A New Measure of Alcohol Affordability for the UK

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Abstract — Aims: To present revisions to the official UK measure of alcohol affordability published by the National Health Service (NHS) Information Centre. The revisions address the following problems in the official measure:
(a) The income measure used in the calculation is a measure of the income for the whole population of the UK, not income per capita.
(b) The income measure includes ‘imaginary’ items, namely imputed rentals and attributed income from insurance policies.
(c) The income measure is inconsistent in its treatment of housing costs.
(d) The adjustment for inflation makes the measure unnecessarily complex and can have counter-intuitive effects.

Methods: The revised measure has the same essential structure as the NHS measure, being the ratio of income to price of alcohol. Adjustments were applied to official income figures, and adjustments for inflation were removed. Results: The revised measure shows that affordability has levelled off since 2003, in contrast to the NHS measure, which shows it continuing to rise until 2008. Conclusion: The revised measure corrects a basic error of failing to divide total income for the UK by number of people in the population. This alters the measure but is more correct. Further improvements result in a measure that correlates more closely with UK alcohol consumption over the last decade.

INTRODUCTION

As with most products, the price of alcohol influences how much people buy and consume. Similarly, those on higher incomes tend to spend more on alcohol, even after adjusting for consumer purchasing power (Anderson and Baumberg, 2006). These two concepts, price and income, may be combined into one measure, affordability of alcohol, being the ratio of income to price, such that higher income and lower price both lead to greater affordability.

The official UK measure of the affordability of alcohol is provided by the National Health Service Information Centre (NHS IC) in Table 2.8 of their annual publication, ‘Statistics on Alcohol: England’ (Information Centre, 2010). Details of this measure and its derivation are as follows:

\[
\text{Relative alcohol price index} = \left( \frac{\text{alcohol price index}}{\text{retail prices index}} \right) \times 100
\]

\[
\text{Affordability of alcohol} = \left( \frac{\text{real households’ disposable income index}}{\text{relative alcohol price index}} \right) \times 100
\]

The alcohol price index, retail price index (RPI) and real households’ disposable income are provided by the Office for National Statistics (ONS).

This measure is widely cited and frequently appears in government documents relating to alcohol policy (e.g. Booth et al., 2008; Health Committee, 2010). The methodology was adopted in the RAND report on the affordability of alcoholic beverages in the European Union (Rabinovich et al., 2009). This report has been cited in the Council of the European Union’s conclusions of alcohol and health (Council of European Union, 2009), by the World Health Organization (WHO Europe, 2009), in a briefing to the Scottish Parliament (SPICe, 2010) and a discussion paper for the Swedish Government (Karlsson and Osterberg, 2009). Given the influence of this calculation, it is vital that the methodology is subject to rigorous scrutiny.

On close examination, the measure of income used in the IC calculations appears unsatisfactory. The following section of this paper examines in detail the nature of this measure, what is included and what is excluded.

Income, as used in the NHS IC measure of affordability

The NHS IC gives the following definition of their measure of income:

Real households’ disposable income is an index of total households’ income, minus payments of income tax and other taxes, social contributions and other current transfers, converted to real terms (i.e. after dividing by a general price index to remove the effect of inflation).

The source cited is Economic Trends: (code NRJR), the ONS. Within this definition, the term that is of concern here is ‘total households’ income’. It is not clear from this whether this is the total for each household, for each person or even the total for the whole population of the UK.

The data series NRJR also appears in the UK National Accounts (ONS, 2010b), within ‘Income and capital accounts: Household and non-profit institutions serving households’. Here, it is evident that NRJR is closely related to a data series called gross disposable income, code QWND. Whereas QWND is presented in current prices (i.e. values appropriate to the year for which they are presented), NRJR is adjusted for inflation, hence the ‘Real’ in ‘Real households’ disposable income’.

A detailed explanation of the national accounts can be found in ‘UK National Accounts Concepts, Sources and Methods’ (ONS, 1998). This document makes it clear that the income in question is the total for all households in the UK,
The national income is a measure of the money value of goods and services becoming available to the nation from economic activity... For the purpose of the economic accounts countries are divided into basic institutional units (for example households or companies). These are grouped into sectors. A sector is a group within which all the units tend to act (from the viewpoint of economic analysis) in a similar way (for example households, and government). Accounts are prepared for the whole economy and for these sectors. [emphasis added]

‘Gross disposable income’ (QWND, referred to in Concepts, Sources and Methods by the code B.6g) is presented in the accounts for the household sector, defined as follows:

The household sector contains all the resident people of the United Kingdom as receivers of income and consumers of products. It includes those in institutions as well as conventional family units. It also contains one-person businesses where household and businesses accounts cannot be separated. [emphasis added]

For 2009, the value of QWND was £957,093 million.

