



# **Evaluation of the use of household survey data on spirits consumption for estimating the level of spirits fraud**

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## Summary and conclusions

HMRC (formerly HMCE) publishes an annual estimate of the amount of revenue lost to the Exchequer through evasion of excise duty on spirits ('spirits fraud'). This estimate is used to guide tax compliance policy and operations and to measure Customs' tax collection performance.

Spirits fraud is estimated as the difference between the volume of spirits purchased in the UK, using data from ONS household surveys, and the volume of spirits on which duty has been paid. The calculation is complex, incorporating adjustments for under-reporting on household surveys and coverage adjustments, eg for cross border shopping. The key data sources for the HMRC calculation for periods prior to 2001 were administrative data on excise duty paid, Family Expenditure Survey (FES) data for on-licence expenditure, and National Food Survey (NFS) data for off-licence consumption. In 2001, the FES and NFS were merged into the Expenditure and Food Survey (EFS) and data from this survey have been used since then for both on- and off-licence purchases.

Early in 2004, the Scotch Whisky Association (SWA) challenged HMRC's estimates, showing that spirits consumption data from either the ONS Omnibus Survey or the General Household Survey (GHS) produced markedly different estimates of both the level of fraud, and trends over time. A subsequent investigation by the National Audit Office (NAO) concluded that the SWA and HMRC methodologies were very similar in all respects other than the household survey chosen.

This report sets out the findings of work undertaken by ONS to explain, where possible, the differences between the surveys, and to assess their fitness for the purpose of estimating the level of spirits fraud. The main conclusions of this work are as follows:

- The surveys used were designed for a range of purposes, none of which specifically included the provision of accurate and precise estimates of expenditure on, or consumption of, spirits in the UK.
- Under-reporting of spirits expenditure/consumption introduces high levels of uncertainty into the estimates for all the surveys.
- The survey sources available are of two types: those based on respondents keeping a diary of expenditure and/or consumption, and those based on a questionnaire in which quantity and frequency of drinking are asked.
- For the diary based approach, the FES/EFS is a better source than the NFS. Evidence suggests that the latter captured only approximately 25% of off-licence spirits consumption, compared with about 50% for the FES/EFS. This greatly outweighs the advantage from using the NFS of not needing to convert expenditure to volume.
- Several government surveys collect data on the volume of spirits consumed using the quantity-frequency approach. Results from these surveys are all broadly the same.
- The GHS is the best quantity-frequency data source. It has had consistent methodology over time, its sample is larger than most of the other surveys, and it covers Great Britain. Like the FES/EFS, it probably captures around half of total spirits consumption.
- The trends in spirits consumption shown by the NFS/FES/EFS and the GHS are markedly different, but the trends for FES/EFS and GHS are very similar. This

provides further evidence that the use of estimates from the NFS for this purpose is inadvisable.

- There is no clear evidence indicating whether the FES/EFS or the GHS is the better source for spirits fraud estimation. It is therefore recommended that data from both sources are used to provide a range of estimates for each year, taking into account sampling error as well as the difference between the survey estimates.

## Part 1: Use of surveys in the spirits fraud model

### 1 Background

The need for this work arose because markedly different estimates of the level of spirits fraud were derived by HM Revenue and Customs (HMRC, formerly HM Customs and Excise) and the Scotch Whisky Association (SWA).

The method used for estimating spirits fraud is, broadly speaking, to subtract HMRC data on clearances<sup>1</sup> (on which tax has been paid) from survey estimates of spirits consumption, which in theory would include consumption of illicit spirits on which tax had not been paid. In 1993, it became legal to move alcohol between EU member states before sale without paying excise duty, thus increasing the risk of fraud. It was assumed that spirits fraud was negligible before that, so that the difference between survey estimates and clearance figures in 1992 is caused solely by the surveys underestimating alcohol consumption. Survey data are therefore uplifted to equate to the clearance data for 1992. The same uplift factor is then applied to the survey data for all subsequent years, and divergence of the uplifted survey data from clearances gives an estimate of illicit spirits sales.

- HMRC, using data from the ONS Family Expenditure Survey (FES) and the National Food Survey (NFS) - which merged into the Expenditure and Food Survey (EFS) from 2001 - estimated the level of spirits fraud increasing from zero in 1992-3 to some £600 million in 2001-2 – an illicit market share of 16%. Customs' latest estimates show a revenue loss for spirits of £250 million and an illicit market share of 7% for 2002-03.
- The SWA, on the other hand, using data from the ONS Omnibus Survey for 1997 onwards, estimated a much lower level of fraud, amounting to some £100-£150 million for 2001-2, and showing a recent fall. The SWA were not aware that alcohol consumption data were available from the General Household Survey (GHS) going back to 1992, and with almost identical results to the Omnibus survey for periods when both are available. Since the GHS is a better source than the Omnibus for this type of data<sup>2</sup>, the NAO report and subsequent ONS research have focussed on the GHS.

HMRC and the SWA made similar assumptions about under-reporting of alcohol consumption, and the differences in the estimates of spirits fraud were largely due to differences in the spirits consumption trends shown by the FES/NFS (EFS from 2001) and the GHS over the period 1992-2002 (see Figure 1): the FES/NFS estimates show a much steeper increase over that period than does the GHS, about 45% compared with about 15%. The difference between the surveys appears to be accentuated after 1998.

The National Audit Office commissioned statistical advice from the London School of Economics which confirmed that the methodologies used for estimating fraud were

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<sup>1</sup> The volume of spirits which have been 'cleared' from bonded warehouses and on which duty has been paid.

<sup>2</sup> See Section 4.

similar, and that the difference between the estimates of spirits fraud appeared to be largely because different survey datasets were used<sup>3</sup>.

ONS undertook to seek to establish reasons for the differences in survey trends, and to consider whether one survey was a more appropriate data source for this purpose than the other. This report does not comment on the models themselves.

