD) of the admittee's home address (specifically the Super Output Area (SOA) in which they live, a unit of geography consisting of approximately 2000 dwellings) and a Healthcare Resource Group (HRG4) code. Importantly, the data also allowed the identification of repeat admissions by the same individual, through a unique identification number in the dataset.

All admissions were categorised according to the principal alcohol-related diagnosis code for that admission (following a process previously described by the North West Public Health Observatory (NWPHO) who performed similar analyses on English data) [27]. Each admission was assigned a cost by matching its HRG4 code to estimated costs provided by DHSSPSNI for each year of the data. Costs were inflated to 2013 prices using annual RPIs from the ONS and all 3 years of data were pooled in order to provide a suitably large sample size.

Deprivation data from the NI Statistics and Research Agency (NISRA) giving the IMD of each SOA in NI was combined with NISRA's annual population estimates for each SOA and yearly data from the Department for Social Development (DSD) on the proportion of the population living in poverty. This allowed the assignation of an indicator to every hospital admission in the dataset identifying those admitted who are likely to be living below the poverty line (under the simplifying assumption that those living in poverty live in the most deprived SOAs).

3 separate analyses were performed on this dataset to inform various aspects of the morbidity model:

1) After adjusting for repeat admissions (i.e. where an individual was admitted multiple times in the same year for the same condition), estimates of the mean annual prevalence of each of the 48 modelled health conditions were made for every age-gender-income subgroup in the model. These were then combined with population data in order to estimate the morbidity rate for each condition for each subgroup. This direct calculation of differential morbidity rates for those above and below the poverty line has not been possible for previous versions of SAPM due to limitations of the available data.
2) For each condition the ratio of total admissions to morbidity was calculated in order to calculate the mean number of hospital admissions in a year for an individual who has presented at hospital with a given condition at least once. These numbers, or multipliers, are used in the model to scale between hospital admission rates and underlying morbidity rates for each condition.
3) For each condition, the mean cost per admission was calculated. These cost estimates were subsequently multiplied by the multipliers described in 2) above, in order to provide an estimate of the annual cost to the NHS of morbidity for each condition.

Table 4.7 presents the headline results of this analysis, with estimated annual morbidity displayed by income.

Table 4.7: Morbidity model parameters estimated from DHSSPSNI admissions data

Condition	Multiplier	Estimated Annual Morbidity			Mean Cost per Morbidity	Total Cost per annum to NHS
		In Poverty (N (%))	Not In Poverty (N (%))	Total (N)		
Alcohol-induced pseudo-Cushing's syndrome	1.00	0 (0%)	0 (100%)	0	£464	£195
Degeneration of the nervous system	1.28	3 (20%)	10 (80%)	13	£3,140	£40,998
Alcoholic polyneuropathy	1.24	2 (39%)	3 (61%)	5	£4,862	£26,728
Alcoholic myopathy	1.00	0 (25%)	1 (75%)	2	£1,625	£2,742
Alcoholic cardiomyopathy	1.19	12 (44%)	15 (56%)	26	£3,294	£86,451
Alcoholic gastritis	1.09	40 (45%)	50 (55%)	90	£1,242	£111,488
Alcoholic liver disease	1.85	295 (41%)	430 (59%)	724	£4,291	£3,107,378
Chronic pancreatitis	1.37	64 (46%)	76 (54%)	140	£3,143	£439,168
Mental and behavioural disorders due to use of alc.	1.46	2713 (45%)	3329 (55%)	6,042	£2,259	£13,649,675
Ethanol poisoning	1.10	519 (38%)	844 (62%)	1,363	£474	£645,643
Methanol poisoning	1.00	1 (67%)	0 (33%)	1	£398	£508
Toxic effect of alcohol, other	1.05	50 (27%)	136 (73%)	186	£454	£84,402
Accidental poisoning by exposure to alcohol (incl. 'undetermined intent')	1.00	0 (34%)	1 (66%)	1	£3,155	£3,999
Excessive blood level of alcohol	1.00	5 (43%)	7 (57%)	12	£1,636	£19,391
Malignant neoplasm of lip, oral cavity and pharynx	2.19	82 (25%)	247 (75%)	329	£7,247	£2,383,543
Malignant neoplasm of oesophagus	3.53	65 (19%)	284 (81%)	350	£6,278	£2,194,393
Malignant neoplasm of colon	3.89	155 (19%)	649 (81%)	804	£9,863	£7,926,539
Malignant neoplasm of rectum	3.82	86 (21%)	321 (79%)	407	£9,746	£3,971,186
Malig. neoplasm of liver and intrahepatic bile ducts	3.01	16 (18%)	70 (82%)	86	£7,710	£665,626
Malignant neoplasm of larynx	1.90	38 (33%)	77 (67%)	114	£8,449	£967,024
Malignant neoplasm of breast	4.24	399 (19%)	1726 (81%)	2,125	£8,355	£17,757,042
Diabetes mellitus (type II)	1.42	1153 (23%)	3811 (77%)	4,964	£2,801	£13,907,335
Epilepsy and status epilepticus	1.51	1043 (27%)	2755 (73%)	3,799	£3,095	£11,756,311
Hypertensive diseases	1.51	7466 (22%)	26991 (78%)	34,457	£3,674	£126,582,924
Ischaemic heart disease	1.42	2181 (24%)	7063 (76%)	9,243	£3,164	£29,246,859
Cardiac arrhythmias	1.54	2910 (20%)	11352 (80%)	14,263	£3,964	£56,539,324
Haemorrhagic stroke	1.77	99 (23%)	334 (77%)	433	£7,092	£3,072,968
Ischaemic stroke	1.74	74 (28%)	190 (72%)	265	£3,865	£1,022,655
Oesophageal varices	1.39	57 (22%)	196 (78%)	252	£1,443	£363,775
Gastro-oesophageal laceration-haemorrhage synd.	1.04	20 (28%)	51 (72%)	70	£1,227	£86,452
Unspecified liver disease	1.77	100 (24%)	310 (76%)	410	£3,770	£1,544,857
Cholelithiasis	1.26	654 (23%)	2196 (77%)	2,850	£3,218	£9,169,830
Acute and chronic pancreatitis	1.32	225 (26%)	637 (74%)	862	£3,292	£2,837,928
Psoriasis	1.35	240 (28%)	604 (72%)	844	£3,451	£2,912,652
Spontaneous abortion	1.03	256 (24%)	801 (76%)	1,058	£1,175	£1,243,031
Road traffic accidents - non pedestrian	1.03	201 (18%)	932 (82%)	1,133	£2,259	£2,558,590
Pedestrian traffic accidents	1.04	41 (31%)	90 (69%)	131	£2,731	£357,490
Water transport accidents	1.03	2 (14%)	13 (86%)	16	£2,905	£45,227
Air/space transport accidents	1.12	1 (12%)	6 (88%)	7	£3,506	£25,066
Fall injuries	1.04	1271 (23%)	4149 (77%)	5,420	£3,189	£17,284,034
Work/machine injuries	1.01	158 (23%)	534 (77%)	693	£2,056	£1,423,687
Firearm injuries	1.00	9 (56%)	7 (44%)	16	£2,208	£35,607
Drowning	1.00	1 (34%)	2 (66%)	3	£408	£1,034
Inhalation of gastric contents	1.05	1 (8%)	16 (92%)	17	£3,359	£56,461
Fire injuries	1.02	15 (27%)	40 (73%)	55	£3,070	£168,374
Accidental excessive cold	1.00	0 (0%)	4 (100%)	4	£916	£3,460
Intentional self-harm	1.13	844 (41%)	1192 (59%)	2,036	£547	£1,112,886
Assault	1.04	496 (37%)	848 (63%)	1,343	£1,593	£2,140,257

4.4.5.3 Health related quality of life

Utilities for all 48 conditions included in the model were derived from a single source, the Health Outcomes Data Repository (HODaR)[28], to avoid potential bias and variability between studies. The HODaR data measures utilities using the EQ-5D, a widely used generic (disease non-specific) quality of life instrument as recommended by NICE for health economic evaluation. Full details of the methodology for deriving these utilities has been described elsewhere [2].

4.4.5.4 Valuation of Health Harms and Discounting

In this analysis QALYs and costs were discounted at 3.5% annually. All costs are presented in 2013 prices.

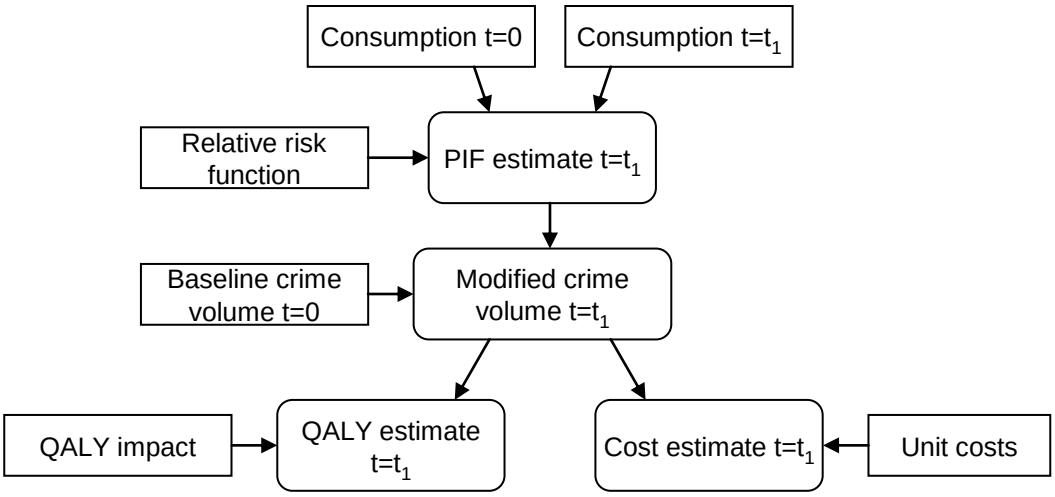
4.5 CONSUMPTION TO CRIME HARMS MODEL

4.5.1 Summary of crime model structure

The model examines the impact of changes in alcohol consumption on rates and associated costs for 18 crime categories listed in Table 4.8.

A simplified schematic of the crime model is shown in Figure 4.15. As for the health model, the main mechanism is the PIF, which is calculated based on the consumption distribution at time *0* and time *t* and an estimated risk function. The PIF is then applied directly to the baseline number of offences to give a new volume of crime for time *t*. The crime model uses the imputed heavy drinking occasion measure, defined as number of heavy drinking occasions per week, since crime is assumed to be a consequence of acute drinking rather than mean drinking (and so there is no time delay between change in exposure to alcohol and subsequent change in risk of committing a crime).

Figure 4.15: Simplified structure of the crime model



Outcomes are presented in terms of the number of offences and the associated cost of crime. The outcomes from the 'do nothing' and the policy scenario are then compared to estimate the incremental effect of the implementation of the policy.

In this analysis, loss of QALYs for crime victims is set to zero as the related cost is embedded within the estimated financial costs of crime.

4.5.2 Baseline volumes of crime

Baseline data on the number of recorded offences is published by PSNI. For this report we use crime data for the year 2011/12 published prior to the revised crime classification implemented from 1st April 2013.[2] However, this data is not available broken down by the age and/or gender of the offender. In order to apportion the volumes of recorded crime between age-gender subgroups in the model, data was obtained from the Department of Justice for each offence giving the age-gender distribution of those convicted in the NI courts in 2012. This distribution is used to estimate the volumes of recorded crime committed within each age-gender subgroup under the assumption that the distribution of offenders is the same as the distribution of those convicted of each offence.

The PSNI data only covers recorded crime, though the total number of offences committed is likely to be substantially in excess of this number. The Home Office have previously estimated multipliers which relate the number of recorded offences to the number of actual offences estimated to have been committed for various different crime categories [29]. These multipliers are matched to the NI crime categories in order to estimate the total baseline volumes of each crime. Table 4.8 presents the estimated volumes for each crime category in the model together with the estimated costs of each crime (also taken from the Home Office report as no Northern-Ireland specific estimates of the unit cost of crimes could be identified).

[2] While there have been changes at the level of individual classifications, overall crime figures at NI level, as well as by policing district and policing area, do not differ from totals previously published.

Table 4.8: Baseline crime volumes

Crime category	Recorded Volume	Multiplier	Estimated Total Volume	Unit Costs
Wounding[3]	13,614	1.5	20,421	£ 9,420
Assault on police (with injury)	729	7.9	5,759	£ 1,844
Assault on police (without injury)	2,564	7.9	20,256	£ 1,844
Assault without injury	7,933	7.9	62,671	£ 1,844
Criminal damage	23,255	5.9	137,205	£ 1,110
Robbery (personal)	801	4.8	3,845	£ 9,283
Robbery (business)	420	4.8	2,016	£ 9,875
Burglary in a dwelling	6,650	2.8	18,620	£ 4,136
Burglary not in a dwelling	3,930	1.9	7,467	£ 4,855
Theft from the person	609	4.6	2,801	£ 804
Theft of a pedal cycle	1,058	3.6	3,809	£ 804
Theft from a vehicle	3,126	3.5	10,941	£ 1,090
Aggravated vehicle taking	224	1.3	291	£ 5,237
Theft of motor vehicle	2,066	1.3	2,686	£ 5,237
Shoplifting	6,201	16.1	99,836	£ 131
Other theft offences	11,941	2.7	32,241	£ 804
Sexual offences	1,836	13.6	24,970	£ 38,936
Murder	16	1	16	£ 1,869,974

4.5.3 Crime risk function parameters

Prevalence-based risk modelling is not as well developed for crime as for chronic health conditions. Risk functions for crime harms are not generally available in the literature and need to be estimated using AAFs. AAFs have previously been estimated for the UK from the Offending Crime and Justice Survey using a methodology described elsewhere [2]. These AAFs are matched to the NI crime categories and risk functions fitted for each age-gender subgroup using the imputed heavy drinking occasion measure as described in Section 4.2.3.

The AAF evidence can be used to derive a relative risk function assuming the relationship described in Equation 3, since the AAF is a positive function of the prevalence of drinking and the relative risk function.

Two assumptions are necessary to compute a relative function from an AAF: assumptions about the form of the curve (or risk function) and assumptions about the threshold below which the relative risk is unity (i.e., harm is not associated with alcohol). Linear functions were selected for the present analyses due to the lack of data in the literature. As imputed number of heavy drinking occasions is used as the drinking measure for crime, a threshold of 0 is used because any individual with positive number of heavy drinking occasion has relative risk above unity.

Therefore the resulting relative risk functions are a function of consumption, defined as the number of heavy drinking occasions per year, (for which a slope is defined) and threshold as follows:

[3] This covers assault occasioning actual bodily harm (AOABH), grievous bodily harm (GBH) and wounding.

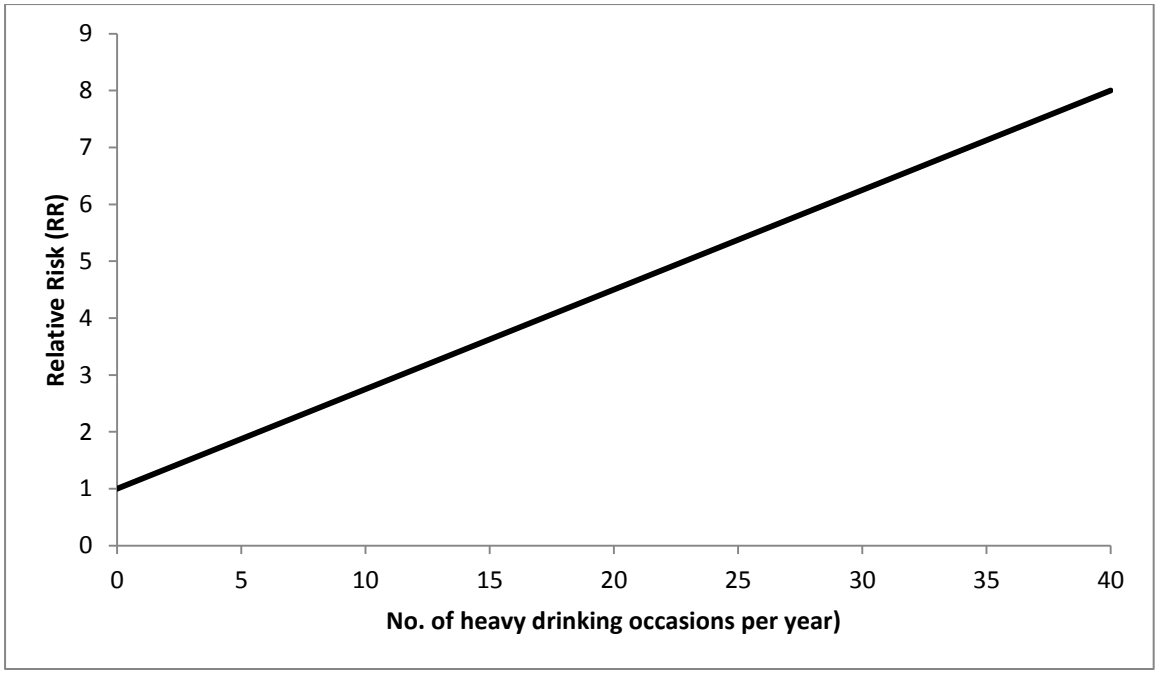
$RR(c) = 1 \; if \; c < T$

$RR(c) = \beta \; (c - T) + 1 \;\; otherwise$ *Equation 7*

where c = mean number of heavy drinking occasions per year, T = 0 and β=slope parameter.

An example of a linear function constructed from an AAF is shown in Figure 4.16.

Figure 4.16: Illustrative linear relative risk function for a partially attributable acute harm (threshold of 0 units)



4.6 CONSUMPTION TO WORKPLACE HARMS MODEL

4.6.1 Summary of workplace model structure

A simplified schematic of the workplace model is shown in Figure 4.17. Based on baseline consumption, consumption at time t and risk functions derived above, a PIF is calculated and applied to the absence rate. Absenteeism is assumed to be related to imputed heavy drinking occasion measure, defined as number of heavy drinking occasions per week, and it is assumed that there is no time delay between change in exposure to alcohol and subsequent change in risk of absenteeism.

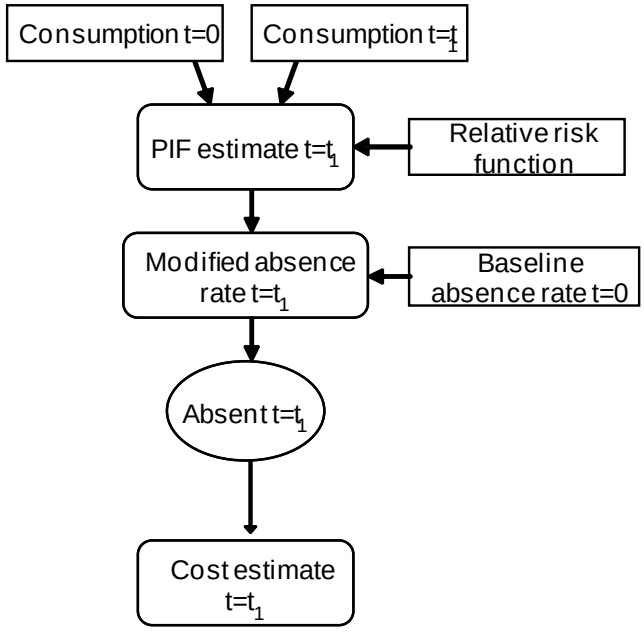
4.6.2 Baseline absence data

Using the quarterly Labour Force Survey [30], a UK-wide survey of individuals' employment circumstances, retaining only those respondents from NI and pooling data from several survey waves (2013 quarters 1-4) in order to generate a suitably large sample size (N=12,693), the number of days absent from work is calculated based on the absence rate, the mean number of days worked

and the number of working individuals in each age/sex subgroup. Days absent from work are then valued using individuals' daily gross income.

Outcomes for two scenarios – do nothing and policy implementation – are computed separately. The difference is then taken to estimate the incremental effect of the policy.

Figure 4.17: Simplified structure of the workplace model



4.6.3 Workplace risk function parameters

AAFs for alcohol-related workplace absenteeism were derived from the National Alcohol Diary Survey, a large-scale (N=5,964) national survey undertaken by the Health Research Board in the Republic of Ireland in 2013. Questions in this survey on overall workplace absence and alcohol-related workplace absence allow the calculation of AAFs for each age-gender subgroup in the model. They are presented in Table 4.9 and are the most appropriate source of available data for NI.

Table 4.9: AAFs for absenteeism calculated from NADS data for the Republic of Ireland

	Male	Female
18-24	0.36	0.33
25-34	0.23	0.09
35-54	0.08	0.04
55+	0.10	0.00

Relative risk functions were calculated for each age-gender group derived from the AAFs applying the same method for calculating crime risk functions (see Section 4.5.3). Absenteeism due to alcohol was assumed to be a consequence of acute consumption, measured by number of heaving drinking occasions in the model.

4.7 SENSITIVITY ANALYSES

Best practice for policy modelling suggests reporting a single base case estimate, supported by a range of sensitivity analyses in order to explore the impact of key uncertainties in the evidence base [31].This approach is focused on the uncertainty around the price elasticities described in Section 4.2.6, as they are the key active ingredient in the appraisal of pricing policies. A range of alternative estimates around the base case elasticities shown in Table 4.4 are examined:

1) All cross-price elasticities in the base case elasticity matrix are assumed to be zero (i.e. there is no cross-price effect between beverages) (SA1)
2) All non-significant elasticities (p-value greater than 0.05) in the base case elasticity matrix are assumed to be zero (SA2)
3) Separate moderate- and increasing risk/high risk-specific elasticity matrices (SA3).