From this, it is clear that ‘Real households’ disposable income’ (NRJR) is not the appropriate measure to use if we are interested in how much alcohol one person can afford. The affordability measure calculated by the NHS IC tells us about how much alcohol the entire population of the UK can afford. As the population increases, so does this measure of alcohol affordability inevitably increases with it. The correlation between population (aged 16+) and the NHS IC measure of alcohol affordability is almost perfect ($r = 0.98$, d.f. = 27, $P < 0.0001$) for the years 1981–2009.

As a first priority, then, we need to divide households’ disposable income by the number of people (or adults) in the UK to get income per capita (or per adult). However, it is worth examining the components of this measure of income, which was developed for and presented as a component of the National Accounts. As such, its details may not be entirely appropriate for other uses, such as calculations of affordability. Concepts, Sources and Methods give details of the derivation of this measure. This breakdown appears in two accounts for the household sector, the Allocation of Primary Income Account and the Secondary Distribution of Income Account. Disposable income (B.6) is the balancing term of the latter.

Sources of income that are included are:

(a) Operating surplus
The operating surplus appearing in the household sector account relates, by definition, to the household sector’s rental income from buildings, including the imputed rental of owner occupied dwellings... For imputed rental estimates... the broad principle involved is to impute to a given owner-occupied property a rental value which is the same as the rental which would be paid for a similar property in the private rented sector.

(b) Mixed income, ‘that part of income from self-employment relating to sole traders’

(c) Compensation of employees
(i) Wages and salaries
(ii) Employers’ social contributions, mainly pension schemes

(d) Property income
(i) Interest
(ii) Dividends and profits from sale of shares, etc.
(iii) Property income attributed to insurance policyholders
(iv) Rent, from land (mainly farmland) but not from buildings

(e) Benefits, from private schemes as well as government-funded social security

(f) Insurance claims (excluding life insurance)

(g) ‘Other’, including grants and money received from abroad

Costs that are subtracted from this to leave disposable income are:

(a) Property ‘income’
(i) Interest paid, primarily on mortgages but also other loans
(ii) Rent paid, on land but not on buildings

(b) Taxes
(i) Income tax
(ii) Taxes on unincorporated enterprises
(iii) Capital gains tax
(iv) Council tax
(v) Vehicle tax
(vi) ‘Certain licences’

(c) Social contributions, e.g. pension funds, both employer and employee contributions.

(d) Insurance premiums (excluding life insurance)

(e) ‘Other’, including government fees, court fines and money sent abroad.

Broadly speaking, this defines disposable income as total income from all sources less taxes and similar costs, as we would expect. However, there are a few items that deserve closer attention.

(a) Imputed rental, treated as income. Owner-occupiers are treated in the accounts as if they pay themselves rent. This imputed rental, as it is called, appears both as an expense and as income, so that within the context of the accounts, it cancels itself out. However, if a measure from one side of this equation is taken out of context, this balance is lost. The measure of QWND for the household sector (QWND or B.6g) includes imputed rent, that the household has supposedly paid to himself, but not the corresponding cost that he incurred when making that imaginary payment. In other words, household income is inflated by the rental income that house owners could earn if they rented out their houses instead of living in them.

(b) Mortgage interest, treated in the same way as tax (also interest on other loans). From the perspective of a householder with bills to pay, it might seem a little odd that one part of the mortgage payment (interest) is excluded from disposable income, but the other part (capital repayment) is not. Similarly, it might seem odd that no part of rental payments are excluded from disposable income.
Moving away from disposable income, within the calculation of affordability, both the alcohol price index and the income measure are adjusted for inflation. The adjustment of the former is explicit, with the adjustment for RPI displayed in the table, whereas the latter is implicit in the fact that the income measure is ‘real’, meaning adjusted for inflation. Since these adjustments are made to both price and income, they simply cancel out when one is divided by the other. Furthermore, the adjustments for inflation may have counter-intuitive effects. For example, RPI was recently driven up by rising UK food prices. The adjustment of the alcohol price index for RPI made alcohol more ‘affordable’ relative to increasingly expensive food.

Whilst economists often say that relative, rather than absolute, price is important in driving consumer behaviour, the principle of a hierarchy of needs (e.g. Drakopoulos, 1992) must not be ignored. One hopes that for the typical shopper food is a higher priority than alcohol, so if we asked that typical shopper whether they could afford more alcohol now that food is more expensive, the answer would be no. Having to spend more money on food would leave them less to spend on alcohol, so alcohol would be less affordable, not more so, as in the NHS IC calculation.