## **2 Key aspects of the methodology of the surveys**

### **2.1 General methodology**

Those general characteristics of the FES, NFS, EFS and the GHS which can be summarised are shown in Table 1. Key points to note are the following:

1. None of the four surveys was designed with the explicit intent of providing reliable estimates of the alcohol consumption of particular types of alcoholic drink.
2. The NFS and FES and, following their merger, the EFS, have been carried out every year (the year changed from calendar to financial in 1994). Until the late 1990s, the GHS was carried out every year, and questions about alcohol consumption were included in alternate, even, years up to and including 2000. Following various reviews of the GHS, however, questions from which alcohol consumption could be estimated were included in 2001 and 2002 and again in 2005, but not 2003 or 2004.
3. All the surveys have used computer-assisted interviewing methods since the mid-1990s, but beyond that, there are important differences between them, which are described in the following sections.
4. The ideal measure excludes alcohol bought abroad (on which duty is not payable in the UK). The FES, and now the EFS, exclude alcohol bought abroad, but the GHS includes all alcohol consumption, regardless of where the alcohol was bought. The NFS attempted to include alcohol brought into the home from all sources, but probably underestimated purchases made abroad.
5. All the surveys interview throughout the year, with the exception of a week or two around the Christmas/New Year period. The expenditure surveys reflect fluctuations in purchases of alcohol directly (about one third of annual spirits expenditure falls in the fourth quarter of the calendar year) but seasonal variation is averaged out in the GHS estimates.

### **2.2 Data collection using the diary method**

#### **Data collection method**

The aim of the FES was to obtain a complete record of a household's income and expenditure on all goods and services. Thus, all members of the household aged 16 and over kept a detailed diary of their expenditure for two weeks. From 1998/99, some diary information was also recorded by children aged 7 to 15. The NFS was mainly

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<sup>3</sup> *Estimating the level of Spirits Fraud: memorandum by the Comptroller and Auditor General, National Audit Office 2004*

concerned with nutritional aspects of domestic consumption and expenditure on food and drink, and a diary of food and drink entering the home (in both volume and expenditure terms) was kept for one week by the person principally responsible for the domestic food arrangements. The merged EFS for the most part adopted the FES methodology, with all members of the household aged 16 and over keeping a detailed diary of their expenditure for two weeks.

The FES diary included expenditure on different types of alcoholic drink. The FES did not, however, record the quantity of alcohol purchased, because it was not seeking to measure alcohol consumption *per se*. The NFS diary of food and drink entering the home recorded both volume and expenditure on alcohol. The merged EFS for the most part adopted the FES methodology, and *Family Spending* reports continue to publish average household expenditure on different types of alcoholic drink analysed by whether the alcohol was consumed on licensed premises or bought at off-licences.

### **Data used in the spirits fraud estimates**

Prior to the merger of the FES and the NFS, HMRC used estimates of consumption derived as follows:

- FES household expenditure on spirits in licensed premises (ie away from home), converted into volumes using data on average prices provided by a commercial market analysis company<sup>4</sup>.
- NFS data on the volume of spirits brought home was assumed to approximate to the household's off-licence spirits consumption. Information was also available from the FES on household off-licence expenditure on spirits, but HMRC used the NFS data for preference as it avoided the need to convert expenditure to volume.

Following the merger, although the EFS adopted FES methodology in requiring all household members to keep a diary, some off-licence volume as well as expenditure data continued to be collected.

## **2.3 Data collection in the General Household Survey**

### **Data collection method**

The GHS, which is a multi-purpose survey covering a number of topics, seeks face-to-face interviews with all adult members of cooperating households. The interview includes a section of questions on drinking. Although the GHS obtains some information by proxy if a household member is unable to be interviewed in person, the drinking questions are considered too sensitive for inclusion in the proxy questionnaire.

The GHS drinking section uses the quantity-frequency method of obtaining estimates of alcohol consumption. Respondents aged 16 and over are asked how often over the last year they have drunk each of a list of different types of drink, and, when they have drunk them, how much they have usually drunk on any one day. For spirits, respondents are asked to say how much they have drunk in single measures. This

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<sup>4</sup> This information is commercially sensitive and cannot be published.

information is combined with information about other drinks to give the published estimates of usual weekly consumption in units of alcohol.

### **Data used in the spirits fraud estimates**

The SWA initially used published ONS Omnibus estimates of the average weekly consumption of spirits per person aged 16 and over, grossed up to national totals of spirits consumption using population estimates. Similarly derived unpublished GHS estimates were subsequently used.

## **3 Assumed levels of under-reporting**

All surveys under-report alcohol consumption, but estimates of its extent are difficult to make, and vary between surveys (because of differences in methodology) and for different types of alcoholic drink. Research shows that surveys of alcohol consumption (as opposed to expenditure) in the UK typically pick up 55-60% of all alcohol consumed<sup>5</sup>. Reasons for under-reporting are discussed in Section 6.3.

As noted earlier, both HMRC and the SWA assumed that no fraud existed in 1992, and that if the survey estimates of spirits consumption were grossed up to the clearance figures for 1992, and the same grossing factors applied in subsequent years, the gap between the grossed up survey estimates and clearance figures would give a measure of the level of fraud in each year<sup>6</sup>.

To bring the 1992 GHS estimate of spirits consumption to the same level as the clearance figures requires an uprating by a factor of 1.96, suggesting that the GHS picks up about 50% of spirits consumption.

The uprating for the FES/NFS is more complex. Estimates of expenditure on household food from the two surveys were not directly comparable, and when they were merged into the EFS, there was no overlapping period in which both surveys were running. Since the new survey was essentially an extended version of the FES, NFS estimates were adjusted so that time series could be constructed that would be compatible with those produced by the merged survey.

DEFRA (which commissioned the NFS) calculated the adjustment for each of 24 food types, one of which was 'alcoholic drinks', by comparing NFS data for 2000 with equivalent data from the FES. The adjustment factor necessary for alcohol (all types combined, not just spirits) was 1.732, indicating that in 2000, the NFS was picking up less than 60% of the weekly off-licence expenditure recorded on the FES<sup>7</sup>. The NFS uplift factor of 1.732 was assumed to apply also in each year back to 1992.