Further details on these alternative elasticities can be found in Meng et al. [6]

5 RESULTS

This section contains model results for 22 different pricing policies:

- a general 10% price increase on all alcohol products in both the on- and off-trade
- MUP policies at 35p, 40p, 45p, 50p, 55p, 60p, 65p, 70p and 75p
- a ban on below-cost selling
- a ban on all price-based off-trade promotions
- a ban on promotions in tandem with each of the modelled MUP policies.

5.1 SUMMARY RESULTS FOR ALL POLICIES

5.1.1 Impact on alcohol consumption

The impacts on consumption across all modelled policies are shown for the total population and population subgroups in Table 5.1 and Table 5.2. Figure 5.1 and Figure 5.2 show relative and absolute changes in consumption across all individual policies (i.e. excluding policies which combine MUP with a promotion ban) by drinker type, whilst Figure 5.3 illustrates the income-specific impacts of different MUP thresholds.

Table 5.1: Summary of estimated effects of pricing policies on alcohol consumption – absolute and % change in consumption per drinker

Change in consumption per drinker per week (units (%))								
	Population	Male	Female	Moderate	Increasing risk	High risk	In Poverty	Not in Poverty
Population size	1,430,500	572,290	858,210	1,157,172	190,097	83,231	291,727	1,138,773
% abstainers	25.9%	20.8%	29.2%	32.0%	0.0%	0.0%	31.6%	24.4%
Drinker population	1,060,680	453,291	607,389	787,352	190,097	83,231	199,512	86,1167
Baseline consumption per person	11.5	19.2	6.3	3.6	26.8	86.5	11.6	11.5
Baseline consumption per drinker	15.5	24.3	9.0	5.3	26.8	86.5	17.0	15.2
General price + 10%	-0.9 (-5.8%)	-1.7 (-7.2%)	-0.3 (-3%)	-0.2 (-4.1%)	-1.5 (-5.6%)	-6 (-6.9%)	-1 (-5.9%)	-0.9 (-5.8%)
35p MUP	-0.1 (-0.8%)	-0.2 (-0.9%)	-0.1 (-0.6%)	0 (-0.3%)	-0.2 (-0.7%)	-1 (-1.2%)	-0.2 (-1.2%)	-0.1 (-0.7%)
40p MUP	-0.3 (-2.1%)	-0.6 (-2.4%)	-0.1 (-1.6%)	0 (-0.6%)	-0.5 (-1.9%)	-2.7 (-3.1%)	-0.6 (-3.3%)	-0.3 (-1.8%)
45p MUP	-0.6 (-3.8%)	-1.1 (-4.3%)	-0.2 (-2.7%)	-0.1 (-1.1%)	-0.9 (-3.3%)	-5 (-5.7%)	-1.1 (-6.2%)	-0.5 (-3.2%)
50p MUP	-0.9 (-5.7%)	-1.6 (-6.5%)	-0.4 (-4%)	-0.1 (-1.6%)	-1.3 (-5%)	-7.4 (-8.6%)	-1.6 (-9.4%)	-0.7 (-4.7%)
55p MUP	-1.2 (-7.9%)	-2.2 (-9.1%)	-0.5 (-5.6%)	-0.1 (-2.3%)	-1.9 (-7.1%)	-10.3 (-11.8%)	-2.2 (-13.1%)	-1 (-6.6%)
60p MUP	-1.6 (-10.6%)	-3 (-12.1%)	-0.7 (-7.4%)	-0.2 (-3.3%)	-2.6 (-9.5%)	-13.4 (-15.5%)	-2.9 (-17.1%)	-1.4 (-8.9%)
65p MUP	-2.1 (-13.4%)	-3.7 (-15.3%)	-0.9 (-9.5%)	-0.2 (-4.7%)	-3.3 (-12.3%)	-16.7 (-19.2%)	-3.6 (-21%)	-1.7 (-11.5%)
70p MUP	-2.5 (-16.4%)	-4.6 (-18.7%)	-1.1 (-11.7%)	-0.3 (-6.2%)	-4.1 (-15.3%)	-20 (-23%)	-4.2 (-24.7%)	-2.2 (-14.2%)
75p MUP	-3 (-19.4%)	-5.4 (-22.1%)	-1.3 (-13.9%)	-0.4 (-7.9%)	-4.9 (-18.3%)	-23.3 (-26.9%)	-4.8 (-28.4%)	-2.6 (-17.1%)
Ban on below-cost selling	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Promotion ban	-0.4 (-2.5%)	-0.7 (-2.8%)	-0.2 (-2%)	-0.1 (-1.9%)	-0.7 (-2.6%)	-2.4 (-2.8%)	-0.4 (-2.3%)	-0.4 (-2.6%)
Promotion ban + 35p MUP	-0.5 (-3.1%)	-0.8 (-3.5%)	-0.2 (-2.5%)	-0.1 (-2.2%)	-0.8 (-3.2%)	-3.2 (-3.7%)	-0.5 (-3.2%)	-0.5 (-3.1%)
Promotion ban + 40p MUP	-0.6 (-4.1%)	-1.1 (-4.6%)	-0.3 (-3.2%)	-0.1 (-2.5%)	-1.1 (-4%)	-4.5 (-5.2%)	-0.8 (-4.8%)	-0.6 (-4%)
Promotion ban + 45p MUP	-0.9 (-5.7%)	-1.6 (-6.4%)	-0.4 (-4.3%)	-0.2 (-3%)	-1.4 (-5.4%)	-6.5 (-7.5%)	-1.3 (-7.4%)	-0.8 (-5.2%)
Promotion ban + 50p MUP	-1.2 (-7.5%)	-2.1 (-8.5%)	-0.5 (-5.6%)	-0.2 (-3.5%)	-1.9 (-7%)	-8.9 (-10.2%)	-1.8 (-10.5%)	-1 (-6.7%)
Promotion ban + 55p MUP	-1.5 (-9.6%)	-2.7 (-10.9%)	-0.6 (-7%)	-0.2 (-4.2%)	-2.4 (-8.9%)	-11.6 (-13.3%)	-2.4 (-14.1%)	-1.3 (-8.5%)
Promotion ban + 60p MUP	-1.9 (-12.1%)	-3.3 (-13.7%)	-0.8 (-8.7%)	-0.3 (-5.1%)	-3 (-11.2%)	-14.5 (-16.7%)	-3.1 (-18%)	-1.6 (-10.5%)
Promotion ban + 65p MUP	-2.3 (-14.6%)	-4 (-16.6%)	-1 (-10.6%)	-0.3 (-6.1%)	-3.7 (-13.6%)	-17.6 (-20.2%)	-3.7 (-21.7%)	-1.9 (-12.8%)
Promotion ban + 70p MUP	-2.7 (-17.3%)	-4.8 (-19.6%)	-1.1 (-12.6%)	-0.4 (-7.3%)	-4.4 (-16.3%)	-20.6 (-23.8%)	-4.3 (-25.2%)	-2.3 (-15.2%)
Promotion ban + 75p MUP	-3.1 (-20%)	-5.5 (-22.7%)	-1.3 (-14.5%)	-0.5 (-8.6%)	-5.1 (-18.9%)	-23.7 (-27.3%)	-4.9 (-28.7%)	-2.7 (-17.7%)

Table 5.2: Summary of estimated effects of pricing policies on alcohol consumption by drinker group and income

Change in consumption per drinker per week (units (%))						
	Moderate		Increasing risk		High risk	
	In poverty	Not in poverty	In poverty	Not in poverty	In poverty	Not in poverty
Population size	238,143	919,029	34,608	155,489	18,976	64,255
% abstainers	38.7%	30.2%	0.0%	0.0%	0.0%	0.0%
Drinker population	145,928	641,423	34,608	155,489	18,976	64,255
Baseline consumption per person	2.9	3.8	25.1	27.2	95.7	83.8
Baseline consumption per drinker	4.8	5.4	25.1	27.2	95.7	83.8
General price + 10%	-0.2 (-4.6%)	-0.2 (-4%)	-1.4 (-5.5%)	-1.5 (-5.6%)	-6.3 (-6.5%)	-5.9 (-7%)
35p MUP	0 (-0.8%)	0 (-0.2%)	-0.3 (-1%)	-0.2 (-0.7%)	-1.4 (-1.4%)	-0.9 (-1.1%)
40p MUP	-0.1 (-1.5%)	0 (-0.4%)	-0.6 (-2.5%)	-0.5 (-1.7%)	-4.2 (-4.4%)	-2.3 (-2.7%)
45p MUP	-0.1 (-2.6%)	0 (-0.7%)	-1.1 (-4.4%)	-0.8 (-3%)	-8.1 (-8.5%)	-4 (-4.8%)
50p MUP	-0.2 (-3.8%)	-0.1 (-1.1%)	-1.6 (-6.5%)	-1.3 (-4.7%)	-12.5 (-13%)	-5.9 (-7.1%)
55p MUP	-0.3 (-5.2%)	-0.1 (-1.7%)	-2.3 (-9.1%)	-1.8 (-6.6%)	-17.4 (-18.1%)	-8.2 (-9.7%)
60p MUP	-0.3 (-7%)	-0.1 (-2.6%)	-3 (-12%)	-2.5 (-9%)	-22.4 (-23.3%)	-10.8 (-12.8%)
65p MUP	-0.4 (-9.1%)	-0.2 (-3.8%)	-3.8 (-15.3%)	-3.2 (-11.7%)	-27.2 (-28.3%)	-13.6 (-16.1%)
70p MUP	-0.5 (-11.3%)	-0.3 (-5.2%)	-4.6 (-18.4%)	-4 (-14.7%)	-31.6 (-33%)	-16.5 (-19.7%)
75p MUP	-0.6 (-13.4%)	-0.4 (-6.7%)	-5.4 (-21.6%)	-4.8 (-17.6%)	-35.9 (-37.4%)	-19.6 (-23.3%)
Ban on below-cost selling	0 (0%)	0 (0%)	0 (-0.1%)	0 (0%)	0 (0%)	0 (0%)
Promotion ban	-0.1 (-2.1%)	-0.1 (-1.9%)	-0.5 (-2.1%)	-0.7 (-2.7%)	-2.3 (-2.4%)	-2.5 (-3%)
Promotion ban + 35p MUP	-0.1 (-2.7%)	-0.1 (-2.1%)	-0.7 (-2.9%)	-0.9 (-3.2%)	-3.3 (-3.5%)	-3.1 (-3.7%)
Promotion ban + 40p MUP	-0.2 (-3.4%)	-0.1 (-2.3%)	-1 (-4%)	-1.1 (-4%)	-5.6 (-5.8%)	-4.2 (-5%)
Promotion ban + 45p MUP	-0.2 (-4.3%)	-0.1 (-2.7%)	-1.4 (-5.7%)	-1.4 (-5.3%)	-9.1 (-9.4%)	-5.8 (-6.8%)
Promotion ban + 50p MUP	-0.3 (-5.5%)	-0.2 (-3.1%)	-2 (-7.8%)	-1.9 (-6.8%)	-13.3 (-13.8%)	-7.6 (-9%)
Promotion ban + 55p MUP	-0.3 (-6.8%)	-0.2 (-3.6%)	-2.6 (-10.2%)	-2.4 (-8.6%)	-18 (-18.8%)	-9.6 (-11.5%)
Promotion ban + 60p MUP	-0.4 (-8.4%)	-0.2 (-4.4%)	-3.3 (-13%)	-2.9 (-10.8%)	-23 (-24%)	-12 (-14.3%)
Promotion ban + 65p MUP	-0.5 (-10.3%)	-0.3 (-5.3%)	-4 (-16%)	-3.6 (-13.2%)	-27.6 (-28.8%)	-14.6 (-17.3%)
Promotion ban + 70p MUP	-0.6 (-12.1%)	-0.3 (-6.3%)	-4.8 (-19%)	-4.3 (-15.7%)	-31.9 (-33.3%)	-17.3 (-20.6%)
Promotion ban + 75p MUP	-0.7 (-14%)	-0.4 (-7.5%)	-5.5 (-21.9%)	-5 (-18.3%)	-36.1 (-37.6%)	-20.1 (-23.9%)

Figure 5.1: Summary of relative consumption changes by policy by drinker type

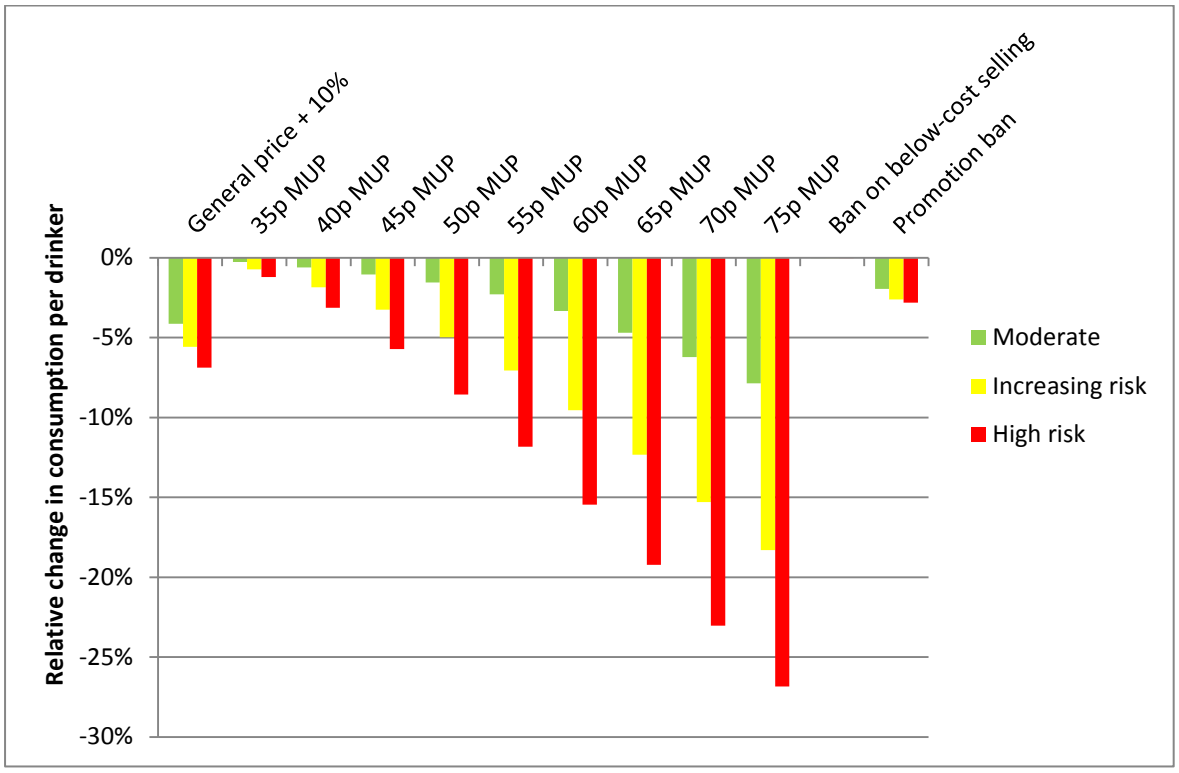


Figure 5.2: Summary of absolute consumption changes by policy by drinker type

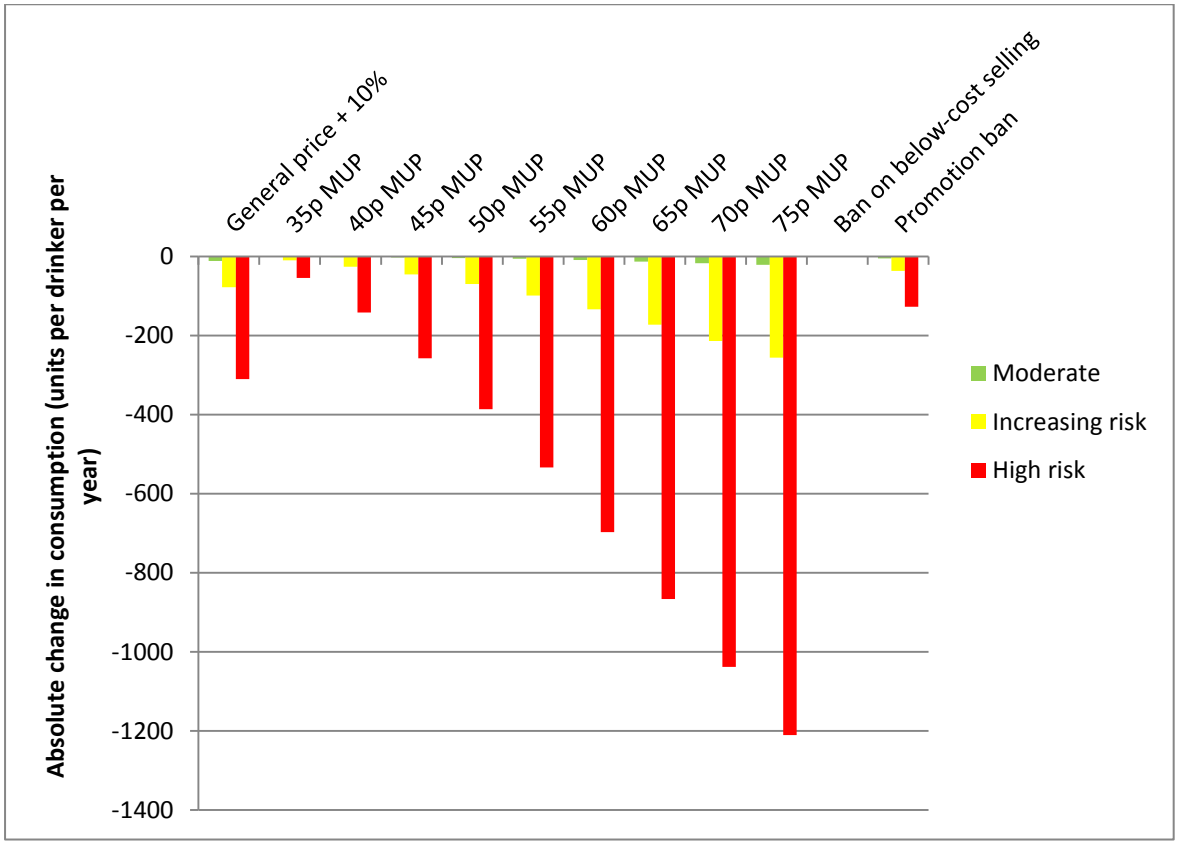
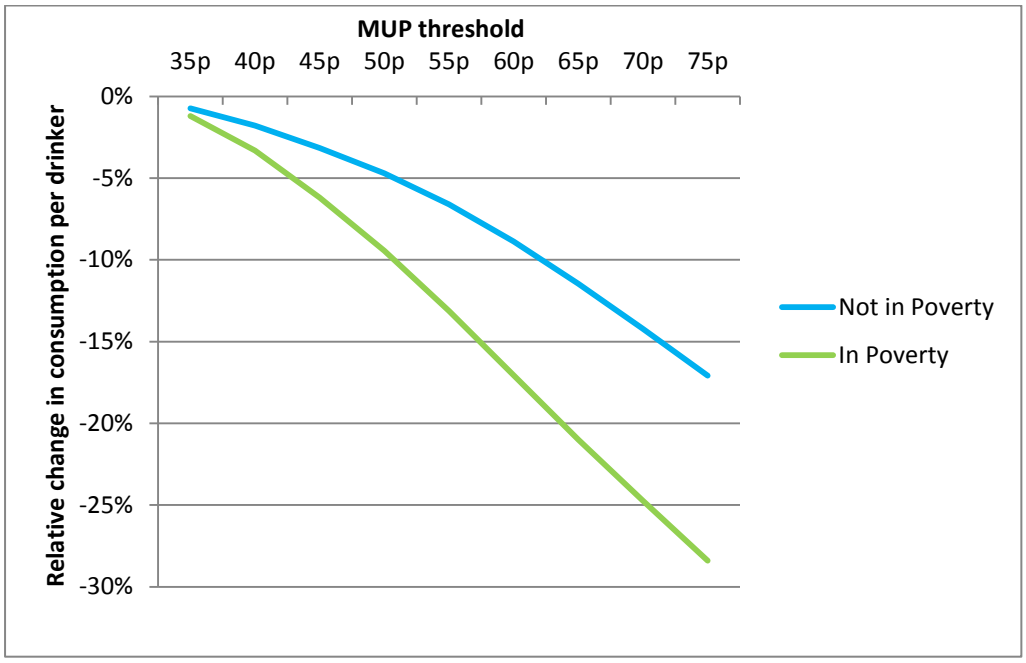


Figure 5.3: Income-specific effects of different levels of MUP policy on consumption



5.1.2 Impact on consumer spending

Table 5.3 and Table 5.4 show the relative and absolute changes in consumer spending estimated to result from each of the modelled policies. Figure 5.4, Figure 5.5 and Figure 5.6 illustrate these results graphically by drinker and income group.