This example highlights the idea that essential expenses should be dealt with on the income side of the equation, i.e. subtracted to leave disposable income. Whilst this would be desirable, it would also be very difficult. For example, within the category of ‘food’, some items are basic necessities and other items are luxuries. Drawing a clear line between essential and non-essential expenditure would be almost impossible. Nonetheless, this paper takes a couple of steps in that direction. The first of these is to remove the adjustments for inflation.

In summary, the following problems have been identified with the NHS IC measure of alcohol affordability:

(a) The income measure used in the calculation is a measure of the income for the whole population of the UK, not income per capita.
(b) The income measure includes ‘imaginary’ items, namely imputed rentals and attributed income from insurance policies.
(c) The income measure is inconsistent in its treatment of housing costs.
(d) The adjustment for inflation makes the measure unnecessarily complex and can have counter-intuitive effects.

To address these problems, the following adjustments are proposed to the calculation of the NHS IC’s alcohol affordability index.

### Method and Results

The adjustments proposed focus mainly on the definition and calculation of ‘disposable income’. In addition, neither income nor alcohol prices are adjusted for inflation, in contrast to the NHS IC calculations. All prices are ‘current’, i.e. not adjusted for inflation, and all figures are for calendar years, i.e. January–December. Totals for the whole of the UK (England, Scotland, Wales and Northern Ireland) are used.

#### Income

Following the Information Centre’s approach, the UK National Accounts are used as the most authoritative source of data on national income. From these, QWND for the household sector (available from ONS as data series QWND) is used as the starting point for our measure of income.

As described above, this measure includes imputed rentals, assumed to be paid by the householder to himself. Also, a number of costs have been subtracted from total income to give QWND. These include various taxes and interest payments, principally mortgage interest.

Since, we are interested in disposable income, i.e. income that remains after fixed expenses have been paid, and since one part of housing costs (mortgage interest) has already been subtracted, it seems reasonable to subtract all housing costs from our measure of income. The National Accounts give a measure of housing costs that includes imputed rentals, actual rentals, maintenance, and supply of water, electricity and gas. This is available from ONS as data series housing costs (ADFS).

The only aspect of housing cost that is missing is the capital repayment part of mortgage payments. This figure is available from the Bank of England, ‘Lending secured on dwellings: repayments of mortgage principle–regular repayments’, code LPQB4C3, available from 1999 onwards (note that these figures are given quarterly; annual figures have been calculated from these). This data series has the latest start point of those used here, and so serves as a limit for the number of years for which affordability can be calculated.

The final element of income that will be excluded here, on account of the fact that the householder does not actually receive this income, is property income attributed to insurance policyholders. This is presented in the National Accounts and is available from ONS as data series QWMC.

The measure of total household disposable income is therefore QWND minus housing costs (ADFS), regular repayments of mortgage principle (LPQB4C3) and attributed insurance income (QWMC):

\[
\text{Income} = \text{QWND} - (\text{ADFS} + \text{LPQB4C3} + \text{QWMC})
\]

#### Number of Adults

Following HMRC’s Alcohol Factsheet (HMRC, 2010b), we have defined adults as all persons aged 16 and over. The ONS periodically publishes mid-year estimates of the population of the UK by various age groups, including total population and those aged under 16 years old (ONS, 2010c). The adult population is, therefore, calculated as total...
population minus those aged under 16.

\[ \text{Income per adult} = \frac{\text{Income}}{\text{adult population}} \]

As in the NHS IC calculations, an income index is calculated, representing percentage change in disposable income per adult since a reference year. The earliest year for which all figures are available, 1999, is used as the reference year.

**Affordability**

Having made the necessary adjustments to the index of disposable income, and noting that this is now based on current, not real income, affordability can be calculated in the same way as the NHS IC calculation, with the exception that the alcohol price index is not adjusted for inflation (RPI; Table 1).

\[
\text{Affordability of alcohol index} = \left( \frac{\text{Households’ disposable income index}}{\text{Alcohol price index}} \right) \times 100
\]

The affordability of alcohol index represents percentage change in affordability since the reference year, 1999.

**Two measures of affordability and alcohol consumption per adult**

The adjusted index of affordability is shown in Fig. 1, alongside the existing measure published by NHS IC, as well as an index of consumption figures in litres of pure alcohol per adult (calculated from alcoholic drinks sold, as reported in HM Revenue and Customs Alcohol Bulletin, 2010, HMRC Review of wine strengths, 2008 (personal communication), and adult population, as used in income calculation).