The HMRC uprating for undercoverage of the FES/NFS in 1992 was therefore carried out in two stages: the NFS off-licence volumes were uplifted by a factor of 1.732, and

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<sup>5</sup> Goddard E *Obtaining information about drinking through surveys of the general population* National Statistics NSM24. ONS (London 2001)

<sup>6</sup> For an explanation of the method, see *Measuring and Tackling Indirect Tax Losses*. HMCE 2003

<sup>7</sup> All but three of the 24 adjustment factors were less than 1.25, and the only one larger than that for alcohol was 2.39, for confectionery.

then the combined FES and NFS estimates of volume were uprated by a further factor of 2.16 to take them up to the clearance figures for 1992. These uprating factors imply that the FES covered about 45% of on-licence expenditure on spirits, but that the NFS picked up only about 25% of off-licence consumption. The latter accounts for about four fifths of all spirits consumption, making fraud estimates highly sensitive to any biases that this low coverage introduces<sup>8</sup>.

There are two probable reasons for the poor coverage of alcohol by the NFS, both of which almost certainly introduced bias.

1. Since the NFS diary information was recorded by the person mainly responsible for domestic food arrangements, purchases for home consumption by other members of the household were likely to be under-recorded<sup>9</sup>.
2. The NFS did not include off-licence purchases of alcohol bought for consumption elsewhere than at the sampled household, so alcohol bought for drinking in someone else's home was excluded.

## 4 Summary of methodological considerations

The above sections have shown that the diary method in some ways matches Customs' requirements more closely than does the GHS. However, the use of the NFS is not advisable, because of the likely biases introduced by the very low coverage due to the 'main diary keeper' method of collecting information. The combined uprating factor suggests that only about 25% of spirits consumption is captured from responding NFS households. This greatly outweighs the advantage of not needing to convert expenditure to volume, particularly as that method has to be used for on-licence consumption in any case.

It is not obvious from a consideration of their general methodologies alone whether the FES or the GHS is the better source of data for this type of application: the type of information obtained on the FES matches more closely the Customs clearances data, but the need to use commercial price information to convert expenditure on alcohol to volume of alcohol purchased is a disadvantage compared with the GHS, because it introduces a further potential source of error into the estimates. The two surveys appear to pick up similar proportions of alcohol consumption, so neither has an obvious advantage on that score.

Although the FES/EFS is the only expenditure-based survey providing information about alcohol, two other surveys in addition to the GHS collect quantity-frequency data on drinking, the ONS Omnibus, and the Health Survey for England (HSE). Both surveys produce estimates of alcohol consumption which are very similar to those obtained from the GHS (see Figures A1-A4 in the Appendix). Each survey, however, has disadvantages compared with the GHS:

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<sup>8</sup> Since this project began, DEFRA have published revised adjustment factors, calculated separately for different types of alcohol. The overall adjustment for all types of alcohol is now 1.69, the adjustment for spirits is 1.79, and for liqueurs and cocktails, 1.59. These revised figures do not materially affect the discussion here.

<sup>9</sup> see Appendix A in *National Food Survey 2000: annual report on food expenditure, consumption and nutrient intakes*. The Stationery Office (London 2001)

- The Omnibus sample size is much smaller (about 3,500 adults over a two-month period, compared with the GHS sample of about 15,000 adults over a year).
- The HSE sample size fluctuates from year to year - it is usually either about 8,000 or about 16,000 individuals: there is always a core general population sample, but in some years particular subgroups are over-sampled, such as ethnic minorities, or children, and the core sample is smaller. A further drawback of the HSE for the use under consideration in this paper is that it covers England only.

The rest of this report therefore presents a more detailed comparison of the FES (EFS from 2001) and the GHS and looks further at some aspects of the methodology of the two surveys.

## Part 2: Comparison of the FES/EFS and the GHS

### 5 Sample representativeness

#### 5.1 Exclusion of those not living in private households

Samples of people living in private households by definition exclude those living in institutions and people who have no fixed address. It is difficult to assess the effect this has on survey estimates of alcohol consumption, or even, indeed, whether it is negative on balance. On the one hand, some excluded groups probably contain a higher than average proportion of heavy drinkers - such as rough sleepers, and some types of student – but others, such as the elderly and others living in residential care, are likely to drink less than those of similar age living in private households.

All private household surveys which include questions about alcohol are equally affected by this factor, and it is not discussed further in this report. However, it should be noted that if the composition of the non-private-household sector changes over time, survey estimates of the alcohol consumption of those living in private households may be affected.

#### 5.2 Overall response rates

Since the early 1990s, response rates on all government surveys have been falling. Sampling variability is inherent in surveys and leads to some differences from year to year in the composition of the sample, but changes in response rate can have a more lasting effect. The lower the response rate, the more likely it is that the composition of the interviewed sample will be biased in some way, and, crucially, in a way that affects the representativeness of the data obtained. Thus if, for example, falling response rates mean that heavy drinkers are less likely to take part in a survey, the proportion of alcohol consumption picked up by that survey will also fall.

Because of methodological differences between the FES/EFS and the GHS, the response rates shown in Figure 2 are calculated differently for the two surveys.

- FES/EFS: the percentage of eligible households in which all adults complete the diary;
- GHS: two response rates are shown: the middle response rate gives the percentage of eligible households in which all adults were interviewed in person or by proxy, and an estimate is given of response to the drinking section (taking account of both household and individual level response);

The response trend on the FES/EFS was similar to that on the GHS, though at a lower level: that is partly due to the different definition of response, as described above, but probably mainly because the much greater respondent burden makes it more difficult to persuade whole households to take part. The slight upturn for both surveys in 2001-2 was thought to be due to publicity for the 2001 Census.

### 5.3 Coverage of heavy drinkers

Alcohol consumption varies more with sex and age than with any other characteristics of the individual<sup>10</sup>. Men drink more than twice as much as women, on average, and those aged 16-24 drink more than twice as much as those aged 65 and over. Thus the heaviest drinkers are young men aged 16-24, whose average weekly consumption in 2002 as measured by the GHS was 21.4 units, compared with 14.0 units for young women of the same age, and 11.8 units for all adults aged 16 and over.