Table 5.3: Summary of estimated effects of pricing policies on consumer spending – absolute and % change in consumption per drinker per year

Change in spending per drinker per year (£ (%))								
	Population	Male	Female	Moderate	Increasing risk	High risk	In Poverty	Not in Poverty
Drinker population	1,060,680	453,291	607,389	787,352	190,097	83,231	199,512	861,167
Baseline spending	£793	£1,220	£474	£377	£1,343	£3,471	£703	£814
General price + 10%	36.5 (4.6%)	30.2 (2.5%)	41.2 (8.7%)	24.4 (6.5%)	67.5 (5%)	79.9 (2.3%)	25 (3.6%)	39.2 (5.6%)
35p MUP	-0.5 (-0.1%)	-2.2 (-0.2%)	0.8 (0.2%)	-0.1 (0%)	-1.8 (-0.1%)	-0.5 (0%)	-2 (-0.3%)	-0.1 (0%)
40p MUP	-0.7 (-0.1%)	-4.3 (-0.3%)	2 (0.4%)	0.3 (0.1%)	-1.1 (-0.1%)	-9.6 (-0.3%)	-4.3 (-0.6%)	0.1 (0%)
45p MUP	1.5 (0.2%)	-4.5 (-0.4%)	5.9 (1.2%)	1.9 (0.5%)	5.6 (0.4%)	-12.4 (-0.4%)	-5.9 (-0.8%)	3.2 (0.5%)
50p MUP	6.3 (0.8%)	-1.3 (-0.1%)	12.1 (2.5%)	4.7 (1.3%)	16.5 (1.2%)	-1.5 (0%)	-6.1 (-0.9%)	9.2 (1.3%)
55p MUP	11.5 (1.5%)	0.2 (0%)	20 (4.2%)	8.3 (2.2%)	28.9 (2.1%)	2.3 (0.1%)	-7.8 (-1.1%)	16 (2.3%)
60p MUP	15.4 (1.9%)	-2 (-0.2%)	28.4 (6%)	12.1 (3.2%)	39.1 (2.9%)	-7.6 (-0.2%)	-11.8 (-1.7%)	21.7 (3.1%)
65p MUP	17.7 (2.2%)	-7.6 (-0.6%)	36.7 (7.7%)	15.5 (4.1%)	46.8 (3.5%)	-27.8 (-0.8%)	-17.5 (-2.5%)	25.9 (3.7%)
70p MUP	18.4 (2.3%)	-16.6 (-1.4%)	44.5 (9.4%)	18.8 (5%)	51.5 (3.8%)	-60.6 (-1.7%)	-23.7 (-3.4%)	28.1 (4%)
75p MUP	17.1 (2.2%)	-29.7 (-2.4%)	52 (11%)	21.6 (5.7%)	53.3 (4%)	-108.4 (-3.1%)	-32.5 (-4.6%)	28.5 (4.1%)
Ban on below-cost selling	0.5 (0.1%)	0.4 (0%)	0.6 (0.1%)	0.2 (0.1%)	0.5 (0%)	3.2 (0.1%)	0.1 (0%)	0.6 (0.1%)
Promotion ban	5.3 (0.7%)	-7.1 (-0.6%)	14.5 (3.1%)	2.7 (0.7%)	15.8 (1.2%)	5.5 (0.2%)	4.1 (0.6%)	5.5 (0.8%)
Promotion ban + 35p MUP	4.6 (0.6%)	-9.2 (-0.8%)	14.9 (3.1%)	2.4 (0.6%)	14 (1%)	4.3 (0.1%)	2.2 (0.3%)	5.1 (0.7%)
Promotion ban + 40p MUP	4 (0.5%)	-11.4 (-0.9%)	15.5 (3.3%)	2.5 (0.7%)	14 (1%)	-4.4 (-0.1%)	-0.3 (0%)	5 (0.7%)
Promotion ban + 45p MUP	4.7 (0.6%)	-13.1 (-1.1%)	18 (3.8%)	3.5 (0.9%)	17.4 (1.3%)	-13 (-0.4%)	-3.2 (-0.5%)	6.5 (0.9%)
Promotion ban + 50p MUP	7.3 (0.9%)	-12.7 (-1%)	22.3 (4.7%)	5.5 (1.5%)	24.4 (1.8%)	-14 (-0.4%)	-5.6 (-0.8%)	10.3 (1.5%)
Promotion ban + 55p MUP	10.7 (1.4%)	-12.5 (-1%)	28 (5.9%)	8.3 (2.2%)	33.1 (2.5%)	-17.4 (-0.5%)	-8.9 (-1.3%)	15.3 (2.2%)
Promotion ban + 60p MUP	13.4 (1.7%)	-14.6 (-1.2%)	34.3 (7.2%)	11.4 (3%)	40.8 (3%)	-30.4 (-0.9%)	-14.1 (-2%)	19.8 (2.8%)
Promotion ban + 65p MUP	15.4 (1.9%)	-18.6 (-1.5%)	40.7 (8.6%)	14.7 (3.9%)	46.9 (3.5%)	-49.5 (-1.4%)	-19.8 (-2.8%)	23.6 (3.4%)
Promotion ban + 70p MUP	16.2 (2%)	-25.1 (-2.1%)	47.1 (9.9%)	17.9 (4.7%)	50.9 (3.8%)	-78.5 (-2.3%)	-25.6 (-3.6%)	25.9 (3.7%)
Promotion ban + 75p MUP	15.4 (1.9%)	-35.5 (-2.9%)	53.4 (11.3%)	20.9 (5.5%)	52.6 (3.9%)	-120.9 (-3.5%)	-33.8 (-4.8%)	26.8 (3.8%)

Table 5.4: Summary of estimated effects of pricing policies on consumer spending by drinker group and income

Change in spending per drinker per year (£ (%))						
	Moderate		Increasing risk		High risk	
	In poverty	Not in poverty	In poverty	Not in poverty	In poverty	Not in poverty
Drinker population	145,928	641,423	34,608	155,489	18,976	64,255
Baseline spending	£344	£384	£1,128	£1,391	£2,688	£3,702
General price + 10%	17.7 (5.2%)	26 (6.8%)	52 (4.6%)	71 (5.1%)	31.7 (1.2%)	94.1 (2.5%)
35p MUP	-1.1 (-0.3%)	0.1 (0%)	-2 (-0.2%)	-1.8 (-0.1%)	-8.9 (-0.3%)	2 (0.1%)
40p MUP	-1.2 (-0.4%)	0.7 (0.2%)	-4.3 (-0.4%)	-0.4 (0%)	-27.5 (-1%)	-4.3 (-0.1%)
45p MUP	-0.6 (-0.2%)	2.5 (0.7%)	-1.5 (-0.1%)	7.2 (0.5%)	-54.4 (-2%)	0 (0%)
50p MUP	0.5 (0.1%)	5.7 (1.5%)	5.3 (0.5%)	19 (1.4%)	-77.3 (-2.9%)	20.8 (0.6%)
55p MUP	1.6 (0.5%)	9.9 (2.6%)	12.5 (1.1%)	32.5 (2.3%)	-116.9 (-4.3%)	37.5 (1%)
60p MUP	2.3 (0.7%)	14.3 (3.7%)	17.6 (1.6%)	43.9 (3.2%)	-174.3 (-6.5%)	41.7 (1.1%)
65p MUP	2.4 (0.7%)	18.5 (4.8%)	18.9 (1.7%)	53.1 (3.8%)	-236.9 (-8.8%)	34 (0.9%)
70p MUP	2.5 (0.7%)	22.4 (5.8%)	18.2 (1.6%)	58.9 (4.2%)	-301.8 (-11.2%)	10.7 (0.3%)
75p MUP	2.4 (0.7%)	25.9 (6.7%)	15.3 (1.4%)	61.7 (4.4%)	-387.6 (-14.4%)	-25.9 (-0.7%)
Ban on below-cost selling	0 (0%)	0.3 (0.1%)	0.3 (0%)	0.5 (0%)	0 (0%)	4.2 (0.1%)
Promotion ban	-0.6 (-0.2%)	3.5 (0.9%)	9.5 (0.8%)	17.2 (1.2%)	30.6 (1.1%)	-1.9 (-0.1%)
Promotion ban + 35p MUP	-1.6 (-0.5%)	3.3 (0.8%)	7.8 (0.7%)	15.3 (1.1%)	21.1 (0.8%)	-0.7 (0%)
Promotion ban + 40p MUP	-2 (-0.6%)	3.5 (0.9%)	5.5 (0.5%)	15.8 (1.1%)	1.8 (0.1%)	-6.2 (-0.2%)
Promotion ban + 45p MUP	-1.9 (-0.5%)	4.7 (1.2%)	5.6 (0.5%)	20 (1.4%)	-29.7 (-1.1%)	-8 (-0.2%)
Promotion ban + 50p MUP	-1.3 (-0.4%)	7 (1.8%)	8.7 (0.8%)	27.9 (2%)	-64.7 (-2.4%)	1 (0%)
Promotion ban + 55p MUP	-0.4 (-0.1%)	10.3 (2.7%)	12.7 (1.1%)	37.6 (2.7%)	-113.5 (-4.2%)	10.9 (0.3%)
Promotion ban + 60p MUP	0.3 (0.1%)	14 (3.6%)	15.6 (1.4%)	46.4 (3.3%)	-178.8 (-6.7%)	13.4 (0.4%)
Promotion ban + 65p MUP	0.7 (0.2%)	17.8 (4.6%)	16.1 (1.4%)	53.7 (3.9%)	-242.5 (-9%)	7.5 (0.2%)
Promotion ban + 70p MUP	1.1 (0.3%)	21.7 (5.6%)	16 (1.4%)	58.7 (4.2%)	-306.7 (-11.4%)	-11 (-0.3%)
Promotion ban + 75p MUP	1.3 (0.4%)	25.3 (6.6%)	13.7 (1.2%)	61.3 (4.4%)	-390.7 (-14.5%)	-41.2 (-1.1%)

Figure 5.4: Summary of relative spending changes by policy by drinker type

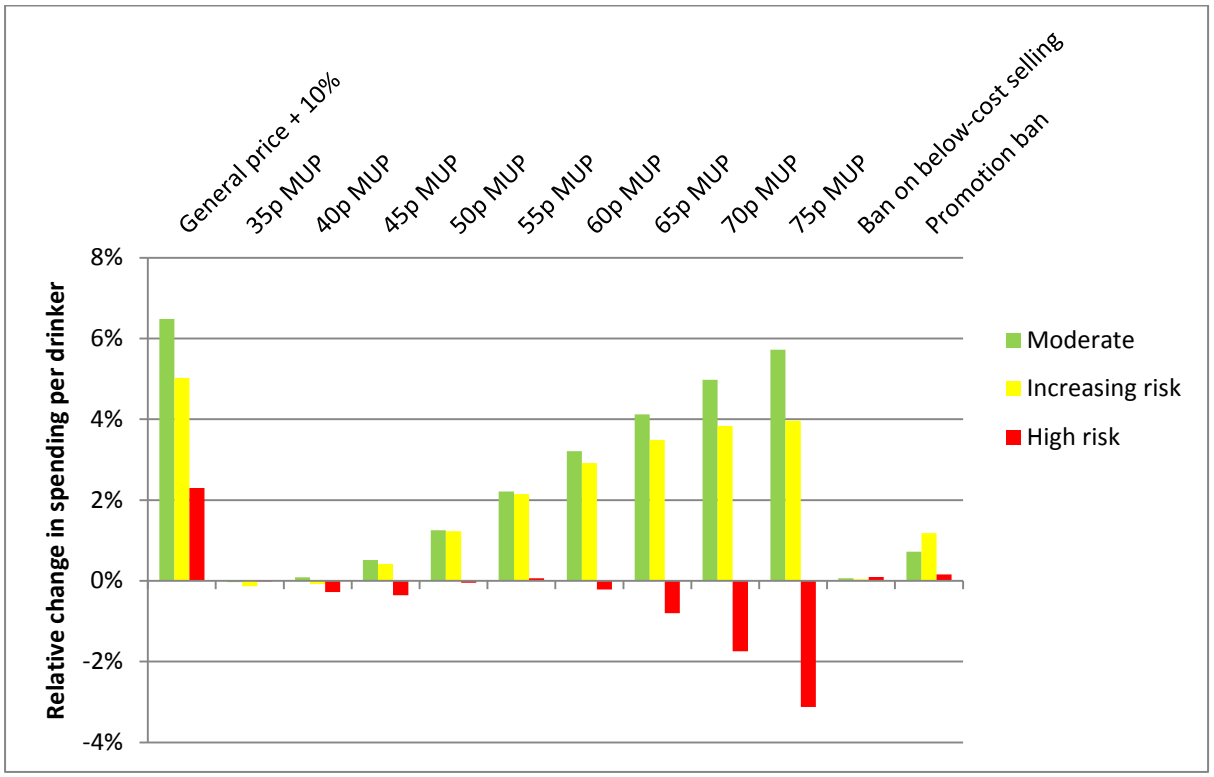


Figure 5.5: Summary of absolute spending changes by policy by drinker type

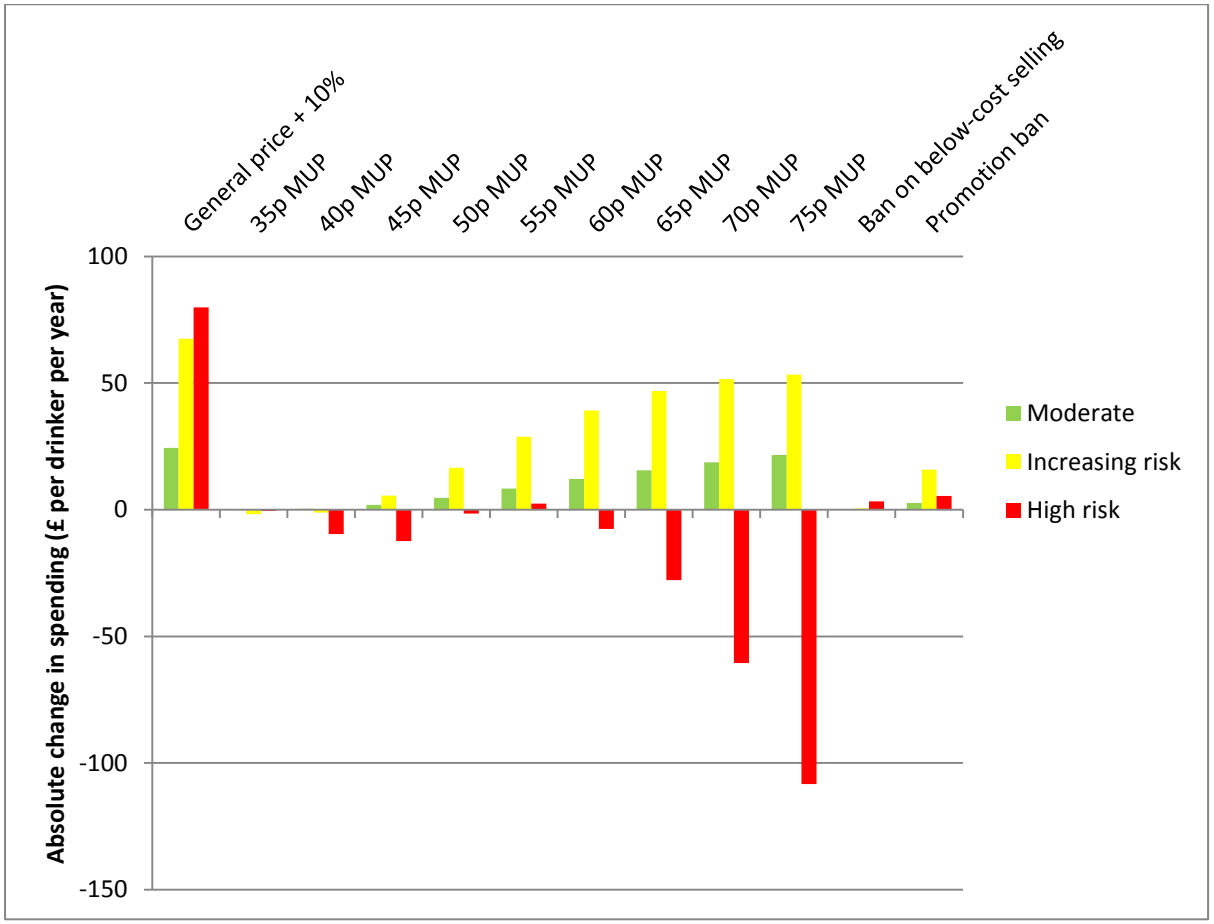
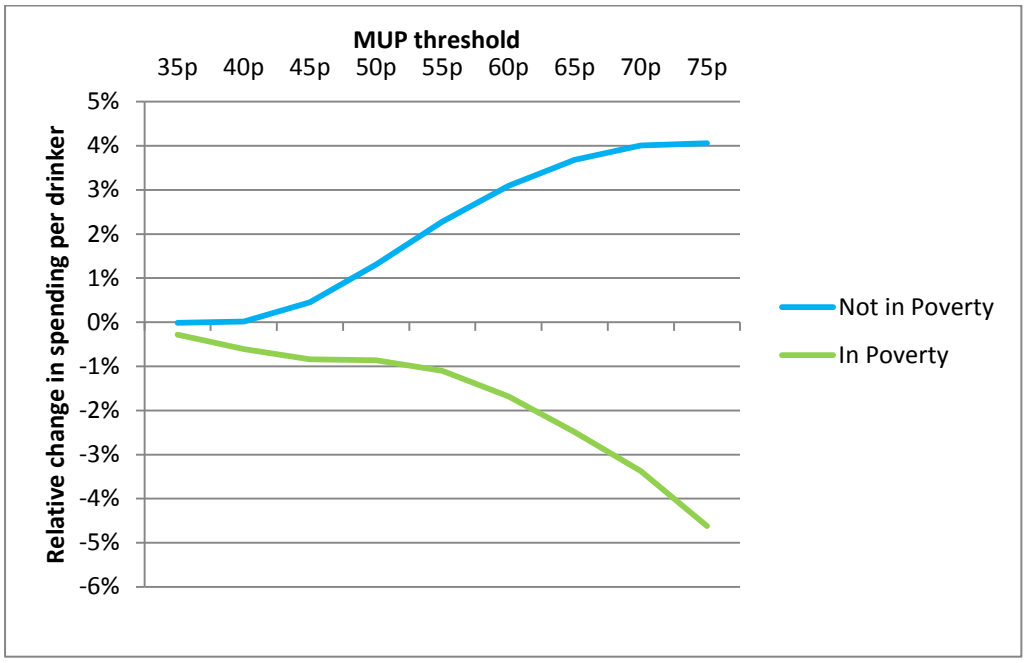


Figure 5.6: Income-specific effects of different levels of MUP on spending



5.1.3 Impact on retailers and the Exchequer

Table 5.5 shows the estimated impact of each policy on duty and VAT revenues to the exchequer as well as the total revenue to retailers, separated between the on- and off-trades.

Table 5.5: Summary of estimated effects of pricing policies on retailer and duty/VAT revenue – absolute and % change

	Estimated annual change in duty + VAT revenue to government (£million (%))			**Estimated change in annual revenue to retailers (after accounting for duty + VAT) (£million (%))**		
	Off-trade	On-trade	Total	Off-trade	On-trade	Total
Baseline receipts (£ million)	87.4	226.9	314.2	145.8	380.9	526.7
General price + 10%	-3 (-3.4%)	1.1 (0.5%)	-1.9 (-0.6%)	36.7 (25.2%)	111.2 (29.2%)	147.8 (28.1%)
35p MUP	-1.2 (-1.4%)	-0.2 (-0.1%)	-1.4 (-0.5%)	1.6 (1.1%)	0 (0%)	1.6 (0.3%)
40p MUP	-3.3 (-3.7%)	-0.3 (-0.2%)	-3.6 (-1.2%)	5.4 (3.7%)	-0.9 (-0.2%)	4.4 (0.8%)
45p MUP	-5.9 (-6.7%)	-0.1 (0%)	-6 (-1.9%)	12.7 (8.7%)	-0.8 (-0.2%)	12 (2.3%)
50p MUP	-8.8 (-10.1%)	0.6 (0.3%)	-8.2 (-2.6%)	22.2 (15.3%)	3.1 (0.8%)	25.3 (4.8%)
55p MUP	-12.2 (-14%)	1.4 (0.6%)	-10.9 (-3.5%)	32.3 (22.2%)	9 (2.4%)	41.3 (7.8%)
60p MUP	-16.2 (-18.5%)	1.7 (0.8%)	-14.4 (-4.6%)	43.3 (29.7%)	12.3 (3.2%)	55.6 (10.6%)
65p MUP	-20.7 (-23.7%)	1.9 (0.8%)	-18.8 (-6%)	50 (34.3%)	12.2 (3.2%)	62.2 (11.8%)
70p MUP	-25.7 (-29.4%)	2 (0.9%)	-23.7 (-7.5%)	47.6 (32.6%)	11.6 (3%)	59.1 (11.2%)
75p MUP	-31.1 (-35.6%)	2 (0.9%)	-29.1 (-9.3%)	36.5 (25%)	10.4 (2.7%)	46.9 (8.9%)
Ban on below-cost selling	0 (0%)	0.1 (0%)	0.1 (0%)	3.4 (2.3%)	-2.2 (-0.6%)	1.2 (0.2%)
Promotion ban	1.1 (1.2%)	-4.1 (-1.8%)	-3 (-0.9%)	23 (15.8%)	0 (0%)	22.9 (4.4%)
Promotion ban + 35p MUP	0.3 (0.3%)	-4.3 (-1.9%)	-4.1 (-1.3%)	24 (16.5%)	0.6 (0.2%)	24.6 (4.7%)
Promotion ban + 40p MUP	-1.4 (-1.6%)	-4.4 (-2%)	-5.8 (-1.9%)	28.1 (19.3%)	-0.5 (-0.1%)	27.7 (5.3%)
Promotion ban + 45p MUP	-3.9 (-4.5%)	-4.3 (-1.9%)	-8.2 (-2.6%)	40.6 (27.8%)	-5.6 (-1.5%)	34.9 (6.6%)
Promotion ban + 50p MUP	-7 (-8%)	-3.8 (-1.7%)	-10.8 (-3.4%)	50.5 (34.7%)	1.7 (0.4%)	52.2 (9.9%)
Promotion ban + 55p MUP	-10.7 (-12.2%)	-3 (-1.3%)	-13.6 (-4.3%)	54.8 (37.6%)	-9.4 (-2.5%)	45.4 (8.6%)
Promotion ban + 60p MUP	-15 (-17.1%)	-2.1 (-0.9%)	-17.1 (-5.4%)	53 (36.4%)	0.8 (0.2%)	53.8 (10.2%)
Promotion ban + 65p MUP	-19.8 (-22.7%)	-1.2 (-0.5%)	-21.1 (-6.7%)	51.4 (35.2%)	6.1 (1.6%)	57.5 (10.9%)
Promotion ban + 70p MUP	-25.1 (-28.8%)	-0.3 (-0.1%)	-25.5 (-8.1%)	47 (32.2%)	14 (3.7%)	60.9 (11.6%)
Promotion ban + 75p MUP	-30.8 (-35.2%)	0.5 (0.2%)	-30.3 (-9.6%)	36.1 (24.8%)	12 (3.2%)	48.1 (9.1%)

5.1.4 Impact on health outcomes

Table 5.6 presents the impact of each modelled policy on deaths and hospital admissions per year at full effect (i.e. in the 20th year following policy implementation), as well as the estimated annual QALY gains. A time lag of 20 year horizon is used to account for the lagged effect of reduced alcohol consumption on changes in mortality and morbidity of alcohol-related chronic health conditions such as liver disease and various cancers [25]. These are shown as relative changes in deaths and hospital admissions in Figure 5.7. Table 5.7 illustrates the equity implications of the health impact of each policy by showing the reductions in deaths and hospitalisations per 100,000 population for each income group. These figures are illustrated graphically in Figure 5.8 and

Figure 5.9 for deaths and hospital admissions respectively. Table 5.8 shows the impact of each policy on alcoholic liver disease outcomes.