### Table 1. Input figures and affordability indices, both for original NHS IC calculation and for the adjusted affordability calculation

<table>
<thead>
<tr>
<th>Year</th>
<th>Index of NRJR: disposable income, total population, real prices</th>
<th>Index of adjusted disposable income, per adult, current prices</th>
<th>Alcohol price index (API)</th>
<th>Retail price index (RPI)</th>
<th>NHS IC affordability</th>
<th>Adjusted affordability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<td>2000</td>
<td>104.2</td>
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<td>101.5</td>
<td>102.9</td>
<td>105.6</td>
<td>104.0</td>
</tr>
<tr>
<td>2001</td>
<td>108.8</td>
<td>112.1</td>
<td>103.7</td>
<td>104.7</td>
<td>109.9</td>
<td>108.1</td>
</tr>
<tr>
<td>2002</td>
<td>111.1</td>
<td>114.6</td>
<td>106.0</td>
<td>106.4</td>
<td>111.5</td>
<td>108.1</td>
</tr>
<tr>
<td>2003</td>
<td>114.4</td>
<td>118.5</td>
<td>108.3</td>
<td>109.5</td>
<td>115.6</td>
<td>109.4</td>
</tr>
<tr>
<td>2004</td>
<td>115.6</td>
<td>119.3</td>
<td>110.4</td>
<td>112.8</td>
<td>118.1</td>
<td>108.1</td>
</tr>
<tr>
<td>2005</td>
<td>117.9</td>
<td>121.3</td>
<td>112.6</td>
<td>115.9</td>
<td>121.5</td>
<td>107.7</td>
</tr>
<tr>
<td>2006</td>
<td>118.7</td>
<td>122.7</td>
<td>115.3</td>
<td>119.7</td>
<td>125.4</td>
<td>106.5</td>
</tr>
<tr>
<td>2007</td>
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<td>123.7</td>
<td>118.7</td>
<td>124.8</td>
<td>123.3</td>
<td>104.2</td>
</tr>
<tr>
<td>2008</td>
<td>121.2</td>
<td>128.0</td>
<td>123.4</td>
<td>129.7</td>
<td>127.4</td>
<td>103.7</td>
</tr>
<tr>
<td>2009</td>
<td>125.1</td>
<td>133.8</td>
<td>127.9</td>
<td>129.1</td>
<td>126.3</td>
<td>104.6</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Having identified a number of problems with the existing measure of affordability, as published by the NHS Information Centre, this paper proposes a number of adjustments to the calculation of affordability that address these problems. The adjustments overcome the identified problems with the NHS IC measure in the following ways:

(a) Total income for the UK is divided by the number of adults in the population, giving income per adult.

(b) Elements of income that do not represent cash received by the individual have been removed.

(c) The partial subtraction of housing costs has been extended so that all housing costs are subtracted, making this adjustment consistent across those who rent and those who pay mortgages.

(d) By using current prices instead of real (i.e. inflation-adjusted) prices, it is simpler and less vulnerable to unexpected effects resulting from specific products driving changes in the RPI.

An important reason for being interested in the affordability of alcohol is its relationship with alcohol consumption and consequent harms, as it is well established that price is an important factor influencing consumption (e.g. Babor *et al.*, 2010). Unfortunately, the data are available for only a relatively short time period, giving just 11 data points for which both measures of affordability can be calculated. With such a small sample, statistical power to detect true differences between the correlations is very low. For example, even if the new measure had a correlation of 0.85 with consumption, this being a substantial improvement on the existing correlation of 0.5, with so...
few data points there would be only a 30% chance of detecting this as a statistically significant difference. However, a graphical representation (Fig. 1) gives an indication that the new measure corresponds more closely to changes in consumption than does the NHS IC measure.

**Limitation**

In common with the IC affordability index, this calculation uses the alcohol price index. This is based on a ‘shopping basket’ approach, in which a number of items are selected to represent the category of alcoholic drinks and prices for these items are monitored at regular intervals (ONS, 1998). The drinks selected cover a range of beverages and both on- and off-sales (ONS, 2010a). This approach does not take account of the different and changing strengths of alcoholic drinks, as it does not treat the ingredient ‘alcohol’ as an item in its own right. For the purpose of a measure of alcohol affordability, this is not ideal.

However, we have been unable to find an alternative to this approach that does not introduce even greater problems such as making the measure of affordability contingent on consumer behaviour. Therefore, it is necessary to accept this limitation and recognise that the affordability index reflects the price of alcoholic drinks, not of alcohol itself.

**Conclusion**

Primarily on the basis that it corrects problems with the existing measure, but with qualitative support from its relationship with consumption, it is proposed that the NHS IC measure of alcohol affordability is adjusted to include the changes presented in this paper.

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**REFERENCES**