Table 2 shows GHS estimates of average weekly consumption of spirits in 1992 and 2002, by sex and age<sup>11</sup>. Overall, GHS spirits consumption increased by 15% between 1992 and 2002, from 1.86 to 2.13 units per adult a week, but among those aged 16-24, the increase was 75% - much greater than among all other age groups. Since young people are particularly difficult to contact, it was important to establish whether differences in changing patterns of response between the two surveys could lead to differences between the survey estimates of spirits trends.

The most thorough analysis of survey response bias has recently been completed using 2001 Census data. In essence, the Census form is traced for a sample of responders and non-responders from each of the main continuous surveys, including the EFS and the GHS, so that the characteristics of those who refuse to take part or are not contacted can be compared with those of responders. Unfortunately only limited analysis could be undertaken at the individual level, because the validity of the comparisons depends on the proportion of the survey sample who could be matched with a census form: this was acceptable at around 95% at the household level, but the matching level was lower for individuals. The Census comparisons did show, however, that although response had fallen on both the FES/EFS and the GHS since the previous comparisons were carried out using the 1991 Census, non-response bias had not increased on either survey<sup>12</sup>.

This finding is supported by Figure 3, which shows that the percentage of the FES/EFS and GHS samples who were aged 16-24 changed little over the ten years 1992-2002 apart from a slight fall at the beginning of the period. Similarly, the proportion of the GHS sample who were 16-24 and responded to the drinking questions has also remained relatively stable over the period.

Falling response rates do not therefore appear to have affected alcohol data from either survey disproportionately. However, non-response bias and changes in response patterns over time remain a likely source of differences between the surveys and a potential source of error in all surveys.

## 6 Collection of data on alcohol consumption and estimation of alcohol volumes

This was covered briefly in Section 2. To draw out the key differences between the methodologies of diary surveys and quantity-frequency surveys, this section presents

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<sup>10</sup> see, for example, the discussion in Chapter 9 in *Living in Britain 2002* The Stationery Office (London 2004)

<sup>11</sup> FES/EFS data are available only at the household, rather than the individual level.

<sup>12</sup> A summary of the results of this work is due to be published in a forthcoming edition of the ONS Survey Methodology Bulletin.

greater detail about the methods used by the FES/EFS and the GHS to collect data on alcohol, and the type of under-reporting likely to occur.

## 6.1 FES/EFS

On the EFS, purchases of alcohol are recorded in the diary. Since this is done without the interviewer being present, respondents are given instructions about what to record. For alcohol, they are asked to record the type of drink, the examples given being 'beer, table wine, sherry, sparkling wine, spirits etc'. They are asked to record separately purchases which are brought home from those which are consumed outside the home (ie off-licence as opposed to on-licence purchases).

Entries in the diary are coded centrally by a team of specialist coders into a detailed list of drink types which are then combined into the following categories:

- beer and lager
- cider
- fortified wines
- unfortified and still wines
- champagne and sparkling wines
- spirits and liqueurs
- alcoholic soft drinks
- other types

When the data have been coded and edited, the amount spent by the household on each type of drink can be derived. These are the data published in *Family Spending* reports.

For expenditure data to be converted into volumes of alcohol purchased, information is needed about the average price per litre of each type of alcohol. This is commercial information supplied to HMRC in confidence by the company that collects it, so it cannot be discussed in detail here. It is, however, obtained by sample survey, and hence subject to both sampling and non-sampling errors. This price information has been used by HMRC to provide estimates of the average volume of spirits purchased per household, and can be used in a similar way for other types of drink.

## 6.2 GHS

On the GHS, respondents are interviewed in person about their drinking (to protect their privacy, particularly if interviewed in the parental home, young people are given the opportunity to fill in a self-completion form rather than answer the questions aloud). Up to 1996-97, the GHS asked separately about each of the following types of drink:

- shandy (excluding bottles and cans)
- beer, lager, stout and cider
- spirits and liqueurs (eg whisky, rum, brandy, vodka, advocaat)
- sherry and martini (including port, vermouth, cinzano, dubonnet)
- wine (including babycham champagne)

The rationale for these particular drink types was that each group was of roughly similar alcoholic strength, and between them they accounted for virtually all alcohol

consumed. However, following the introduction of alcopops, and the increasing availability of strong beers, lagers and ciders, these have been included as separate categories since 1998-99. In other respects, the methodology is unchanged.

For spirits, the question is *'How often have you had a drink of spirits or liqueurs, such as gin, whisky, brandy, rum, vodka, advocaat or cocktails during the last 12 months?'* Then those who have had a drink in the last year are asked *'How much spirits or liqueurs (such as gin, whisky, brandy, rum, vodka, advocaat or cocktails) have you usually drunk on any one day during the last 12 months?'* The interviewer is instructed to record the number of single measures.

Similar questions are also asked for the other types of drink.

The GHS requires estimates of the number of units consumed, so the volume information is converted into units - in the office, not by the respondent or the interviewer - as follows:

Drink type	Volume	Units
Normal strength beer, lager, cider	½ pints, small cans/bottles,	1 unit
	large cans/bottles	1.5 units
Strong beer, lager, cider (ABV>6%)	½ pints, small cans/bottles,	1.5 units
	large cans/bottles	2.25 units
Table wine	1 glass	1 unit
Fortified wine	1 small glass	1 unit
Spirits	1 single measure	1 unit
Alcopops	1 bottle	1.5 units

Average weekly units are then calculated using a multiplier according to the frequency with which the respondent has a drink of that type:

Drinking frequency	Multiplied factor
1 Almost every day	7.0
2 5 or 6 days a week	5.5
3 3 or 4 days a week	3.5
4 Once or twice a week	1.5
5 Once or twice a month	0.375 (1.5/4)
6 Once every couple of months	0.115 (6/52)
7 Once or twice a year	0.029 (1.5/52)
8 Not at all in the last 12 months	-

Note that conversion from volume to units in this way implies a particular ABV for each type of drink, and that changing the assumption about ABV alters the estimated number of units.

### 6.3 Under-reporting of consumption by those interviewed

People asked directly about their drinking tend to understate the amount they drink, generally unintentionally, and this is likely to be the case whether they are asked about their alcohol purchases, as in the FES/EFS, or how much they usually drink, as in the GHS.