Table 5.6: Summary of policy impacts on health outcomes – changes in alcohol-related deaths, hospital admissions and QALYs per year at full effect (20 years)

Policy	Estimated deaths averted in 20th year following policy implementation			Estimated hospital admissions averted in 20th year following policy implementation			Estimated QALYs gained in 20th year following policy implementation
	Total	Acute	Chronic	Total	Acute	Chronic	
Baseline alcohol-attributable harm[4]	556	220	337	25,759	12,996	12,763	
General price + 10%	-56	-14	-41	-2,132	-862	-1,270	489
35p MUP	-9	-2	-7	-410	-114	-296	82
40p MUP	-23	-5	-18	-966	-307	-659	210
45p MUP	-41	-10	-31	-1,634	-562	-1,072	372
50p MUP	-63	-15	-47	-2,425	-868	-1,557	561
55p MUP	-89	-22	-67	-3,442	-1,250	-2,193	799
60p MUP	-119	-30	-89	-4,696	-1,705	-2,990	1,073
65p MUP	-151	-39	-112	-6,023	-2,212	-3,811	1,362
70p MUP	-181	-47	-134	-7279	-2,710	-4,570	1,639
75p MUP	-212	-55	-157	-8,469	-3,229	-5,239	1,913
Ban on below-cost selling	0	0	0	-4	-3	-1	1
Promotion ban	-25	-6	-19	-1,043	-366	-677	223
Promotion ban + 35p MUP	-31	-7	-24	-1,304	-453	-852	279
Promotion ban + 40p MUP	-42	-10	-32	-1,711	-606	-1,104	376
Promotion ban + 45p MUP	-59	-14	-45	-2,316	-845	-1,471	524
Promotion ban + 50p MUP	-80	-20	-60	-3,080	-1,140	-1,940	706
Promotion ban + 55p MUP	-105	-26	-79	-4,038	-1,502	-2,535	931
Promotion ban + 60p MUP	-133	-34	-99	-5,070	-1,930	-3,139	1,177
Promotion ban + 65p MUP	-161	-41	-120	-6,358	-2,397	-3,962	1,448
Promotion ban + 70p MUP	-189	-49	-140	-7,552	-2,846	-4,706	1705
Promotion ban + 75p MUP	-217	-56	-160	-8,655	-3,318	-5,337	1956

[4] Estimated by modelling a "counterfactual" scenario in which the entire population become abstainers, i.e. zero consumption.

Table 5.7: Income-specific health outcomes – policy impacts on deaths and hospital admissions per year per 100,000 population at full effect (20 years)

Policy	In poverty		Not in poverty	
	Deaths per 100,000 population	Hospital admissions per 100,000 population	Deaths per 100,000 population	Hospital admissions per 100,000 population
Alcohol-attributable baseline harm	73.5	2,903	30.0	1,518
General price + 10%	-6.0	-204	-3.3	-135
35p MUP	-1.2	-39	-0.5	-26
40p MUP	-3.4	-110	-1.2	-57
45p MUP	-6.2	-200	-2.0	-92
50p MUP	-9.6	-317	-3.0	-132
55p MUP	-13.7	-488	-4.3	-177
60p MUP	-18.1	-664	-5.9	-242
65p MUP	-22.4	-830	-7.5	-316
70p MUP	-26.4	-975	-9.1	-390
75p MUP	-30.4	-1114	-10.8	-458
Ban on below-cost selling	-0.1	-3	0.0	0
Promotion ban	-2.1	-74	-1.7	-73
Promotion ban + 35p MUP	-3.0	-101	-2.0	-89
Promotion ban + 40p MUP	-4.7	-156	-2.5	-110
Promotion ban + 45p MUP	-7.3	-239	-3.3	-142
Promotion ban + 50p MUP	-10.6	-357	-4.3	-179
Promotion ban + 55p MUP	-14.6	-523	-5.5	-221
Promotion ban + 60p MUP	-18.9	-694	-6.8	-267
Promotion ban + 65p MUP	-23.0	-853	-8.2	-340
Promotion ban + 70p MUP	-26.8	-990	-9.7	-410
Promotion ban + 75p MUP	-30.7	-1123	-11.2	-472

Figure 5.7: Summary of relative changes in deaths and hospital admissions per year at full effect (20 years)

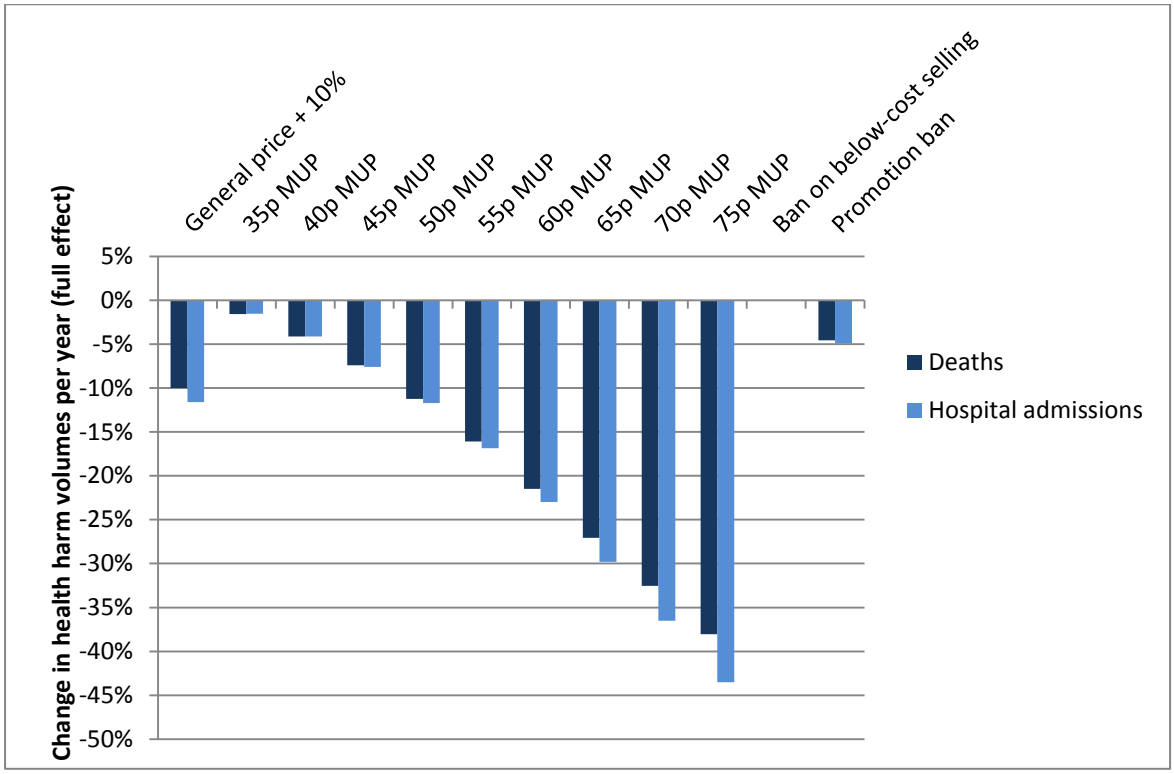


Figure 5.8: Income-specific reduction in deaths per year per 100,000 population at full effect (20 years)

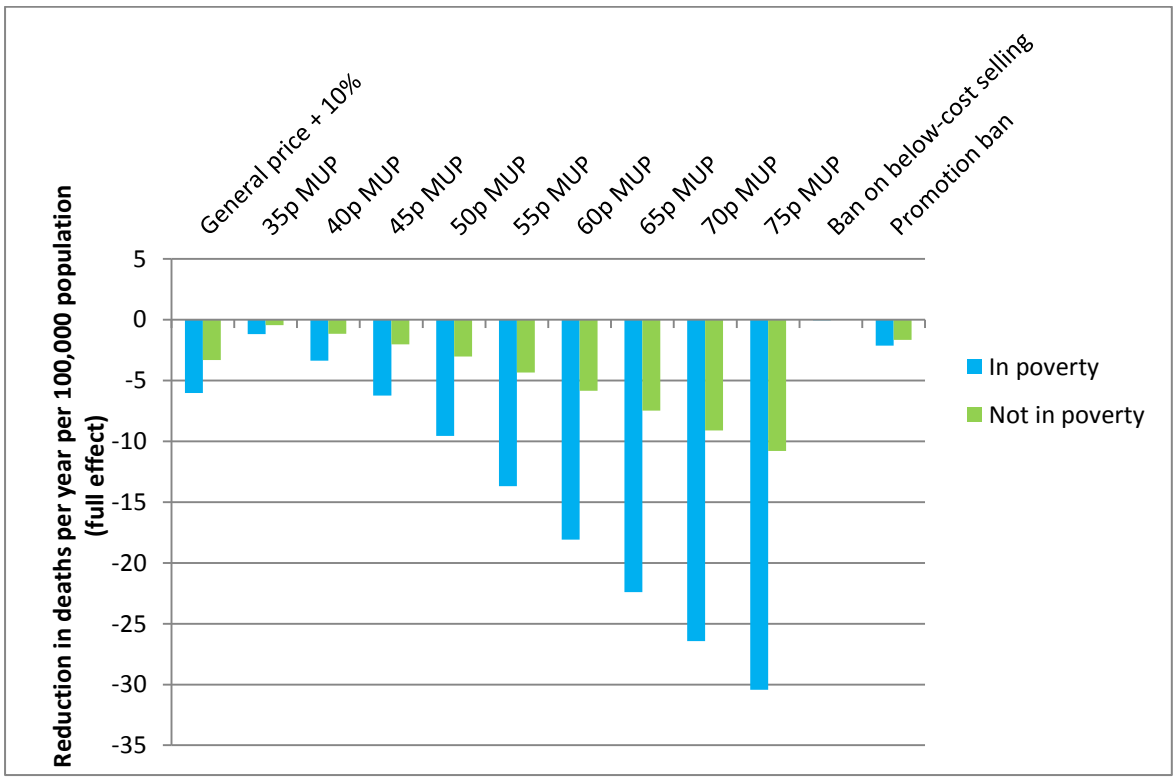


Figure 5.9: Income-specific reductions in hospital admissions per year per 100,000 population

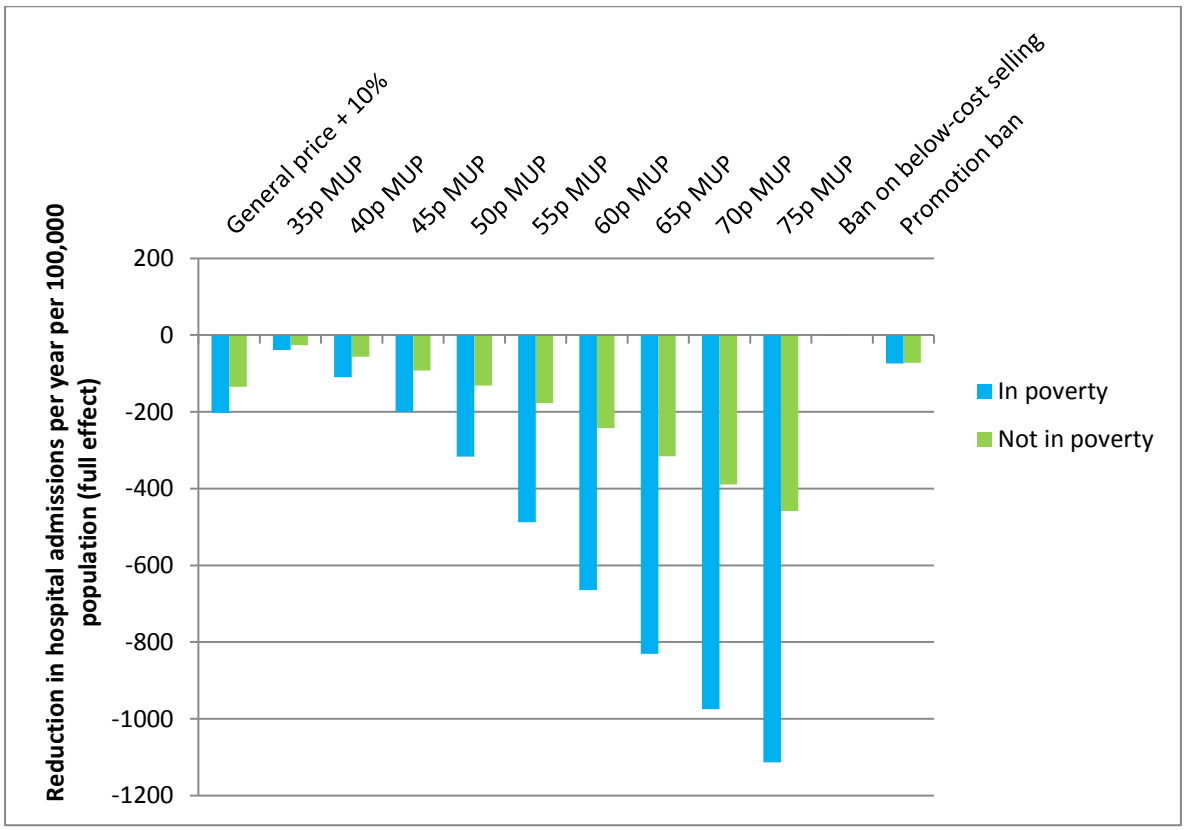


Table 5.8: Summary of policy impacts on alcohol liver disease outcomes at full effect (20 years)

Policy	Alcoholic liver disease (ICD-10 code K70)	
	Deaths per year	Hospital admissions per year
Baseline alcohol-attributable harm volume	195	1,437
General price + 10%	-19	-145
35p MUP	-3	-24
40p MUP	-9	-62
45p MUP	-15	-110
50p MUP	-23	-166
55p MUP	-32	-233
60p MUP	-43	-308
65p MUP	-54	-385
70p MUP	-64	-460
75p MUP	-75	-535
Ban on below-cost selling	0	0
Promotion ban	-9	-65
Promotion ban + 35p MUP	-12	-82
Promotion ban + 40p MUP	-16	-111
Promotion ban + 45p MUP	-22	-155
Promotion ban + 50p MUP	-29	-209
Promotion ban + 55p MUP	-38	-272
Promotion ban + 60p MUP	-47	-341
Promotion ban + 65p MUP	-57	-411
Promotion ban + 70p MUP	-67	-479
Promotion ban + 75p MUP	-77	-547

5.1.5 Impact on crime outcomes

The estimated impact of the modelled policies on annual volumes of crime is shown in Table 5.9, including the differential impact by drinker group. Relative reductions in crime by drinker group are presented in Figure 5.10. Table 5.10 shows the changes in annual crime volumes, broken down further by category of crime.

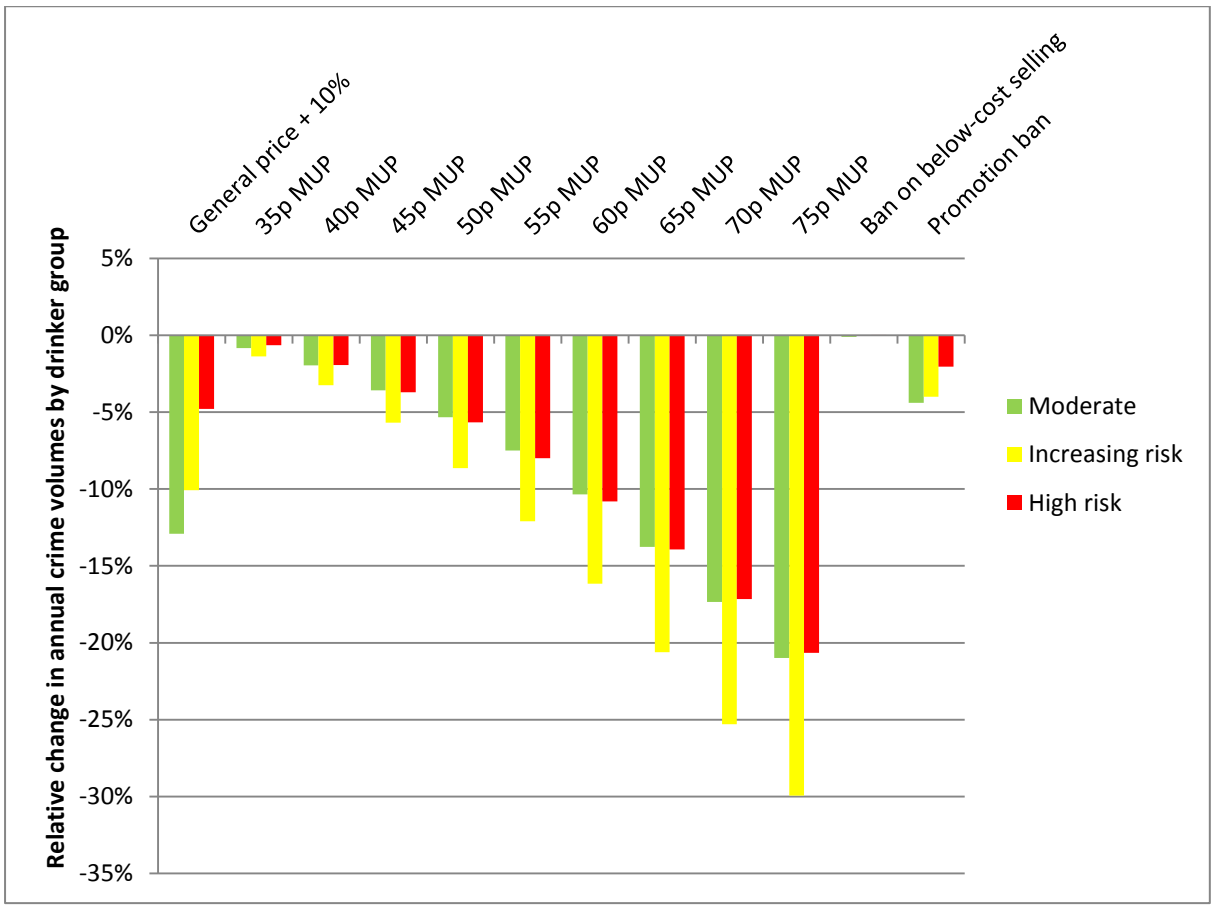
Table 5.9: Impact of modelled policies on annual crime volumes

Policy	Changes in annual crime volumes			
	Population	Moderate	Increasing risk	High risk
Baseline alcohol-attributable crime volume	80,395	7,182	25,636	47,577
General price + 10%	-5,793	-928	-2,584	-2,281
35p MUP	-716	-61	-352	-304
40p MUP	-1,894	-141	-834	-918
45p MUP	-3,474	-258	-1,456	-1,761
50p MUP	-5,293	-382	-2,214	-2,697
55p MUP	-7,444	-539	-3,102	-3,804
60p MUP	-10,024	-742	-4,142	-5,139
65p MUP	-12,899	-988	-5,285	-6,626
70p MUP	-15,891	-1,245	-6,485	-8,162
75p MUP	-19,008	-1,507	-7,676	-9,825
Ban on below-cost selling	-14	-7	-7	0
Promotion ban	-2,311	-315	-1,027	-969
Promotion ban + 35p MUP	-2,855	-364	-1,307	-1,184
Promotion ban + 40p MUP	-3,782	-425	-1,692	-1,664
Promotion ban + 45p MUP	-5,224	-528	-2,272	-2,425
Promotion ban + 50p MUP	-6,957	-645	-2,975	-3,337
Promotion ban + 55p MUP	-9,001	-790	-3,799	-4,411
Promotion ban + 60p MUP	-11,396	-964	-4,746	-5,685
Promotion ban + 65p MUP	-14,018	-1,163	-5,768	-7,086
Promotion ban + 70p MUP	-16,718	-1,373	-6,831	-8,515
Promotion ban + 75p MUP	-19,543	-1,586	-7,893	-10,064

Table 5.10: Estimated changes in annual crime volumes by crime category

Policy	Changes in annual crime volumes		
	Violent crimes	Criminal damage	Robbery, burglary & theft
Baseline alcohol-attributable volume	25,076	51,418	3,901
General price + 10%	-1,871	-3,645	-278
35p MUP	-239	-442	-35
40p MUP	-620	-1,181	-92
45p MUP	-1,133	-2,172	-169
50p MUP	-1,725	-3,311	-257
55p MUP	-2,433	-4,650	-361
60p MUP	-3,278	-6,259	-486
65p MUP	-4,220	-8,054	-625
70p MUP	-5,199	-9,923	-770
75p MUP	-6,215	-11,873	-920
Ban on below-cost selling	-5	-9	-1
Promotion ban	-748	-1,451	-112
Promotion ban + 35p MUP	-932	-1,785	-138
Promotion ban + 40p MUP	-1,233	-2,365	-183
Promotion ban + 45p MUP	-1,703	-3,267	-253
Promotion ban + 50p MUP	-2,268	-4,351	-338
Promotion ban + 55p MUP	-2,940	-5,624	-436
Promotion ban + 60p MUP	-3,726	-7,117	-552
Promotion ban + 65p MUP	-4,585	-8,753	-679
Promotion ban + 70p MUP	-5,469	-10,440	-810
Promotion ban + 75p MUP	-6,390	-12,207	-946

Figure 5.10: Summary of relative changes in alcohol-attributable crime volumes by drinker group



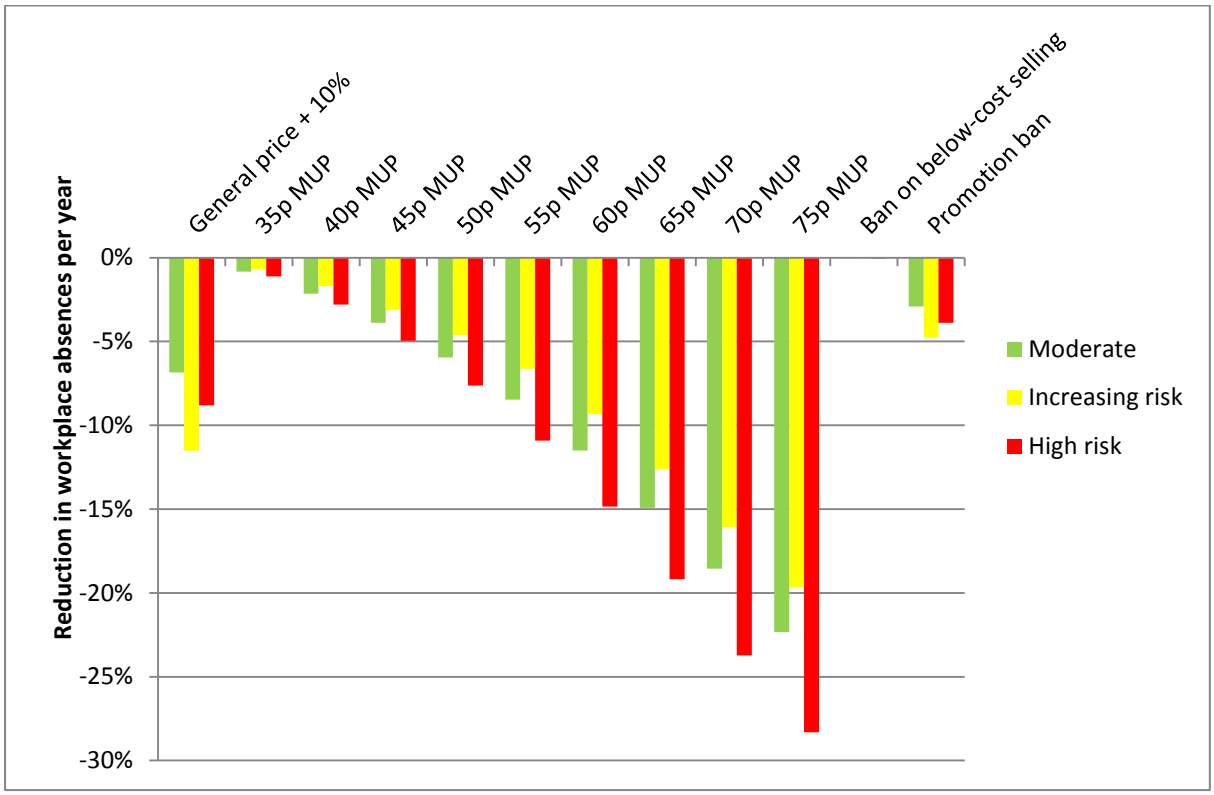
5.1.6 Impact on workplace outcomes

Table 5.11 presents the modelled impact of each policy on the number of days per year lost to workplace absenteeism. Figure 5.11 illustrates this in terms of relative changes in absence days by drinker group.

Table 5.11: Estimated changes in workplace absence

Policy	Changes in days absence from work per year (1,000s)			
	Population	Moderate	Increasing risk	High risk
Baseline alcohol-attributable absence (1,000s)	588.4	58.1	217.2	313.1
General price + 10%	-40.2	-6.7	-19.1	-14.4
35p MUP	-4.9	-0.4	-2.4	-2.0
40p MUP	-12.6	-1.0	-6.1	-5.5
45p MUP	-22.9	-1.8	-10.8	-10.3
50p MUP	-35.0	-2.7	-16.6	-15.7
55p MUP	-49.9	-3.8	-23.7	-22.3
60p MUP	-67.7	-5.4	-32.2	-30.1
65p MUP	-87.8	-7.3	-41.7	-38.8
70p MUP	-109.1	-9.3	-51.5	-48.2
75p MUP	-131.4	-11.4	-61.5	-58.5
Ban on below-cost selling	-0.1	0.0	-0.1	0.0
Promotion ban	-17.1	-2.8	-8.4	-5.9
Promotion ban + 35p MUP	-20.6	-3.1	-10.2	-7.3
Promotion ban + 40p MUP	-26.7	-3.6	-13.1	-10.1
Promotion ban + 45p MUP	-36.2	-4.3	-17.5	-14.4
Promotion ban + 50p MUP	-47.8	-5.2	-22.9	-19.7
Promotion ban + 55p MUP	-61.8	-6.3	-29.6	-25.9
Promotion ban + 60p MUP	-78.2	-7.6	-37.3	-33.3
Promotion ban + 65p MUP	-96.3	-9.1	-45.7	-41.5
Promotion ban + 70p MUP	-115.5	-10.6	-54.5	-50.3
Promotion ban + 75p MUP	-135.5	-12.2	-63.4	-59.8

Figure 5.11:Summary of relative changes in annual workplace absence by drinker group



5.1.7 Impact on societal costs

Table 5.12 gives an overview of the estimated savings in the first year following implementation and the cumulative savings over 20 years for each of the modelled policies. Cumulative savings are given as present values using a discount rate of 3.5% per annum. QALYs are valued at £60,000 in line with the valuation used by the Department of Health in the UK [1]. These savings are presented separately for healthcare costs, costs associated with crime and the cost of workplace absenteeism. It should be noted that these costs may not be fully realised in practice as, for example, crime costs incorporate a financial valuation of the impact on the victim.

Table 5.12: Summary of financial impact of modelled policies on health, crime and workplace related harm in year 1 and cumulatively over 20 years

Policy	Value of harm reductions in year 1 (£m)					Cumulative value of harm reductions over 20 years (£m)				
	Healthcare costs	QALY valuation	Crime costs	Work absence costs	Total costs	Healthcare costs	QALY valuation	Crime costs	Work absence costs	Total costs
Baseline cost	20.4		288.2	48.6	357.1	561.4		4238.9	714.8	5515.1
General price + 10%	-1.7	-14.7	-22.2	-3.6	-42.3	-51.0	-496.8	-327.2	-52.9	-927.9
35p MUP	-0.3	-2.3	-2.8	-0.4	-5.7	-10.7	-82.7	-40.6	-6.4	-140.4
40p MUP	-0.7	-5.7	-7.1	-1.1	-14.6	-24.3	-209.6	-104.8	-16.4	-355.1
45p MUP	-1.2	-10.1	-13.0	-2.0	-26.3	-40.1	-370.0	-191.7	-29.8	-631.6
50p MUP	-1.8	-15.3	-19.9	-3.1	-40.1	-59.0	-558.6	-292.4	-45.6	-955.6
55p MUP	-2.5	-21.8	-28.1	-4.4	-56.9	-83.4	-795.4	-413.7	-65.3	-1,357.9
60p MUP	-3.4	-29.5	-38.0	-6.0	-76.9	-114.1	-1,070.4	-558.8	-88.9	-1,832.2
65p MUP	-4.4	-37.9	-48.9	-7.8	-99.0	-146.7	-1,362.9	-719.9	-115.3	-2,344.7
70p MUP	-5.3	-46.3	-60.4	-9.7	-121.7	-177.1	-1,645.9	-887.9	-143.3	-2,854.2
75p MUP	-6.2	-54.8	-72.3	-11.7	-145.0	-204.4	-1,924.4	-1,063.0	-172.5	-3,364.3
Ban on below-cost selling	0.0	-0.1	-0.1	0.0	-0.1	-0.1	-1.1	-0.8	-0.1	-2.2
Promotion ban	-0.8	-6.4	-8.8	-1.5	-17.4	-25.5	-224.2	-128.8	-22.2	-400.7
Promotion ban + 35p MUP	-1.0	-8.0	-10.9	-1.8	-21.7	-31.9	-280.6	-159.8	-26.9	-499.3
Promotion ban + 40p MUP	-1.3	-10.7	-14.3	-2.4	-28.7	-41.6	-377.2	-210.7	-34.8	-664.4
Promotion ban + 45p MUP	-1.7	-14.8	-19.7	-3.2	-39.4	-55.8	-524.0	-290.3	-47.2	-917.3
Promotion ban + 50p MUP	-2.3	-19.8	-26.3	-4.2	-52.6	-74.0	-705.7	-386.4	-62.4	-1,228.6
Promotion ban + 55p MUP	-3.0	-26.0	-34.1	-5.5	-68.5	-97.0	-929.7	-501.0	-80.9	-1,608.6
Promotion ban + 60p MUP	-3.7	-33.0	-43.2	-7.0	-86.9	-120.9	-1,175.5	-635.6	-102.5	-2,034.5
Promotion ban + 65p MUP	-4.6	-40.7	-53.2	-8.6	-107.1	-153.4	-1,450.8	-782.3	-126.4	-2,512.8
Promotion ban + 70p MUP	-5.5	-48.4	-63.5	-10.3	-127.7	-183.0	-1,712.5	-933.9	-151.5	-2,981.0
Promotion ban + 75p MUP	-6.4	-56.2	-74.3	-12.1	-149.0	-208.5	-1,968.4	-1092.7	-177.9	-3447.6

5.2 EXAMPLE POLICY ANALYSIS A: 50P MUP

This section describes the estimated impacts of a minimum unit price policy of 50p per unit in detail. We assume that this threshold is updated annually in line with inflation. In addition to the results already presented in Table 5.1 to Table 5.12, further detailed results are shown in Table 5.13 to Table 5.18 for consumption changes, consumer spending and health outcomes.

Across the whole population, 38.9% of units purchased would be affected (i.e. would have their price raised to 50p)**.** The proportion and absolute number of purchased units per week affected for high risk drinkers (49.0% or 42.4 units) is substantially more than for increasing risk drinkers (37.3% or 10.0 units) or moderate drinkers (21.8% or 0.8 units). The proportion and number of purchased units per week affected is slightly higher for those in poverty than those above the poverty line (37.7% and 4.3 units vs. 43.0% and 5.0 units), though this difference is primarily driven by a substantial difference between high risk drinkers in poverty (60.9% or 58.2 units) vs. high risk drinkers not in poverty (46.8% or 39.2 units).

Across the whole population, mean weekly consumption is estimated to change by -5.7%. Consumption is estimated to reduce by 0.65 units per person, or 0.88 units per drinker per week. Weekly consumption reductions are greater for high risk drinkers (-8.6% or 7.4 units) than moderate drinkers (-1.6% or 0.08 units) and for those in poverty (-9.4% or 1.6 units) compared to those not in poverty (-4.7% or 0.72 units).

In both income groups, reductions in consumption are estimated to be small for moderate drinkers and much larger for high risk drinkers. The estimated consumption reduction for moderate drinkers in poverty is -3.8% or 0.11 units per week compared to -13.0% or 12.5 units per week for high risk drinkers in poverty. The corresponding figures for those not in poverty are -1.1% or 0.04 units and -7.1% or 5.9 units.

Across the whole population, estimated spending increases by 0.8% or £6.30 per drinker per year (£0.12 per week). The cost impact of the policy on consumer spending varies significantly between different drinker and income subgroups. Moderate and increasing risk drinkers are estimated to increase their spending by £4.70 and £16.50 per year respectively, whilst high risk drinkers reduce their spending marginally, by £1.50. Similar differences are observed between income subgroups, with those in poverty saving £6.10 per year compared to a spending increase of £9.20 per year for those not in poverty. This difference is largely driven by high risk drinkers in poverty, who are estimated to reduce their spending by £77.30 per year, compared to £0.50 for moderate drinkers in poverty. High risk and moderate drinkers who are not in poverty are estimated to increase spending by £20.80 and £5.70 respectively. These differing patterns are a result of both the different proportion of each population subgroup's purchases which are affected by the policy as well as the different price elasticities of the beverages which make up a greater or lesser proportion of each subgroup's purchases.

16-24 year olds, who both consume and spend more on alcohol than older age groups are estimated to experience the greatest absolute changes in both consumption (-0.9 units per week) and spending (+£19.40 per year). Relative reductions in consumption are greater in 25-34 and 35-54 year olds (-6.5% and -6.4% respectively) compared to 16-24 year olds (-5.4%). Those aged over 55

are estimated to change their consumption the least (-0.29 units per week, equivalent to a 4.0% reduction).

Overall revenue to the Exchequer from duty and VAT receipts is estimated to reduce by 2.6% or £8.2 million.

Revenue to retailers is estimated to increase by £22.2million (15.3%) in the off-trade and £3.1million (0.8%) in the on-trade. This is because reduced sales volumes are more than offset by the increased value of remaining sales.

Effects on health are estimated to be substantial, with alcohol-attributable deaths estimated to reduce by approximately 63 per year after 20 years, by which time the full effects of the policy will be seen. Reductions in deaths are distributed differentially across drinker groups with less than 1 saved per year amongst moderate drinkers, 19 amongst increasing risk drinkers and 43 per year amongst high risk drinkers. Whilst those in poverty see a smaller absolute number of reduced deaths annually (28 vs. 35 for those not in poverty), they comprise a substantially smaller proportion of the population (20.4%). This means that the relative reductions in annual deaths per 100,000 population is considerably greater amongst those in poverty (9.6 vs. 3.0 for those not in poverty).

Similar patterns are observed amongst reductions in alcohol-related hospital admissions, with an estimated 2,420 fewer admissions per year across the population. Admissions reductions for moderate, increasing risk and high risk drinkers are 70, 670 and 1,680 respectively. Again, those in poverty experience a lower absolute reduction in hospital admissions (930 vs. 1,500) but a substantially larger reduction per 100,000 population (317 vs. 132). Direct healthcare costs are estimated to reduce by £1.8m in the 1st year following implementation of the policy.

Crime is estimated to fall by 5,293 offences per year overall. Reductions are concentrated amongst heavier drinkers with 382, 2,214 and 2,697 fewer offences committed by moderate, increasing risk and high risk drinkers respectively. It should also be noted that increasing risk and high risk drinkers (14% and 6% respectively) make up a considerably smaller proportion of the population than moderate drinkers (81%). Costs of crime and policing are estimated to reduce by £19.9m in the 1st year following implementation of the policy.

Workplace absence is estimated to be reduced by 35,000 days per year. This is estimated to lead to an saving in the 1st year of the policy of £3.1m.

The total societal value of these reductions in health, crime and workplace harms is estimated at £956m over the 20 year period modelled. This includes direct healthcare costs (£59m), crime costs (£292m), workplace costs (£46m) and a financial valuation of the QALY gain (£559m), assuming a QALY is valued at £60,000. All costs and benefits are discounted at 3.5%.

Table 5.13: Detailed consumption and spending results for 50p MUP

	Population	Male	Female	In poverty	Not in poverty	Moderate	Increasing risk	High risk
Baseline statistics								
Baseline Consumption (units per week)	11.5	19.2	6.3	11.6	11.5	3.6	26.8	86.5
Population size	1,430,500	572,290	858,210	291,727	1,138,773	1,157,172	190,097	83,231
Baseline Consumption (drinker)	15.5	24.3	9.0	17.0	15.2	5.3	26.8	86.5
Drinker population	1,060,680	453,291	607,389	199,512	861,167	787,352	190,097	83,231
% drinkers	74.1%	79.2%	70.8%	68.4%	75.6%	68.0%	100.0%	100.0%
Sales/Consumption volume, units per drinker per year								
Off-beer	146.6	266.9	56.9	194.8	135.5	30.1	224.3	1071.4
Off-cider	23.9	45.5	7.8	70.9	13.0	3.5	26.8	210.9
Off-wine	155.0	143.0	164.0	120.1	163.1	72.3	329.7	538.4
Off-spirits	113.5	140.7	93.1	147.5	105.6	34.1	225.8	608.3
Off-RTDs	15.4	10.6	19.0	29.5	12.2	5.0	22.4	98.3
On-beer	264.2	564.0	40.5	236.4	270.7	70.7	418.1	1743.0
On-cider	7.1	13.0	2.7	3.0	8.0	3.3	12.4	30.9
On-wine	21.9	22.0	21.8	11.8	24.2	19.7	30.0	23.3
On-spirits	42.7	51.2	36.4	47.3	41.6	27.5	72.3	118.4
On-RTDs	18.9	10.3	25.3	23.1	17.9	9.6	36.3	66.8
Total	**809.2**	**1267.0**	**467.6**	**884.3**	**791.8**	**275.9**	**1398.1**	**4509.7**
Spending, £ per drinker per year								
Off-beer	63.7	117.7	23.4	83.0	59.2	14.0	95.8	460.9
Off-cider	7.4	13.3	2.9	16.4	5.3	1.3	8.8	62.2
Off-wine	85.8	80.7	89.7	62.3	91.3	42.6	180.1	279.6
Off-spirits	53.6	66.0	44.3	57.4	52.7	16.9	111.1	269.7
Off-RTDs	9.3	2.6	14.4	12.9	8.5	4.5	20.2	30.0
On-beer	346.3	719.9	67.4	305.5	355.7	130.6	531.3	1963.7
On-cider	8.3	15.3	3.0	2.5	9.6	4.5	14.9	28.6
On-wine	54.9	55.8	54.2	24.4	62.0	50.8	74.8	48.0
On-spirits	124.2	130.2	119.8	98.7	130.1	91.2	225.6	205.4
On-RTDs	39.3	19.0	54.4	39.4	39.3	20.4	80.8	123.0
Total	**792.8**	**1220.5**	**473.6**	**702.6**	**813.7**	**376.8**	**1343.5**	**3470.9**
After intervention / Change from baseline								
Change in consumption (units per drinker)	-0.9	-1.6	-0.4	-1.6	-0.7	-0.1	-1.3	-7.4
Change in consumption (%)	-5.7%	-6.5%	-4.0%	-9.4%	-4.7%	-1.6%	-5.0%	-8.6%
Final Consumption (drinker)	14.6	22.7	8.6	15.4	14.5	5.2	25.5	79.1
Absolute change in sales/Consumption volume, units per drinker per year								
Off-beer	-28.4	-49.3	-12.8	-37.5	-26.2	-3.8	-43.9	-225.7
Off-cider	-7.7	-15.3	-2.1	-24.3	-3.9	-1.2	-10.5	-62.8
Off-wine	5.9	5.5	6.3	1.2	7.0	3.1	15.6	10.7
Off-spirits	-9.9	-11.8	-8.5	-10.8	-9.7	-2.3	-23.0	-51.9
Off-RTDs	-4.3	-3.2	-5.2	-7.5	-3.6	-0.9	-6.2	-32.6
On-beer	-5.2	-11.5	-0.5	-6.8	-4.8	-0.6	-9.3	-39.4
On-cider	0.3	0.5	0.1	0.1	0.3	0.1	0.7	0.8
On-wine	1.4	1.4	1.4	0.7	1.6	1.1	2.4	1.9
On-spirits	-0.3	-0.2	-0.3	-0.3	-0.3	-0.4	0.0	0.5
On-RTDs	2.2	1.3	2.9	1.9	2.3	0.6	4.7	12.1
Total	**-46.0**	**-82.6**	**-18.7**	**-83.5**	**-37.3**	**-4.3**	**-69.6**	**-386.3**
Absolute change in spending, £ per drinker per year								
Off-beer	-1.5	-2.2	-1.0	-2.3	-1.3	0.0	-1.5	-15.7
Off-cider	-1.7	-3.3	-0.4	-5.2	-0.9	-0.3	-2.4	-13.2
Off-wine	8.1	7.3	8.7	6.0	8.6	3.6	17.5	28.7
Off-spirits	0.0	-0.2	0.2	1.0	-0.2	0.3	-2.2	2.2
Off-RTDs	-2.3	-0.5	-3.7	-2.7	-2.3	-0.8	-5.5	-9.9
On-beer	-3.9	-8.5	-0.5	-6.9	-3.2	-0.9	-7.2	-24.5
On-cider	0.4	0.7	0.1	0.1	0.4	0.2	1.0	1.1
On-wine	3.5	3.6	3.4	1.3	4.0	2.8	6.1	3.9
On-spirits	-0.8	-0.6	-1.0	-0.5	-0.9	-1.4	0.6	1.4
On-RTDs	4.6	2.4	6.3	3.1	5.0	1.2	10.2	24.5
Total	**6.3**	**-1.3**	**12.1**	**-6.1**	**9.2**	**4.7**	**16.5**	**-1.5**