- On quantity-frequency surveys such as the GHS, estimating amounts drunk is particularly difficult for people drinking at home, where drinks are not dispensed in standard quantities.
- On expenditure surveys where respondents are asked to keep a detailed diary of their expenditure for a period, expenditure on alcohol is invariably underestimated; some purchases are not recorded in the diary, and in some cases respondents defer purchases until after the survey period.

Overall, the FES/EFS and the GHS appear to account for similar levels of alcohol consumption – for example, about 50% of spirits consumption as measured by Customs clearances data. They are not, however, likely to be missing the same 50% of consumption. On the GHS, for example, the measure is of average weekly consumption, and respondents are not asked to include a-typically high (or low) consumption when estimating how much they usually drink. The FES/EFS, on the other hand, should pick up a-typical purchases, but does not, for example, cover consumption of alcohol paid for by the respondent's employer, or expense account purchases.

## 7 Trends in alcohol consumption<sup>13</sup>

### 7.1 Trends in spirits consumption

Figure 4 compares FES/EFS data on spirits from 1990 with GHS data from 1992 (the earliest year for which they are available). The figures differ from those in Figure 1 in that they are not indexed to 1992 by the use of uprating figures to compensate for estimated levels of under-reporting.

The FES/EFS fluctuates much more from year to year than does the GHS, but both surveys show an increasing trend over the period. The similarity of the trends is accentuated if the FES/EFS fluctuations are smoothed by using 3-year moving averages (Figure 5), and suggests that the trends have converged in recent years. Furthermore, the similarity of the estimates produced by the two surveys is striking, particularly given the different methodologies used for obtaining them.

Although the smoothed FES/EFS trend is not significantly different from that shown by the GHS, an explanation needs to be sought for the fluctuation in the data, with peaks in 1994-95 and 1999-2000, and to a lesser degree, in 1993. In addition, the 1992 FES figure is relatively low, which is important given that the gap model used by Customs is based on there being no fraud in 1992 and grossing up spirits figures to match clearances (this is discussed further in Section 7.6).

Trends in the consumption of wine, beer (including lager and cider) and alcopops have therefore also been examined, to see if they throw any light on the fluctuation in FES/EFS spirits data<sup>14</sup>.

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<sup>13</sup> Although both surveys introduced re-weighting of data during the 1990s to compensate partially for non-response bias, for comparability throughout the time period being considered, unweighted data have been used in this report.

<sup>14</sup> Consumption of fortified wine is very low compared to other types of alcohol (only about 2% of all alcohol consumed) and has not been considered further in this report.

## **7.2 Trends in wine consumption**

Figure 6 compares FES/EFS and GHS data on wine. As with the spirits data, the trends are similar, but there are two differences. First, the FES/EFS wine data fluctuate less than the spirits data (although, as with spirits, there is a peak in 1994-95), and second, the absolute level measured by the GHS is lower. For example, in 2002-03, the GHS estimate was 2.9 units a week, compared with 3.7 from the EFS. This is not necessarily due to lower reporting levels on the GHS, but is more likely to be due to assumptions made in converting amounts drunk into units.

In calculating the FES/EFS estimate of units per adult from litres per household, it has been assumed that wine has an average ABV of 12%. On the GHS, respondents are asked to say how many glasses of wine they usually drink, without the size of glass being defined, and in the estimates shown here, a glass of wine is counted as one unit. Since 1978, when the questions were first asked on the GHS, the average alcoholic strength of wine has increased from about 9% to about 12%, and the size of wine glass used in licensed premises has also increased. It would probably be more realistic to count a glass of wine as 1.8 units, the amount of alcohol in a 150ml glass of wine at 12% ABV, in which case, the GHS estimates would be considerably higher than the FES/EFS ones.

In a sense, this is immaterial, but it should be noted that quantity-frequency survey estimates of wine consumption, and hence the apparent level of under-reporting, are highly sensitive to the assumptions made about average glass size and alcoholic strength. This is also the case for other types of drinks, but probably to a lesser extent.

## **7.3 Trends in beer consumption**

Figure 7 shows that beer consumption on both surveys fluctuates more than does the consumption of spirits or wine. However, as with spirits and wine, the trends and measured levels are remarkably similar, in spite of the different data collection methods of the two surveys, and the change in the GHS questions from 1998-99.

In the estimates derived from FES/EFS data, beers have been assumed to be 4% ABV, on average. This is likely to be an underestimate of their strength, particularly in more recent years.

On the GHS, respondents are asked separately about consumption of beer in half-pints, large cans/bottles, and small cans/bottles: and a half-pint and a small can/bottle are counted as one unit, and a large can/bottle as 1.5 units. Because of the increasing availability of strong beers and lagers, they have been included as a separate category since 1998-99, (defined as being 6% ABV or greater) and are assumed to be 1.5 times the strength of ordinary beers.

## **7.4 Trends in alcopops consumption**

Alcopops (flavoured spirit- or wine-based drinks with an ABV up to 5.5%) were introduced into the drinks market in the 1990s. The FES identified expenditure on alcopops from 1996 onwards, and, as noted earlier, the GHS identified them as a separate category of drink from 1998.

The FES/EFS estimates of volume in litres were converted to units assuming that 275ml contained 1.5 units. On the GHS, respondents were asked how many bottles of alcopops they usually drank, and again, each bottle was assumed to contain 1.5 units.

Figure 8 shows that the GHS estimates of alcopops consumption were markedly higher than those obtained from the FES/EFS. Both surveys showed an increasing trend, but the GHS trend was much steeper.

## 7.5 Coding of 'other' types of alcohol

On the GHS prior to 1998-99, respondents were asked about 'other' types of drink in addition to the main categories (beer, wine, fortified wine, spirits). These were coded in the office into one of the main groups, and so 'other' drinks were not analysed as a separate category. From 1998-99 onwards, 'other' types of drink have not been shown separately in the questionnaire.