Table 5.14: Detailed income- and drinker group-specific results for 50p MUP

	In Poverty			Not in Poverty		
	Moderate	Increasing risk	High risk	Moderate	Increasing risk	High risk
Baseline statistics						
Baseline Consumption (units per week)	2.9	25.1	95.7	3.8	27.2	83.8
Population size	238,143	34,608	18,976	919,029	155,489	64,255
Baseline Consumption (drinker)	4.8	25.1	95.7	5.4	27.2	83.8
Drinker population	145,928	34,608	18,976	641,423	155,489	64,255
% drinkers	61.3%	100.0%	100.0%	69.8%	100.0%	100.0%
Sales/Consumption volume, units per drinker per year						
Off-beer	31.0	212.6	1422.1	29.9	226.8	967.8
Off-cider	5.8	43.5	621.8	2.9	23.1	89.6
Off-wine	49.5	234.7	454.6	77.5	350.8	563.2
Off-spirits	37.3	270.9	769.4	33.3	215.7	560.7
Off-RTDs	9.0	36.6	173.9	4.1	19.3	76.0
On-beer	65.4	373.9	1300.3	72.0	427.9	1873.7
On-cider	2.4	6.5	1.8	3.5	13.7	39.5
On-wine	9.6	15.4	21.5	22.0	33.3	23.9
On-spirits	27.4	60.4	176.5	27.6	75.0	101.2
On-RTDs	13.1	52.3	46.5	8.9	32.7	72.7
Total	**250.5**	**1306.8**	**4988.6**	**281.7**	**1418.4**	**4368.3**
Spending, £ per drinker per year						
Off-beer	13.1	90.4	607.1	14.2	97.0	417.8
Off-cider	2.0	11.9	135.5	1.1	8.1	40.5
Off-wine	27.3	117.9	230.9	46.1	194.0	293.9
Off-spirits	19.7	110.5	250.5	16.2	111.3	275.3
Off-RTDs	8.1	39.4	1.7	3.7	16.0	38.3
On-beer	133.8	451.1	1361.2	129.9	549.1	2141.6
On-cider	2.8	2.8	0.0	4.9	17.6	37.1
On-wine	22.7	35.4	17.2	57.3	83.5	57.1
On-spirits	89.9	160.5	53.4	91.4	240.1	250.2
On-RTDs	24.3	107.8	30.2	19.6	74.8	150.4
Total	**343.6**	**1127.6**	**2687.7**	**384.3**	**1391.5**	**3702.2**
After intervention / Change from baseline						
Change in consumption (units per drinker)	-0.2	-1.6	-12.5	-0.1	-1.3	-5.9
Change in consumption (%)	-3.8%	-6.5%	-13.0%	-1.1%	-4.7%	-7.1%
Final Consumption (drinker)	4.6	23.4	83.2	5.3	25.9	77.9
Absolute change in sales/Consumption volume, units per drinker per year						
Off-beer	-4.8	-46.8	-272.8	-3.5	-43.3	-211.7
Off-cider	-2.2	-11.2	-218.5	-1.0	-10.3	-16.8
Off-wine	1.1	2.6	-0.4	3.6	18.5	13.9
Off-spirits	-2.5	-19.3	-59.3	-2.3	-23.8	-49.7
Off-RTDs	-1.5	-8.7	-51.1	-0.7	-5.7	-27.1
On-beer	-0.9	-7.3	-51.9	-0.5	-9.8	-35.7
On-cider	0.1	0.2	0.0	0.1	0.8	1.1
On-wine	0.5	0.8	1.5	1.2	2.8	2.0
On-spirits	-0.3	-0.3	-0.5	-0.5	0.1	0.8
On-RTDs	1.0	5.0	2.7	0.5	4.6	14.9
Total	**-9.4**	**-85.1**	**-650.1**	**-3.1**	**-66.1**	**-308.5**
Absolute change in spending, £ per drinker per year						
Off-beer	-0.2	-3.6	-16.8	0.1	-1.1	-15.3
Off-cider	-0.5	-2.2	-46.6	-0.2	-2.4	-3.4
Off-wine	2.1	12.2	25.1	4.0	18.6	29.7
Off-spirits	-0.1	2.9	6.1	0.4	-3.4	1.1
Off-RTDs	-1.3	-9.4	-0.6	-0.6	-4.6	-12.6
On-beer	-1.8	-6.7	-46.2	-0.7	-7.4	-18.1
On-cider	0.1	0.0	0.0	0.2	1.2	1.4
On-wine	1.2	1.6	1.6	3.2	7.1	4.5
On-spirits	-0.8	1.1	-1.5	-1.5	0.5	2.3
On-RTDs	1.8	9.3	1.7	1.0	10.4	31.2
Total	**0.5**	**5.3**	**-77.3**	**5.7**	**19.0**	**20.8**

Table 5.15: Detailed age group-specific results for 50p MUP

	Population	16-24	25-34	35-54	55+
Baseline statistics					
Baseline Consumption (units per week)	11.5	16.8	12.9	12.2	7.3
Population size	1,430,500	229,266	248,810	496,781	455,642
Baseline Consumption (drinker)	15.5	20.7	15.2	15.2	12.5
Drinker population	1,060,680	186,113	211,274	396,590	266,703
% drinkers	74.1%	81.2%	84.9%	79.8%	58.5%
Sales/Consumption volume, units per drinker per year					
Off-beer	146.6	154.7	156.3	178.4	86.1
Off-cider	23.9	27.8	30.7	30.1	6.7
Off-wine	155.0	68.9	126.4	196.7	175.7
Off-spirits	113.5	132.9	91.0	109.8	123.2
Off-RTDs	15.4	47.2	20.3	4.4	5.9
On-beer	264.2	425.0	287.6	214.2	207.9
On-cider	7.1	11.5	9.3	7.9	1.0
On-wine	21.9	15.5	20.0	26.5	20.9
On-spirits	42.7	118.1	35.5	22.5	25.9
On-RTDs	18.9	80.0	16.1	3.8	1.0
Total	**809.2**	**1081.5**	**793.1**	**794.3**	**654.2**
Spending, £ per drinker per year					
Off-beer	63.7	63.6	70.5	76.8	38.9
Off-cider	7.4	0.5	10.9	12.6	1.7
Off-wine	85.8	36.7	73.1	109.5	95.0
Off-spirits	53.6	53.7	40.2	54.5	62.8
Off-RTDs	9.3	23.4	17.6	4.1	0.8
On-beer	346.3	527.0	372.4	306.5	258.5
On-cider	8.3	11.2	11.7	9.9	1.1
On-wine	54.9	41.6	52.1	64.4	52.3
On-spirits	124.2	325.7	112.6	69.9	73.6
On-RTDs	39.3	173.2	29.3	7.9	0.5
Total	**792.8**	**1256.6**	**790.4**	**716.1**	**585.2**
After intervention / Change from baseline					
Change in consumption (units per drinker)	-0.9	-1.1	-1.0	-1.0	-0.5
Change in consumption (%)	-5.7%	-5.4%	-6.5%	-6.4%	-4.0%
Final Consumption (drinker)	14.6	19.6	14.2	14.3	12.0
Absolute change in sales/Consumption volume, units per drinker per year					
Off-beer	-28.4	-37.8	-25.1	-34.7	-15.0
Off-cider	-7.7	-1.5	-13.5	-12.1	-0.9
Off-wine	5.9	0.3	5.2	10.0	4.5
Off-spirits	-9.9	-10.1	-8.3	-11.3	-9.0
Off-RTDs	-4.3	-13.2	-4.6	-1.2	-2.6
On-beer	-5.2	-8.4	-7.0	-3.5	-4.1
On-cider	0.3	0.1	0.6	0.3	0.0
On-wine	1.4	0.8	1.3	1.9	1.2
On-spirits	-0.3	1.1	-0.9	-0.6	-0.2
On-RTDs	2.2	10.5	1.1	0.3	0.1
Total	**-46.0**	**-58.1**	**-51.2**	**-50.9**	**-26.0**
Absolute change in spending, £ per drinker per year					
Off-beer	-1.5	-3.7	-0.5	-1.4	-0.8
Off-cider	-1.7	0.0	-2.9	-2.8	-0.2
Off-wine	8.1	2.9	6.8	11.1	8.2
Off-spirits	0.0	0.7	-0.7	-0.6	1.0
Off-RTDs	-2.3	-5.9	-4.1	-1.1	-0.3
On-beer	-3.9	-2.9	-5.4	-4.4	-2.8
On-cider	0.4	0.2	0.8	0.5	0.0
On-wine	3.5	2.1	3.4	4.6	2.8
On-spirits	-0.8	3.3	-2.8	-1.8	-0.6
On-RTDs	4.6	22.5	2.0	0.7	0.0
Total	**6.3**	**19.4**	**-3.4**	**4.7**	**7.4**

Table 5.16: Relative changes in price, consumption and spending, by beverage type and location for 50p MUP

	Change in price	Change in consumption	Change in spending
Off-trade beer	21.1%	-19.3%	-6.3%
Off-trade cider	14.2%	-32.2%	-5.7%
Off-trade wine	5.4%	3.8%	13.5%
Off-trade spirits	9.6%	-8.7%	2.5%
Off-trade RTDs	4.2%	-28.0%	-20.5%
Subtotal: Off-trade	**12.1%**	**-9.8%**	**3.5%**
On-trade beer	0.8%	-2.0%	-0.9%
On-trade cider	0.8%	3.8%	7.2%
On-trade wine	0.0%	6.4%	8.0%
On-trade spirits	0.0%	-0.6%	-1.1%
On-trade RTDs	0.0%	11.7%	15.5%
Subtotal: On-trade	**1.1%**	**-0.5%**	**0.6%**
Subtotal: Beer		**-8.2%**	**-1.8%**
Subtotal: Cider		**-24.0%**	**4.3%**
Subtotal: Wine		**4.1%**	**11.3%**
Subtotal: Spirits		**-6.5%**	**-0.4%**
Subtotal: RTDs		**-6.1%**	**9.6%**
Total	**6.9%**	**-5.7%**	**1.3%**

Table 5.17: Detailed health outcomes by drinker group and income for 50p MUP

	Population	Moderate	Increasing risk	High risk	In poverty	Not in poverty
Baseline alcohol-attributable deaths per year	556	-40[5]	162	434	214	342
Changes in deaths per year	-63	0	-19	-43	-28	-35
% change in deaths	-11.3%	1.2%	-11.7%	-9.9%	-13.0%	-10.1%
Baseline alcohol-attributable hospital admissions per year (1,000s)	25.8	0.1	8.5	17.2	8.5	17.3
Change in hospital admissions per year (1,000s)	-2.4	-0.1	-0.7	-1.7	-0.9	-1.5
% change in hospital admissions	-9.4%	-59.9%	-8.0%	-9.8%	-10.9%	-8.7%
QALYs saved per year (1,000s)	0.6	0.1	0.2	0.3	0.3	0.3
Healthcare costs per year (£millions)	-2.7	-0.1	-0.7	-2.0	-1.0	-1.8

[5] The value is negative because it is estimated that, due to the "protective" effect of moderate alcohol consumption on ischaemic heart disease, ischaemic stroke and type II diabetes, alcohol has an overall protective effect for moderate drinkers, although there is some debate in the scientific community that this effect exists at all (e.g. [33]).

Table 5.18: Detailed breakdown of deaths and hospital admissions averted by health condition type for 50p MUP

Condition*	Deaths per year (full effect)	Hospital admissions per year (full effect)
Alcoholic liver disease	-23	-166
Cancers	-9	-93
Other disease of the circulatory system	-7	-258
Diseases of the digestive system	-5	-56
Intentional self-harm	-4	-33
Road traffic accidents	-3	-42
Alcoholic disorders (excl. liver disease)	-3	-622
Other accidents	-3	-81
Alcoholic poisoning	-2	-108
Hypertensive diseases	-2	-852
Epilepsy and status epilepticus	-1	-77
Assault	0	-27
Diabetes mellitus	0	-3
Other alcohol-related conditions	0	-6

*Alcoholic liver disease – K70, Cancers – C00-14, C15, C18, C20, C22, C32, C50; Other diseases of the circulatory system – I20-25, I47-48, I60-62, I69.0-69.2, I66, I69.3, I69.4; Diseases of the digestive system – I85, K22.6, K73, K74, K80, K85, K86.1; Intentional self-harm – X60-84; Road traffic accidents - V12-14, V19.4-19.6, V19.9, V20-28, V29-79, V80.3-80.5, V81.1, V82.1, V83-86, V87.0-87.9, V89.2, V89.3, V89.9; Alcoholic disorders (excl. liver disease) – E24.4, G31.2, G62.1, G72.1, I42.6, K29.2, K86.0, F10; Other accidents – V02-04, V06.1, V09.2, V09.3, V90-94, V95-97, W00-19, W24-31, W32-34, W65-74, W78, X00-09, X31; Alcoholic poisoning – T51, X45, Y15, R78.0; Hypertensive diseases – I10-15; Epilepsy and status epilepticus – G40-41; Assault – X85-Y09; Diabetes Mellitus – E11; Other alcohol-related conditions – L40 excl. L40.5, O03.

5.3 EXAMPLE POLICY ANALYSIS B: BAN ON OFF-TRADE PRICE-BASED PROMOTIONS

This section describes the estimated impact of a ban on off-trade price promotion in detail. In addition to the results already presented in Table 5.1 to Table 5.12, further detailed results are shown in Table 5.19 to Table 5.24 for consumption changes, consumer spending and health outcomes.

Overall, 40% of alcohol units sold in the off-trade are sold on promotion. Products on promotion also account for 39% of the total off-trade sales value. Promoted products are sold for an average of 74% of their Recommended Retail Price (RRP), indicating that the average price reduction for off-trade promotions is 26%.

Across the whole population, mean weekly consumption is estimated to change by -2.5%. Consumption is estimated to reduce by 0.29 units per person, or 0.39 units per drinker per week. Weekly consumption reductions are greater for high risk drinkers (-2.8% or 2.4 units) than moderate drinkers (-2.6% or 0.70 units) and similar for those in poverty (-2.3% or 0.26 units) compared to those not in poverty (-2.6% or 0.30 units).

In both income groups, reductions in consumption are estimated to be small for moderate drinkers and larger for high risk drinkers, though the relative difference is greater amongst those living above the poverty line. The estimated consumption reduction for moderate drinkers in poverty is -2.1% or 0.06 units per week compared to -2.4% or 2.3 units per week for high risk drinkers in poverty. The corresponding figures for those not in poverty are -1.9% or 0.07 units and -3.0% or 2.5 units.

Across the whole population, estimated spending increases by 0.7% or £5.30 per drinker per year (£0.10 per week). The cost impact of the policy on consumer spending varies significantly by gender and between different drinker and income subgroups. Men are estimated to reduce their spending by £7.10 per year whilst women increase theirs by £14.50. All drinker groups reduce their spending overall (£2.70, £15.80 and £5.50 overall reduction per year for moderate, increasing risk and high risk drinkers respectively); however, this masks considerable differences between income groups. Moderate drinkers in poverty are estimated to spend £0.60 less per year, while increasing risk and high risk drinks in poverty increase their spending by £9.50 and £30.60 respectively. A different pattern is observed in those not in poverty, with increases of £3.50 and £17.20 per year for moderate and increasing risk drinkers, while high risk drinkers save £1.90 per year. These differing patterns are a result of both the different proportion of each population subgroup's purchases which are affected by the policy as well as the different price elasticities of the beverages which make up a greater or lesser proportion of each subgroup's purchases.

16-24 year olds, who both consume and spend more on alcohol than older age groups are estimated to experience the greatest absolute reduction in consumption (-0.37 units per week). Relative reductions in consumption are greater in older age groups (-2.7%, -2.7% and -2.4% for 25-34 year olds, 35-54 year olds and 55+ year olds respectively compared to -2.2% for 16-24 year olds). Estimated annual spending changes also vary between age groups, with 35-54 and 55+ year olds

being the most effected (£11.00 and £9.90 increase respectively, equivalent to increases of 1.5% and 1.7%) and 25-34 year olds the least effected (£1.40 per year decrease, equivalent to -0.2%).

Overall revenue to the Exchequer from duty and VAT receipts is estimated to reduce by 0.9% or £3.0 million.

Revenue to retailers is estimated to increase by £23.0million (15.8%) in the off-trade and remain unchanged in the on-trade. This is as reduced off-trade sales volumes are more than offset by the increased value of remaining sales.

Effects on health are estimated to be relatively large, with alcohol-attributable deaths estimated to reduce by approximately 25 per year after 20 years, by which time the full effects of the policy will be seen. Reductions in deaths are distributed differentially across drinker groups with approximately 1 saved per year amongst moderate drinkers, 12 amongst increasing risk drinkers and 12 per year amongst high risk drinkers. Whilst those in poverty see a smaller absolute number of reduced deaths annually (6 vs. 19 for those not in poverty), they also comprise a substantially smaller proportion of the population (20.4%), meaning that the relative reductions in annual deaths per 100,000 population is marginally greater amongst those in poverty (2.1 vs. 1.7 for those not in poverty).

Similar patterns are observed amongst reductions in alcohol-related hospital admissions, with an estimated 1,040 fewer admissions per year across the population. Admissions reductions for moderate, increasing risk and high risk drinkers are 90, 410 and 540 respectively. Those in poverty experience a substantially lower absolute reduction in hospital admissions (220 vs. 830), but once population size is accounted for the reduction is broadly similar (74.2 vs. 72.6 fewer admissions per 100,000 population). Direct healthcare costs are estimated to reduce by £0.8m in the 1st year of the policy.

Crime is estimated to fall by 2,311 offences per year overall. Reductions are concentrated amongst heavier drinkers with 315, 1,027 and 969 fewer offences committed by moderate, increasing risk and high risk drinkers respectively. It should also be noted that increasing risk and high risk drinkers (14% and 6% respectively) make up a considerably smaller proportion of the population than moderate drinkers (81%). Costs of crime and policing are estimated to reduce by £8.8m in the 1st year following implementation of the policy.

Workplace absence is estimated to be reduced by 17,100 days per year. This is estimated to lead to a saving in the 1st year of the policy of £1.5m.

The total societal value of these reductions in health, crime and workplace harms is estimated at £401m over the 20 year period modelled. This includes direct healthcare costs (£26m), crime costs (£129m), workplace costs (£22m) and a financial valuation of the QALY gain (£224m), assuming a QALY is valued at £60,000. All costs and benefits are discounted at 3.5%.

Table 5.19: Detailed consumption and spending results for a ban on off-trade price-based promotions

	Population	Male	Female	In poverty	Not in poverty	Moderate	Increasing risk	High risk
Baseline statistics								
Baseline Consumption (units per week)	11.5	19.2	6.3	11.6	11.5	3.6	26.8	86.5
Population size	1,430,500	572,290	858,210	291,727	1,138,773	1,157,172	190,097	83,231
Baseline Consumption (drinker)	15.5	24.3	9.0	17.0	15.2	5.3	26.8	86.5
Drinker population	1,060,680	453,291	607,389	199,512	861,167	787,352	190,097	83,231
% drinkers	74.1%	79.2%	70.8%	68.4%	75.6%	68.0%	100.0%	100.0%
Sales/Consumption volume, units per drinker per year								
Off-beer	146.6	266.9	56.9	194.8	135.5	30.1	224.3	1071.4
Off-cider	23.9	45.5	7.8	70.9	13.0	3.5	26.8	210.9
Off-wine	155.0	143.0	164.0	120.1	163.1	72.3	329.7	538.4
Off-spirits	113.5	140.7	93.1	147.5	105.6	34.1	225.8	608.3
Off-RTDs	15.4	10.6	19.0	29.5	12.2	5.0	22.4	98.3
On-beer	264.2	564.0	40.5	236.4	270.7	70.7	418.1	1743.0
On-cider	7.1	13.0	2.7	3.0	8.0	3.3	12.4	30.9
On-wine	21.9	22.0	21.8	11.8	24.2	19.7	30.0	23.3
On-spirits	42.7	51.2	36.4	47.3	41.6	27.5	72.3	118.4
On-RTDs	18.9	10.3	25.3	23.1	17.9	9.6	36.3	66.8
Total	**809.2**	**1267.0**	**467.6**	**884.3**	**791.8**	**275.9**	**1398.1**	**4509.7**
Spending, £ per drinker per year								
Off-beer	63.7	117.7	23.4	83.0	59.2	14.0	95.8	460.9
Off-cider	7.4	13.3	2.9	16.4	5.3	1.3	8.8	62.2
Off-wine	85.8	80.7	89.7	62.3	91.3	42.6	180.1	279.6
Off-spirits	53.6	66.0	44.3	57.4	52.7	16.9	111.1	269.7
Off-RTDs	9.3	2.6	14.4	12.9	8.5	4.5	20.2	30.0
On-beer	346.3	719.9	67.4	305.5	355.7	130.6	531.3	1963.7
On-cider	8.3	15.3	3.0	2.5	9.6	4.5	14.9	28.6
On-wine	54.9	55.8	54.2	24.4	62.0	50.8	74.8	48.0
On-spirits	124.2	130.2	119.8	98.7	130.1	91.2	225.6	205.4
On-RTDs	39.3	19.0	54.4	39.4	39.3	20.4	80.8	123.0
Total	**792.8**	**1220.5**	**473.6**	**702.6**	**813.7**	**376.8**	**1343.5**	**3470.9**
After intervention / Change from baseline								
Change in consumption (units per drinker)	-0.4	-0.7	-0.2	-0.4	-0.4	-0.1	-0.7	-2.4
Change in consumption (%)	-2.5%	-2.8%	-2.0%	-2.3%	-2.6%	-1.9%	-2.6%	-2.8%
Final Consumption (drinker)	15.1	23.6	8.8	16.6	14.8	5.2	26.1	84.0
Absolute change in sales/Consumption volume, units per drinker per year								
Off-beer	-8.0	-14.3	-3.3	-10.7	-7.4	-1.4	-13.1	-58.7
Off-cider	0.5	0.7	0.3	0.7	0.4	0.1	1.2	2.5
Off-wine	-7.0	-6.4	-7.4	-5.5	-7.3	-2.8	-16.1	-25.4
Off-spirits	3.4	4.0	2.9	3.4	3.3	0.9	7.6	16.6
Off-RTDs	-1.1	-0.7	-1.4	-1.8	-1.0	-0.3	-1.7	-7.4
On-beer	-8.8	-18.9	-1.3	-6.6	-9.3	-2.0	-15.6	-57.5
On-cider	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
On-wine	0.6	0.6	0.6	0.3	0.6	0.5	0.8	0.6
On-spirits	-1.2	-1.3	-1.1	-1.0	-1.3	-0.8	-2.2	-2.8
On-RTDs	1.2	0.7	1.5	1.2	1.1	0.5	2.4	4.7
Total	**-20.5**	**-35.5**	**-9.3**	**-20.0**	**-20.6**	**-5.4**	**-36.5**	**-127.2**
Absolute change in spending, £ per drinker per year								
Off-beer	0.1	0.2	0.0	0.0	0.1	0.0	0.1	0.5
Off-cider	0.6	1.1	0.3	1.4	0.5	0.1	0.8	5.3
Off-wine	10.5	9.6	11.1	7.0	11.3	5.1	22.6	33.5
Off-spirits	5.9	6.9	5.1	5.9	5.9	1.8	12.5	29.2
Off-RTDs	-0.5	-0.1	-0.8	-0.7	-0.5	-0.2	-1.2	-1.7
On-beer	-11.4	-23.8	-2.2	-9.3	-11.9	-3.7	-19.7	-65.5
On-cider	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.2
On-wine	1.4	1.4	1.4	0.6	1.6	1.3	2.1	1.3
On-spirits	-3.8	-3.7	-3.8	-3.0	-3.9	-2.7	-6.8	-6.5
On-RTDs	2.4	1.2	3.3	2.2	2.5	1.0	5.4	9.1
Total	**5.3**	**-7.1**	**14.5**	**4.1**	**5.5**	**2.7**	**15.8**	**5.5**

Table 5.20: Detailed income- and drinker group-specified results for a ban on off-trade price-based promotions

	In Poverty			Not in Poverty		
	Moderate	Increasing risk	High risk	Moderate	Increasing risk	High risk
Baseline statistics						
Baseline Consumption (units per week)	2.9	25.1	95.7	3.8	27.2	83.8
Population size	238,143	34,608	18,976	919,029	155,489	64,255
Baseline Consumption (drinker)	4.8	25.1	95.7	5.4	27.2	83.8
Drinker population	145,928	34,608	18,976	641,423	155,489	64,255
% drinkers	61.3%	100.0%	100.0%	69.8%	100.0%	100.0%
Sales/Consumption volume, units per drinker per year						
Off-beer	31.0	212.6	1422.1	29.9	226.8	967.8
Off-cider	5.8	43.5	621.8	2.9	23.1	89.6
Off-wine	49.5	234.7	454.6	77.5	350.8	563.2
Off-spirits	37.3	270.9	769.4	33.3	215.7	560.7
Off-RTDs	9.0	36.6	173.9	4.1	19.3	76.0
On-beer	65.4	373.9	1300.3	72.0	427.9	1873.7
On-cider	2.4	6.5	1.8	3.5	13.7	39.5
On-wine	9.6	15.4	21.5	22.0	33.3	23.9
On-spirits	27.4	60.4	176.5	27.6	75.0	101.2
On-RTDs	13.1	52.3	46.5	8.9	32.7	72.7
Total	**250.5**	**1306.8**	**4988.6**	**281.7**	**1418.4**	**4368.3**
Spending, £ per drinker per year						
Off-beer	13.1	90.4	607.1	14.2	97.0	417.8
Off-cider	2.0	11.9	135.5	1.1	8.1	40.5
Off-wine	27.3	117.9	230.9	46.1	194.0	293.9
Off-spirits	19.7	110.5	250.5	16.2	111.3	275.3
Off-RTDs	8.1	39.4	1.7	3.7	16.0	38.3
On-beer	133.8	451.1	1361.2	129.9	549.1	2141.6
On-cider	2.8	2.8	0.0	4.9	17.6	37.1
On-wine	22.7	35.4	17.2	57.3	83.5	57.1
On-spirits	89.9	160.5	53.4	91.4	240.1	250.2
On-RTDs	24.3	107.8	30.2	19.6	74.8	150.4
Total	**343.6**	**1127.6**	**2687.7**	**384.3**	**1391.5**	**3702.2**
After intervention / Change from baseline						
Change in consumption (units per drinker)	-0.1	-0.5	-2.3	-0.1	-0.7	-2.5
Change in consumption (%)	-2.1%	-2.1%	-2.4%	-1.9%	-2.7%	-3.0%
Final Consumption (drinker)	4.7	24.5	93.4	5.3	26.5	81.3
Absolute change in sales/Consumption volume, units per drinker per year						
Off-beer	-1.6	-12.7	-76.6	-1.4	-13.1	-53.4
Off-cider	0.3	2.4	0.3	0.1	0.9	3.1
Off-wine	-2.4	-11.0	-19.2	-2.9	-17.2	-27.3
Off-spirits	1.3	9.2	9.2	0.8	7.3	18.8
Off-RTDs	-0.4	-2.5	-10.5	-0.3	-1.5	-6.5
On-beer	-2.3	-15.3	-24.1	-1.9	-15.6	-67.4
On-cider	0.0	0.0	0.0	0.0	0.1	0.2
On-wine	0.2	0.4	0.5	0.6	0.9	0.6
On-spirits	-0.8	-1.8	-1.1	-0.8	-2.2	-3.2
On-RTDs	0.7	3.5	1.8	0.4	2.2	5.6
Total	**-5.1**	**-28.0**	**-119.7**	**-5.4**	**-38.4**	**-129.5**
Absolute change in spending, £ per drinker per year						
Off-beer	0.0	-0.1	0.7	0.1	0.1	0.4
Off-cider	0.2	1.1	11.0	0.1	0.7	3.7
Off-wine	3.3	13.8	23.2	5.5	24.6	36.5
Off-spirits	2.1	12.4	23.3	1.8	12.5	31.0
Off-RTDs	-0.3	-2.6	-0.1	-0.2	-0.9	-2.1
On-beer	-4.8	-18.2	-27.9	-3.5	-20.0	-76.6
On-cider	0.0	-0.1	0.0	0.0	0.1	0.2
On-wine	0.5	0.8	0.5	1.4	2.3	1.5
On-spirits	-2.8	-5.1	-1.1	-2.7	-7.2	-8.1
On-RTDs	1.2	7.4	1.0	1.0	5.0	11.5
Total	**-0.6**	**9.5**	**30.6**	**3.5**	**17.2**	**-1.9**

Table 5.21: Detailed age group-specific results for ban on off-trade price-based promotions

	Population	16-24	25-34	35-54	55+
Baseline statistics					
Baseline Consumption (units per week)	11.5	16.8	12.9	12.2	7.3
Population size	1,430,500	229,266	248,810	496,781	455,642
Baseline Consumption (drinker)	15.5	20.7	15.2	15.2	12.5
Drinker population	1,060,680	186,113	211,274	396,590	266,703
% drinkers	74.1%	81.2%	84.9%	79.8%	58.5%
Sales/Consumption volume, units per drinker per year					
Off-beer	146.6	154.7	156.3	178.4	86.1
Off-cider	23.9	27.8	30.7	30.1	6.7
Off-wine	155.0	68.9	126.4	196.7	175.7
Off-spirits	113.5	132.9	91.0	109.8	123.2
Off-RTDs	15.4	47.2	20.3	4.4	5.9
On-beer	264.2	425.0	287.6	214.2	207.9
On-cider	7.1	11.5	9.3	7.9	1.0
On-wine	21.9	15.5	20.0	26.5	20.9
On-spirits	42.7	118.1	35.5	22.5	25.9
On-RTDs	18.9	80.0	16.1	3.8	1.0
Total	**809.2**	**1081.5**	**793.1**	**794.3**	**654.2**
Spending, £ per drinker per year					
Off-beer	63.7	63.6	70.5	76.8	38.9
Off-cider	7.4	0.5	10.9	12.6	1.7
Off-wine	85.8	36.7	73.1	109.5	95.0
Off-spirits	53.6	53.7	40.2	54.5	62.8
Off-RTDs	9.3	23.4	17.6	4.1	0.8
On-beer	346.3	527.0	372.4	306.5	258.5
On-cider	8.3	11.2	11.7	9.9	1.1
On-wine	54.9	41.6	52.1	64.4	52.3
On-spirits	124.2	325.7	112.6	69.9	73.6
On-RTDs	39.3	173.2	29.3	7.9	0.5
Total	**792.8**	**1256.6**	**790.4**	**716.1**	**585.2**
After intervention / Change from baseline					
Change in consumption (units per drinker)	-0.4	-0.5	-0.4	-0.4	-0.3
Change in consumption (%)	-2.5%	-2.2%	-2.7%	-2.7%	-2.4%
Final Consumption (drinker)	15.1	20.3	14.8	14.8	12.2
Absolute change in sales/Consumption volume, units per drinker per year					
Off-beer	-8.0	-9.0	-8.3	-9.7	-4.6
Off-cider	0.5	0.2	0.9	0.5	0.4
Off-wine	-7.0	-3.9	-5.4	-8.4	-8.3
Off-spirits	3.4	4.4	2.8	3.0	3.6
Off-RTDs	-1.1	-3.3	-1.3	-0.4	-0.6
On-beer	-8.8	-14.7	-10.6	-6.9	-6.0
On-cider	0.0	0.0	0.0	0.1	0.0
On-wine	0.6	0.4	0.5	0.7	0.6
On-spirits	-1.2	-3.0	-1.1	-0.7	-0.8
On-RTDs	1.2	5.1	0.9	0.2	0.1
Total	**-20.5**	**-24.0**	**-21.6**	**-21.6**	**-15.6**
Absolute change in spending, £ per drinker per year					
Off-beer	0.1	-0.1	0.0	0.2	0.1
Off-cider	0.6	0.0	1.1	1.0	0.2
Off-wine	10.5	4.4	8.2	13.7	11.6
Off-spirits	5.9	6.7	4.0	6.0	6.7
Off-RTDs	-0.5	-1.2	-1.0	-0.3	-0.1
On-beer	-11.4	-18.1	-13.3	-9.8	-7.7
On-cider	0.0	0.0	0.1	0.1	0.0
On-wine	1.4	1.0	1.3	1.7	1.4
On-spirits	-3.8	-9.6	-3.5	-2.2	-2.3
On-RTDs	2.4	11.0	1.7	0.5	0.0
Total	**5.3**	**-5.9**	**-1.4**	**11.0**	**9.9**

Table 5.22: Relative changes in price, consumption and spending, by beverage type and location, for a ban on off-trade price-based promotions

	Change in price	Change in consumption	Change in spending
Off-trade beer	5.9%	-5.5%	0.1%
Off-trade cider	6.6%	2.0%	8.7%
Off-trade wine	17.5%	-4.5%	12.2%
Off-trade spirits	7.8%	3.0%	11.0%
Off-trade RTDs	1.8%	-7.3%	-5.6%
Subtotal: Off-trade	**10.5%**	**-2.7%**	**7.5%**
On-trade beer	0.0%	-3.3%	-3.3%
On-trade cider	0.1%	0.4%	0.5%
On-trade wine	0.0%	2.6%	2.6%
On-trade spirits	-0.2%	-2.8%	-3.0%
On-trade RTDs	0.1%	6.1%	6.2%
Subtotal: On-trade	**0.4%**	**-2.3%**	**-2.0%**
Subtotal: Beer		**-4.1%**	**-2.8%**
Subtotal: Cider		**1.6%**	**4.4%**
Subtotal: Wine		**-3.6%**	**8.4%**
Subtotal: Spirits		**1.4%**	**1.2%**
Subtotal: RTDs		**0.1%**	**3.9%**
Total	**3.3%**	**-2.5%**	**0.7%**

Table 5.23: Detailed health outcomes by drinker group and income for a ban on off-trade price-based promotions

	Population	Moderate	Increasing risk	High risk	In poverty	Not in poverty
Baseline alcohol-attributable deaths per year	556	-40	162	434	214	342
Changes in deaths per year	-25	-1	-12	-12	-6	-19
% change in deaths	-4.6%	2.2%	-7.6%	-2.8%	-2.9%	-5.6%
Baseline alcohol-attributable hospital admissions per year (1,000s)	25.8	0.1	8.5	17.2	8.5	17.3
Changes in hospital admissions per year (1,000s)	-1.0	-0.1	-0.4	-0.5	-0.2	-0.8
% change in hospital admissions	-4.0%	-75.7%	-4.9%	-3.1%	-2.6%	-4.8%
QALYs saved per year (1,000s)	0.2	0.0	0.1	0.1	0.1	0.2
Healthcare costs per year (€millions)	-1.2	-0.1	-0.4	-0.7	-0.2	-1.0

Table 5.24: Detailed breakdown of deaths and hospital admissions averted by health condition type for a ban on off-trade price-based promotions

Condition*	Deaths per year (full effect)	Hospital admissions per year (full effect)
Alcoholic liver disease	-9	-65
Cancers	-4	-46
Other disease of the circulatory system	-3	-140
Diseases of the digestive system	-2	-18
Other accidents	-1	-39
Alcoholic disorders (excl. liver disease)	-1	-261
Intentional self-harm	-1	-11
Alcoholic poisoning	-1	-44
Hypertensive diseases	-1	-361
Road traffic accidents	-1	-17
Epilepsy and status epilepticus	0	-28
Assault	0	-10
Other alcohol-related conditions	0	-4
Diabetes mellitus	0	0

*Alcoholic liver disease – K70, Cancers – C00-14, C15, C18, C20, C22, C32, C50; Other diseases of the circulatory system – I20-25, I47-48, I60-62, I69.0-69.2, I66, I69.3, I69.4; Diseases of the digestive system – I85, K22.6, K73, K74, K80, K85, K86.1; Other accidents – V02-04, V06.1, V09.2, V09.3, V90-94, V95-97, W00-19, W24-31, W32-34, W65-74, W78, X00-09, X31; Alcoholic disorders (excl. liver disease) – E24.4, G31.2, G62.1, G72.1, I42.6, K29.2, K86.0, F10; Intentional self-harm – X60-84; Alcoholic poisoning – T51, X45, Y15, R78.0; Hypertensive diseases – I10-15; Road traffic accidents - V12-14, V19.4-19.6, V19.9, V20-28, V29-79, V80.3-80.5, V81.1, V82.1, V83-86, V87.0-87.9, V89.2, V89.3, V89.9; Epilepsy and status epilepticus – G40-41; Assault – X85-Y09; Other alcohol-related conditions – L40 excl. L40.5, O03; Diabetes Mellitus – E11.

5.4 SENSITIVITY ANALYSES

The results of the 3 sensitivity analyses described in Section 4.7 are presented in Table 5.25 for two exemplar policies: a 50p MUP and a ban on off-trade price-based promotions. These results show similar reductions in consumption at population level for all four analyses for both the 50p MUP policy (-5.3% to -6.1%, around the base case estimate of -5.7%) and the promotions ban (-1.7% to -2.6%, around the base case estimate of -2.5%). The effects of the sensitivity analyses are not uniform across subgroups. For example, SA3 on a promotions ban shows larger effects in moderate drinkers and smaller effects in increasing risk and high risk drinkers. Table 5.26 shows the impact of the alternative elasticity estimates on estimated harm outcomes.

Table 5.25: Comparison of estimated impacts on alcohol consumption for a 50p MUP and a ban on off-trade price-based promotions using alternative elasticities

	50p MUP: alternative elasticities			
	Base case	SA1 - No cross-price	SA2 - No non-significant	SA3 - Consumption level-specific
Population	-5.7%	-5.5%	-5.3%	-6.1%
Moderate	-1.6%	-2.6%	-2.4%	-1.8%
Increasing risk	-5.0%	-5.0%	-4.8%	-6.4%
High risk	-8.6%	-7.4%	-7.2%	-8.5%
In poverty	-9.4%	-7.9%	-7.6%	-8.6%
Not in poverty	-4.7%	-4.8%	-4.6%	-5.5%
	Ban on off-trade promotions: alternative elasticities			
	Base case	SA1 - No cross-price	SA2 - No non-significant	SA3 - Consumption level-specific
Population	-2.5%	-2.6%	-2.3%	-1.7%
Moderate	-1.9%	-2.4%	-2.2%	-3.5%
Increasing risk	-2.6%	-2.9%	-2.6%	-0.7%
High risk	-2.8%	-2.6%	-2.1%	-1.3%
In poverty	-2.3%	-2.7%	-2.0%	-1.5%
Not in poverty	-2.6%	-2.6%	-2.3%	-1.7%

SA1 – assuming all cross-price elasticities to be zero (i.e. no substitution effects) in the elasticity matrix used for the base case. SA2 – excluding all non-significant elasticities (p-value>0.05) in the elasticity matrix used for the base case. SA3 – Separate moderate- and increasing risk/high risk-specific elasticity matrices were estimated using a similar approach to the base case.