Inspection of FES/EFS data shows a marked fluctuation from year to year in the level of expenditure on drinks classified as 'other' (Figure 9). In principle, this residual category would include individual types of drink that could not be coded into one of the main categories, and purchases such as a round of drinks in a pub, where the respondent could not say how much had been spent on each drink type bought. Consideration of the size of the 'other' group in relation to the main drink types shows the following:

- (a) In the earlier years in the decade, expenditure in this residual group was about £1.00-£1.20 per household, about 10% of all alcohol expenditure.
- (b) In 1994-95, expenditure in the 'other' category dropped to 19p per household and expenditure on spirits, wine and beers all rose (see Figure 10) implying that a number of cases that in previous years would have been in the residual category had been re-assigned to the main drink types.
- (c) In 1995-96, expenditure in the 'other' category reverted to the pre-1994-95 level, at £1.28, and expenditure on spirits, wines and beers fell.
- (d) In 1996-97, a separate code was introduced for alcopops: the total 'other' category (including alcopops) fell, and spirits, wine and beer rose again.
- (e) Expenditure in the 'other' category fell to another low point in 1997-98, and then rose again for the remaining years of the FES.
- (f) The steep increase in the 'other' group from 1997-98 to 2000-01 suggests that some alcopops were included in that category. (the GHS shows alcopops increasing from 0.26 units in 1998-99 to 0.66 units in 2000-01, whereas the FES showed only an increase from 0.06 to 0.13 units over that period.)
- (g) There was a substantial increase in alcopops in 2001-02, which corresponds with the introduction of the EFS, which has no 'other' category, except for rounds of drinks.

The size of the 'other' categories has fluctuated a great deal, suggesting that there have been several changes in FES coding practice which may have affected trend data for individual drink types; it is therefore difficult to be confident about year-on-year

comparisons for individual drink types, including spirits. It is not possible to quantify the effects of coding changes: their existence has been inferred from the data, and there is no archived documentation on this topic.

Data for 1994/5 in particular appear to have been coded differently, resulting in a very small 'other undefined' drinks category, and should probably be discounted. The peak in spirits consumption in 1999/00 is not repeated in other types of drink. While it may have been due to unidentified changes in coding practice, it is more likely to reflect increased consumption because of the solar eclipse and the Millennium.

Some alcopops were probably not coded as such, but remained in the 'other undefined' category: this category increases noticeably, in line with alcopops consumption.

It should be noted that although the coding of drink types on the FES appears to have been inconsistent over the years, the main purpose of the FES was to obtain an estimate of total expenditure on alcohol: accurate distinction between different types of alcohol was not of prime concern.

## **7.6 Use of 1992 as the index year for the fraud estimates**

If some drinks were left in the 'other' category which should really have been reassigned as spirits, this may help to account for the relatively low spirits figure for 1992 noted earlier in the discussion of Figure 4.

The model used by Customs for estimating spirits fraud is based on there being no fraud in 1992 and the grossing up of spirits figures to match clearances for that year. The multiplier needed to do this suggested that FES was picking up about 45% of spirits consumption. However, if the 1992 figure was atypically low, this would mean that the multiplying factor to bring the spirits figure up to the clearances was too high and the estimate of 45% coverage too low. Figures for all other FES years would also have been multiplied up by too great a factor, giving too great a gap between FES and the clearances and thus leading to over-estimates of the level of fraud.

The potential consequences of using a single year's data as an index point also applies to the GHS, but the magnitude of the effect is likely to be less, because of the lack of fluctuation over time in the GHS spirits data.

## **8 Summary of the comparison of the FES/EFS and the GHS**

The similarities of the two surveys and the differences between them can be summarised as follows:

1. Neither survey was designed with the explicit intent of providing reliable estimates of the alcohol consumption of particular types of alcoholic drink.
2. The FES/EFS provides a measure of alcohol purchased which relates more closely to clearance data than does the GHS measure of weekly alcohol units averaged out over a nominal period of twelve months.

3. The GHS data can be converted directly into estimates of volume, although assumptions about alcoholic strength are necessary. On the FES/EFS, expenditure has to be converted to volume using price information.
4. The ideal measure excludes alcohol bought abroad (on which duty is not payable in the UK). The FES/EFS exclude alcohol bought abroad, but the GHS includes all alcohol consumption, regardless of where the alcohol was bought.
5. The FES/EFS and GHS appear to account for similar proportions of total spirits consumed overall, about 50%.
6. The FES/EFS reflect fluctuations in purchases of alcohol directly (about one third of annual spirits expenditure falls in the fourth quarter of the calendar year) but seasonal variation is averaged out in the GHS estimates.
7. Response rates and achieved sample sizes are of the same order of magnitude on both surveys, and falling response rates do not appear to have disproportionately affected the representativeness of either survey.
8. Trends in spirits consumption are at similar levels and show the same increasing trend. However, the FES figures fluctuated in the mid-1990s, probably due to changes in coding of drinks that were difficult to classify.
9. Trends in the consumption of wines, beers and alcopops are also similar, except for alcopops, some of which were probably incorrectly classified on the FES/EFS.