Figure 5.12: Comparison of estimated impacts on alcohol consumption of a 50p MUP policy using alternative elasticities

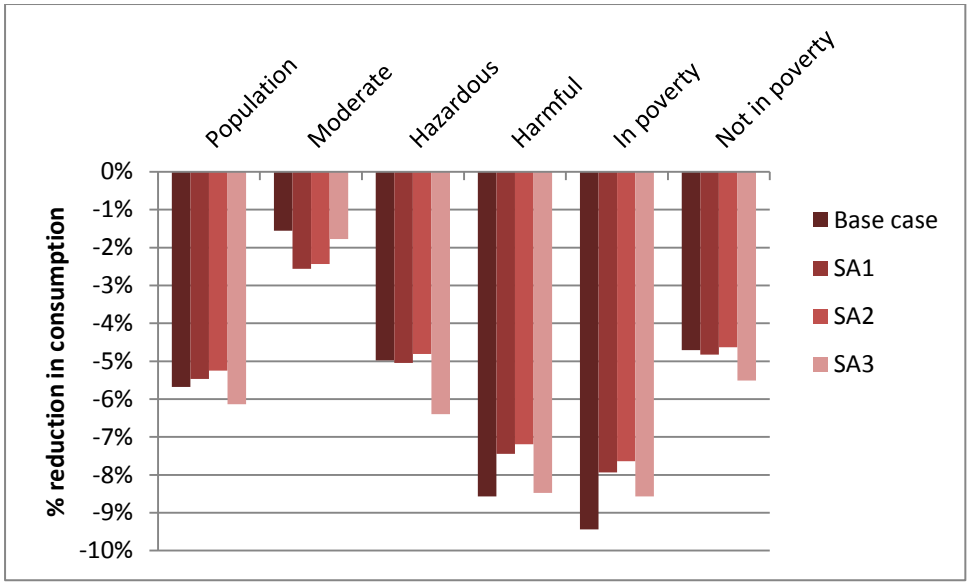


Figure 5.13: Comparison of estimated impacts on alcohol consumption of a ban on off-trade price-based promotions using alternative elasticities

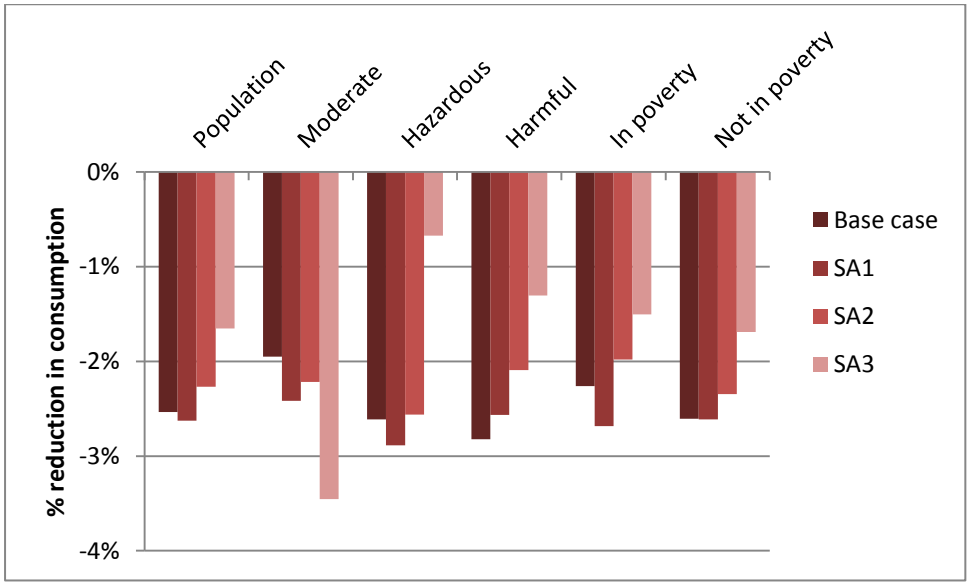


Table 5.26: Comparison of estimated impacts on harm outcomes of a 50p MUP and a ban on off-trade price-based promotions using alternative elasticities

		Harm reductions in year 20			
		Deaths per year	Hospital admissions per year	Crimes per year	Workplace absence days per year
50p MUP	Base case	-63	-2,425	-5,293	-34,995
	SA1 - No cross-price	-56	-1,944	-4,793	-33,377
	SA2 - No non-significant	-54	-1,853	-4,622	-31,905
	SA3 - Consumption level-specific	-65	-2,234	-6,205	-39,807
Promotions ban	Base case	-25	-1,043	-2,311	-17,074
	SA1 - No cross-price	-30	-1,069	-1,732	-16,433
	SA2 - No non-significant	-26	-930	-1,451	-14,367
	SA3 - Consumption level-specific	-1	308	-1,808	-10,521

6 DISCUSSION

This research study presents the synthesis of evidence available to undertake policy appraisal of 20 options for price regulation of alcohol in NI. In this discussion section, we draw out the key themes and findings from the detailed analysis.

6.1 DIFFERENTIAL POLICY IMPACTS

We have examined 9 policy options for a minimum price threshold ranging from 35p to 75p per unit of alcohol. The estimated per person reduction in alcohol consumption for the overall population ranges from 0.8% to 19.4% for a MUP policy with thresholds set from 35p to 75p per unit of alcohol, with higher MUP thresholds leading to greater reductions in consumption. These consumption reductions lead to estimated reductions in deaths from 9 to 212 per year, hospital admissions from 410 to 8470 per year, crime from 720 to 19010 per year and days absence from work from 4900 to 131400 per year for a MUP policy with thresholds set from 35p to 75p per unit of alcohol, again with higher MUP thresholds leading to greater reductions in alcohol-related harms. Specifically, a 50p MUP policy is estimated to reduce per person alcohol consumption by 5.7% and lead to 63 fewer deaths, 2430 fewer hospital admissions, 5290 fewer crimes and 35000 fewer absent days in NI per year.

In contrast, a policy to ban below-cost selling has virtually no impact on consumption and alcohol-related harms because most alcohol sold in the market would not be affected by the policy.

A policy to ban all price-based promotion in the off-trade is estimated to reduce per person alcohol consumption by 2.5% and leads to 25 fewer deaths, 1040 fewer hospital admissions, 2310 fewer crimes and 17100 fewer absent days in NI per year. The same pattern of consumption and harm reductions is found for policies combining MUP and a ban on price-based promotion in the off-trade, with higher MUP thresholds leads to greater reductions in consumption and alcohol-related harms. For the same MUP threshold, a combined policy is more effective in consumption and harm reduction than the single MUP policy, but the additional benefit is diminishing as the MUP threshold increases. For example, per person consumption reductions for without a promotions ban versus with the promotions ban are estimated to be 2.1% versus 4.1% (difference is 2%) for a 40p MUP, , 5.7% versus 7.5% (difference is 1.8%) for 50p, and 10.6% versus 12.1% (difference is 1.5%) for a 60p MUP without or with the promotion ban.

In summary, MUP policies are estimated to reduce alcohol consumption and alcohol-related mortality, hospital admissions, crime and absence from work in NI either as a single policy or in combination with a ban on price-based promotion in the off-trade; and the higher the threshold of MUP is set, the greater the reduction in alcohol consumption and alcohol-related harms.

6.2 IMPACTS BY DRINKER GROUP

In line with findings from previous studies in England, Scotland and Canada, this analysis shows that MUP is policy targeted at increasing risk and high risk drinkers [3], [4], [7]. The main reason for this is that high risk drinkers tend to favour the cheaper alcohol, which is mostly affected by MUP policies. See for example Figure 4.7 which shows that high risk drinkers buy more than half of their alcohol at below 50p per unit, whereas moderate drinkers buy less than a quarter of their alcohol below the threshold.

A 50p MUP is estimated to reduce alcohol consumption by 1.6%, 5.0% and 8.6% for moderate, increasing risk and high risk drinkers respectively. The absolute reduction in alcohol units consumed is estimated at just 0.1 per week for moderate drinkers, 1.3 per week for increasing risk, and 7.4 per week for high risk drinkers. So it is the high risk drinkers who are most affected in terms of scale of consumption reduction.

This in turn is reflected in the harm reductions for the 50p MUP policy. High risk drinkers, who make up 6% of the population, contribute to 43 out of 63 (68%) and 1700 out of 2430 (70%) estimated annual reductions in deaths and hospital admissions for the policy.

6.3 IMPACTS BY INCOME

The analyses also present income-specific results from SAPM3 for NI and five main findings should be highlighted.

First, when interpreting these results, it should be borne in mind that 31.6% of those in poverty are non-drinkers compared to 24.4% of those not in poverty and, amongst moderate drinkers, those in poverty consume 4.8 units per week compared to 5.4 units for those not in poverty. Therefore, the subgroup of the population which is in poverty contains a disproportionate number of people who will be wholly or largely unaffected by the direct impacts of MUP due to their abstinence or relatively low consumption.

Second, MUP impacts on the consumption of both in poverty and not in poverty income groups; however, it has a greater relative impact on the consumption of drinkers in poverty. As we assume drinkers in poverty and not in poverty are equally responsive to price changes when they have the same consumption patterns, this difference in estimated policy impact is due to 1) drinkers in poverty tending to buy more products from the cheaper end of the spectrum, and 2) the larger price elasticities of the products favoured by drinkers in poverty, particularly beer and cider purchased in the off-trade.

Third, the impact of a 50p MUP on some groups is very small in absolute terms. Consumption amongst moderate drinkers in poverty and not in poverty respectively would fall by just 9.4 and 3.1 units per year. This compares with an average reduction of 650.1 units for in poverty high risk drinkers and 308.5 units for not in poverty high risk drinkers.

Fourth, the impact of a MUP on drinkers in poverty's spending is smaller overall, and within each consumption group, than the impact on drinkers who are not in poverty's spending. This is because

the products favoured by drinkers not in poverty have smaller price elasticities and thus, although drinkers not in poverty do reduce their consumption, they are also more likely to increase their spending in response to price increases.

Finally, the greater fall in consumption amongst drinkers in poverty also leads to greater reductions in alcohol-related health harms within this group. For a 50p MUP, the estimated reductions in deaths are 13.0% and 10.1% for drinkers in poverty and not in poverty respectively. For hospital admissions, the estimated reductions are 10.9% and 8.7% for drinkers in poverty and not in poverty.

In summary, the income-specific analysis of the potential impacts of a 50p MUP suggests that MUP will impact on both drinkers in poverty and not in poverty and that, within each income group, the impacts on high risk drinkers will be substantial and greater than the impacts on moderate drinkers. A key policy concern is whether moderate drinkers in poverty are 'penalised' by MUP. Policy impacts on moderate drinkers in poverty are small in absolute terms, amounting to a consumption reduction of just 9.4 units per year and a spending increase of just £0.50 per year. As moderate consumers make up 81.6% of the in poverty population and 31.6% of these are abstainers and thus not directly affected by the policy, our estimates suggest only a small minority of those in poverty will be substantially impacted by MUP and these individuals will be those who, though in poverty, consume at increasing risk or high risk levels. The greater health benefits of MUP for lower income drinkers suggest the policy may also contribute to the reduction of health inequalities.

6.4 IMPACTS ON REVENUE TO THE EXCHEQUER AND RETAILERS

When prices and consumption change then the revenue to government will change also because duty is levied on amount of ethanol content (e.g. beer and spirits) or product volume (e.g. wine and cider) that is sold, and VAT is charged on the sales value.

A 50p MUP is estimated to lead to an overall decrease in revenue for the Exchequer of £8.2 m (2.6%), with a decrease in duty plus VAT revenue from the off-trade of £8.8m (10.1%) and a small increase from the on-trade of £0.6m (0.3%). The decrease in duty plus VAT revenue from the off-trade is mainly due to the decrease in off-trade duty receipts which are directly linked to the reduction in alcohol consumption, as duty is levied on either ethanol content (e.g. beer and spirits) or product volume (e.g. wine and cider).

Retailers' revenues are affected to a larger extent than those of government. A 50p MUP is estimated to lead to an overall increase in revenue for retailers of £25.3m (4.8%), with increase in revenue for off-trade retailers of £22.2m (15.3%) and for on-trade retailers of £3.1m (0.8%).

The relative inelasticity of alcohol (see Table 4.4 where most estimated own-price elasticities are smaller than 1) means that the average consumer response to alcohol price increases includes paying more as well as buying less, and when elasticities are less than 1, spending and hence revenue to retailers increases even though consumption falls.

Table 4.4 also shows that there is a mix of positive and negative cross-price elasticities of demand for on-trade beverages with regard to off-trade prices, and the magnitude of these cross-price elasticities are smaller than the own-price elasticities. This leads to the small increase in revenue for on-trade retailers even though the prices of products in the on-trade are largely unaffected by the policy.

Caution is required regarding the estimated impacts on revenue for on-trade due to the lack of statistical significance for many of the cross-price elasticities.

It should also be noted that considerable uncertainty exists regarding retailers' responses to the introduction of a MUP. SAPM3 assumes the only change in pricing that will occur is for all prices of products below the MUP threshold to be raised up to that threshold. In reality, retailers and producers may make a range of additional changes to both prices and products which may impact on resulting revenue changes to the Exchequer and retailers and other modelled outcomes.

6.5 IMPACTS ON ALCOHOL-RELATED CRIME

A 50p MUP is estimated to lead to 5,300 fewer crimes. High risk drinkers, who comprise around 6% of the population, account for 51% of this reduction. Costs of crime are estimated to reduce by £19.9million in the 1st year following implementation of this policy, with higher MUP thresholds providing even greater savings (e.g. £60.4million for a 70p MUP).

This is most likely to an underestimation of the true savings because 1) The AAF estimates used to calibrate the crime risk functions (see Section 4.5.3) which were derived from the Offending Crime and Justice Survey were based on a question asking respondents whether alcohol was one of the reasons for committing the crime, rather than a question asking whether the offender was drunk when the crime was committed. It is likely that the responses to the former question underestimate the impact of alcohol on crime levels, whilst the latter question would overestimate this impact; and 2) the crime categories shown in Table 4.8 and included in the model exclude a number of offences which have some alcohol-related component. These offences were excluded because of either a lack of evidence on the AAF of the offence (e.g. riotous behaviour) or because of a lack of available evidence on the valuation of the harm (e.g. drink-driving offences).

6.6 IMPACTS ON WORK ABSENCE

Workplace absence is estimated to fall under all modelled policies, with a reduction of 35,000 days absent per year for a 50p MUP, valued at £3.1m in the first year of the policy and £292million over 20 years.

6.7 RELATIVE MERITS OF MUP AND PRICE-BASED PROMOTIONS BAN IN COMPARISON WITH TAX INCREASES.

Modelling of taxation policies was out-with the scope of this report. It is nevertheless worthwhile rehearsing for policy makers some key principles in terms of the difference in targeting between MUP and general tax rises.

Firstly, MUP is targeted at increasing the price only of cheap alcohol sold below the MUP threshold. In contrast, it is expected that a tax increase (most likely through increased duty rates) would increase the price of all alcohol sold in the market because alcohol duties are levied on either ethanol content or product volume. The likelihood is therefore that moderate drinkers would be much more affected by a general tax rise than a MUP policy targeted at cheaper alcohol.

Secondly, there is the issue of whether and how retailers pass through the tax increases to customers. A recent study shows that when duty increases in the UK, supermarkets have tended to increase the price of more expensive alcohol more than the tax increase and increase the price of cheaper alcohol less than the tax increase [32]. This in turn is likely to reduce the impact of the tax policy on increasing and high risk drinkers and drinkers who prefer cheaper alcohol.

7 REFERENCES

[1] D. Glover and J. Henderson, “Quantifying health impacts of government policies,” London, 2010.

[2] R. Purshouse, A. Brennan, N. Latimer, Y. Meng, R. Rafia, R. Jackson, and P. Meier, “Modelling to assess the effectiveness and cost-effectiveness of public health related strategies and interventions to reduce alcohol attributable harm in England using the Sheffield Alcohol Policy Model version 2.0,” Sheffield, 2009.

[3] Y. Meng, D. Hill-McManus, A. Brennan, and P. Meier, “Model-Based Appraisal of Alcohol Minimum Pricing and off-Licensed Trade Discount Bans in Scotland using the Sheffield Alcohol Policy Model (v.2): Second update based on newly available data,” Sheffield, 2012.

[4] D. Hill-McManus, A. Brennan, T. Stockwell, N. Giesbrecht, G. Thomas, J. Zhao, G. Martin, and A. Wettlaufer, “Model-Based Appraisal Of Alcohol Minimum Pricing In Ontario And British Columbia: A Canadian adaptation of the Sheffield Alcohol Policy Model Version 2,” 2012.

[5] C. Angus, E. Scafato, S. Ghirini, A. Torbica, F. Ferre, P. Struzzo, R. Purshouse, and A. Brennan, “Cost-effectiveness of a programme of screening and brief interventions for alcohol in primary care in Italy.,” *BMC Fam. Pract.*, vol. 15, no. 1, p. 26, Jan. 2014.

[6] Y. Meng, A. Brennan, J. Holmes, D. Hill-McManus, C. Angus, R. Purshouse, and P. S. Meier, “Modelled income group-specific impacts of alcohol minimum unit pricing in England 2014/15: Policy appraisals using new developments to the Sheffield Alcohol Policy Model (v2.5),” 2013.

[7] J. Holmes, Y. Meng, P. S. Meier, A. Brennan, C. Angus, A. Campbell-Burton, Y. Guo, D. Hill-McManus, and R. C. Purshouse, “Effects of minimum unit pricing for alcohol on different income and socioeconomic groups: a modelling study.,” *Lancet*, vol. 383, no. 9929, pp. 1655–64, May 2014.

[8] Office for National Statistics, “Consumer Price Inflation Reference Tables,” 2014.

[9] Y. Meng, A. Brennan, R. Purshouse, D. Hill-McManus, C. Angus, J. Holmes, and P. S. Meier, “Estimation of own and cross price elasticities of alcohol demand in the UK-A pseudo-panel approach using the Living Costs and Food Survey 2001-2009.,” *J. Health Econ.*, vol. 34, pp. 96–103, Mar. 2014.

[10] J. Rehm, D. Baliunas, and G. Borges, “The relation between different dimensions of alcohol consumption and burden of disease: an overview,” *Addiction*, vol. 105, no. 5, pp. 817–843, 2010.

[11] J. Rehm and C. Mathers, “Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders,” *Lancet*, vol. 373, pp. 2223–33, 2009.

[12] I. Tramacere, E. Negri, V. Bagnardi, W. Garavello, M. Rota, L. Scotti, F. Islami, G. Corrao, P. Boffetta, and C. La Vecchia, “A meta-analysis of alcohol drinking and oral and pharyngeal

cancers. Part 1: overall results and dose-risk relation.," *Oral Oncol.*, vol. 46, no. 7, pp. 497–503, Jul. 2010.

[13] G. Corrao, V. Bagnardi, A. Zambon, and C. La Vecchia, "A meta-analysis of alcohol consumption and the risk of 15 diseases.," *Prev. Med. (Baltim).*, vol. 38, no. 5, pp. 613–9, May 2004.

[14] F. Islami, I. Tramacere, M. Rota, V. Bagnardi, V. Fedirko, L. Scotti, W. Garavello, M. Jenab, G. Corrao, K. Straif, E. Negri, P. Boffetta, and C. La Vecchia, "Alcohol drinking and laryngeal cancer: overall and dose-risk relation--a systematic review and meta-analysis.," *Oral Oncol.*, vol. 46, no. 11, pp. 802–10, Nov. 2010.

[15] J. Key, S. Hodgson, R. Z. Omar, T. K. Jensen, S. G. Thompson, A. R. Boobis, D. S. Davies, and P. Elliott, "Meta-analysis of studies of alcohol and breast cancer with consideration of the methodological issues.," *Cancer causes Control CCC*, vol. 17, no. 6, pp. 759–70, Aug. 2006.

[16] E. Gutjahr, G. Gmel, and J. Rehm, "Relation between average alcohol consumption and disease: an overview.," *Eur. Addict. Res.*, vol. 7, no. 3, pp. 117–27, Aug. 2001.

[17] A. V Samokhvalov, H. Irving, S. Mohapatra, and J. Rehm, "Alcohol consumption, unprovoked seizures, and epilepsy: a systematic review and meta-analysis.," *Epilepsia*, vol. 51, no. 7, pp. 1177–84, Jul. 2010.

[18] S. Kodama, K. Saito, S. Tanaka, C. Horikawa, A. Saito, Y. Heianza, Y. Anasako, Y. Nishigaki, Y. Yachi, K. T. Iida, Y. Ohashi, N. Yamada, and H. Sone, "Alcohol consumption and risk of atrial fibrillation: a meta-analysis.," *J. Am. Coll. Cardiol.*, vol. 57, no. 4, pp. 427–36, Jan. 2011.

[19] D. English, C. Holman, and E. Milne, "The quantification of drug caused morbidity and mortality in Australia 1995 edition," 1995.

[20] B. J. Taylor, K. D. Shield, and J. T. Rehm, "Combining best evidence: a novel method to calculate the alcohol-attributable fraction and its variance for injury mortality.," *BMC Public Health*, vol. 11, no. 1, p. 265, Jan. 2011.

[21] L. Gunning-Schepers, "The health benefits of prevention: a simulation approach.," *Health Policy (New. York).*, vol. 12, no. 1–2, pp. 1–255, Jul. 1989.

[22] K. M. Fillmore, W. C. Kerr, T. Stockwell, T. Chikritzhs, and A. Bostrom, "Moderate alcohol use and reduced mortality risk: Systematic error in prospective studies," *Addict. Res. Theory*, vol. 14, no. 2, pp. 101–132, Jan. 2006.

[23] D. Hill-McManus, C. Angus, Y. Meng, J. Holmes, A. Brennan, and P. Sylvia Meier, "Estimation of usual occasion-based individual drinking patterns using diary survey data," *Drug Alcohol Depend.*, 2013.

[24] D. Hill-McManus, C. Angus, Y. Meng, J. Holmes, A. Brennan, and P. Meier, "Injury alcohol-attributable fractions: methodological issues and developments," Sheffield, 2014.

[25] J. Holmes, P. S. Meier, A. Booth, Y. Guo, and A. Brennan, "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.*, vol. 123, no. 1–3, pp. 7–14, Jun. 2012.

[26] Office for National Statistics, "Population estimates for UK, England and Wales, Scotland and Northern Ireland - Mid 2012," 2013.

[27] L. Jones, M. Bellis, D. Dedman, H. Sumnall, and K. Tocque, "Alcohol-attributable fractions for England Alcohol-attributable mortality and hospital admissions," North West Public Health Observatory, Centre for Public Health Research Directorate, Liverpool John Morres University, Liverpool, Liverpool, 2008.

[28] Cardiff Research Consortium, "Health Outcomes Data Repository," 2011.

[29] "Revisions made to the multipliers and unit costs of crime used in the Integrated Offender Management Value for Money Toolkit." [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118042/IOM-phase2-costs-multipliers.pdf. [Accessed: 27-May-2014].

[30] ONS, "Labour Force Survey," 2013.

[31] HM Treasury, "The green book: appraisal and evaluation in central government," London: The Stationary Office, 2003.

[32] A. K. Ally, Y. Meng, R. Chakraborty, P. W. Dobson, J. S. Seaton, J. Holmes, C. Angus, Y. Guo, D. Hill-McManus, A. Brennan, and P. S. Meier, "Alcohol tax pass-through across the product and price range: do retailers treat cheap alcohol differently?," *Addiction*, Jun. 2014.

[33] H. O. Fekjaer, "Alcohol-a universal preventive agent? A critical analysis.," *Addiction*, vol. 108, no. 12, pp. 2051–7, Dec. 2013.