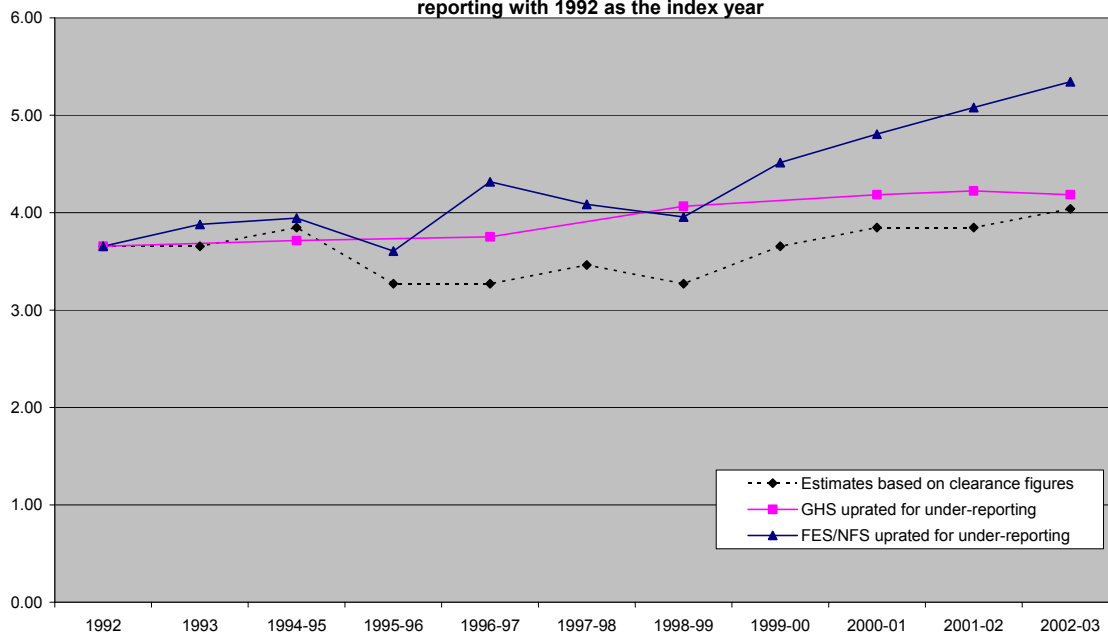
Each type of survey (diary or quantity-frequency) has advantages over the other in some respects. Looking forward, it seems likely that the two data series are converging, although this will not be apparent until the EFS has run for a few more years. The FES/EFS matches Customs' needs more closely than does the GHS, because it collects data closer in time to the clearance figures, and excludes cross-border shopping. The key problems associated with its use relate to the FES in the decade before 2001/02, and arise from discontinuities in the data collection and handling methodologies which mean that the expenditure figures for spirits are not completely comparable from year to year over the whole period. The effect of these inconsistencies can be reduced by the use of three-year moving averages, but this also removes fluctuations which reflect actual changes in expenditure. This suggests that the GHS is preferable for that period, because of its stability.

We recognise, however, that it would be difficult to change sources in mid-series, and we therefore think that at present it is unwise to rely entirely on either source alone, but that they should be used to provide a range of estimates for each year, taking into account sampling error as well as the difference between the survey estimates. Whichever source is used, basing updating factors for the spirits fraud model on one year alone is unwise, because of the possibility that it is atypical, due to either sampling or non-sampling error.

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**Figure 1 Spirits: comparison of estimates of units per adult per week derived from HMRC clearance figures, and survey estimates of units per adult per week, uplifted (NFS) and uprated for under-reporting with 1992 as the index year**



**Figure 2 Survey response rates 1992-2002**

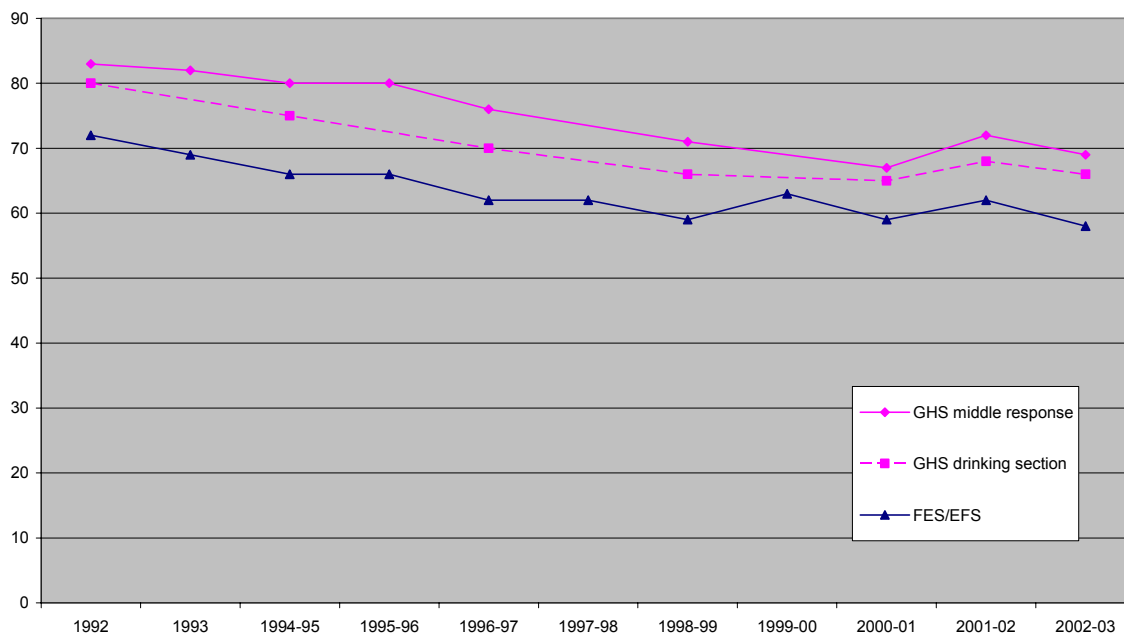


Figure 3: Representation of 16-24 year-olds

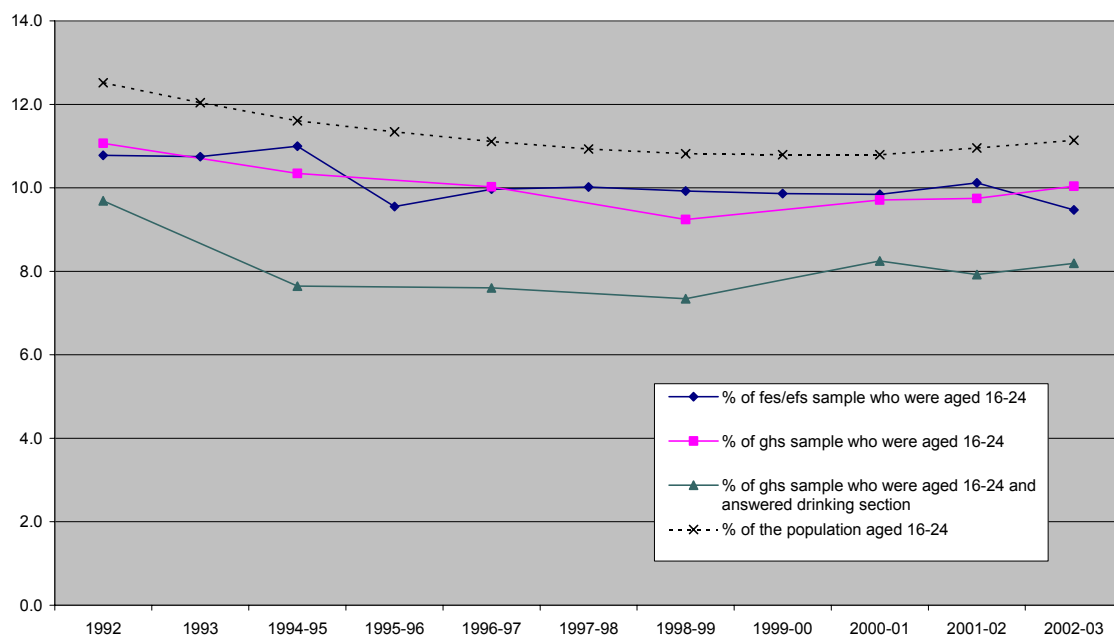


Figure 4: Weekly spirits units per adult: FES/EFS and GHS

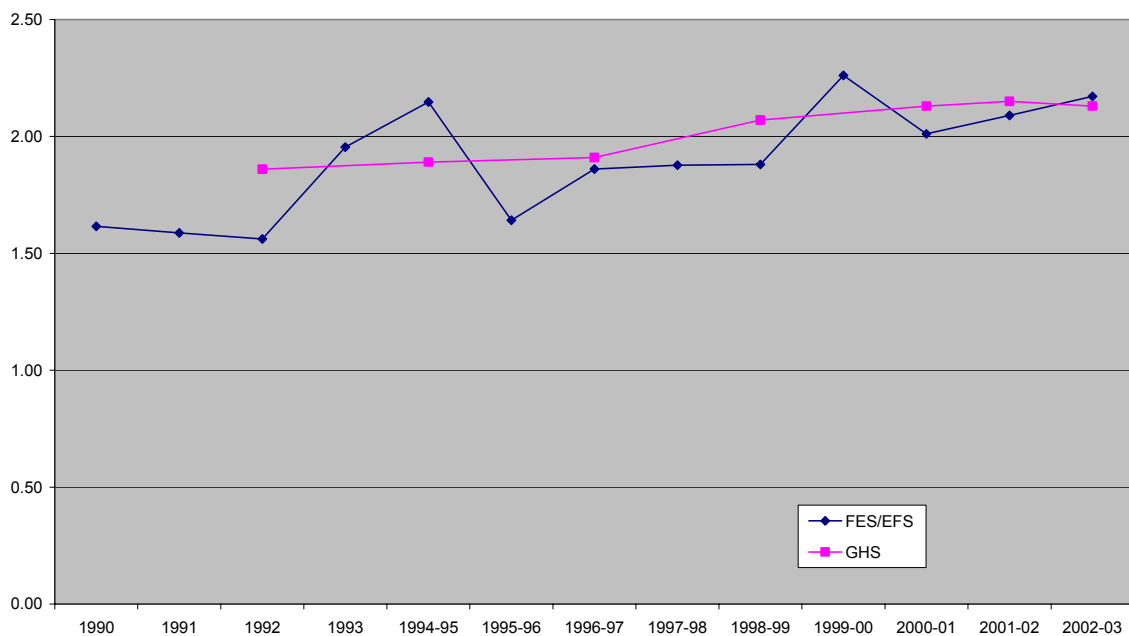


Figure 5: Weekly spirits units per adult: FES/EFS smoothed and GHS

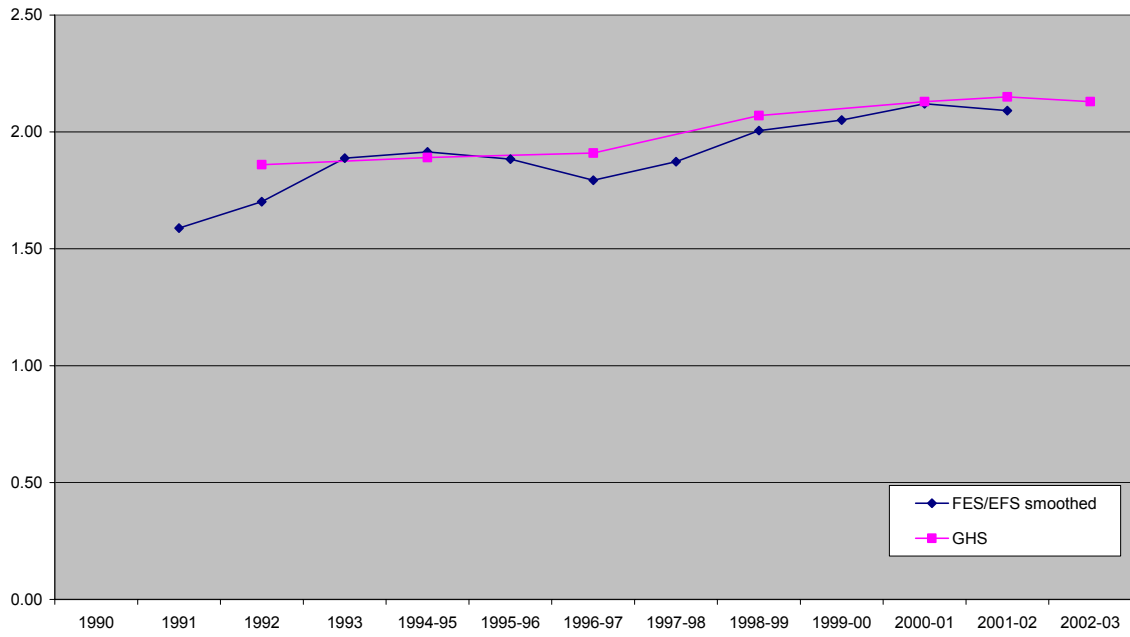


Figure 6: Weekly wine units per adult: FES/EFS and GHS

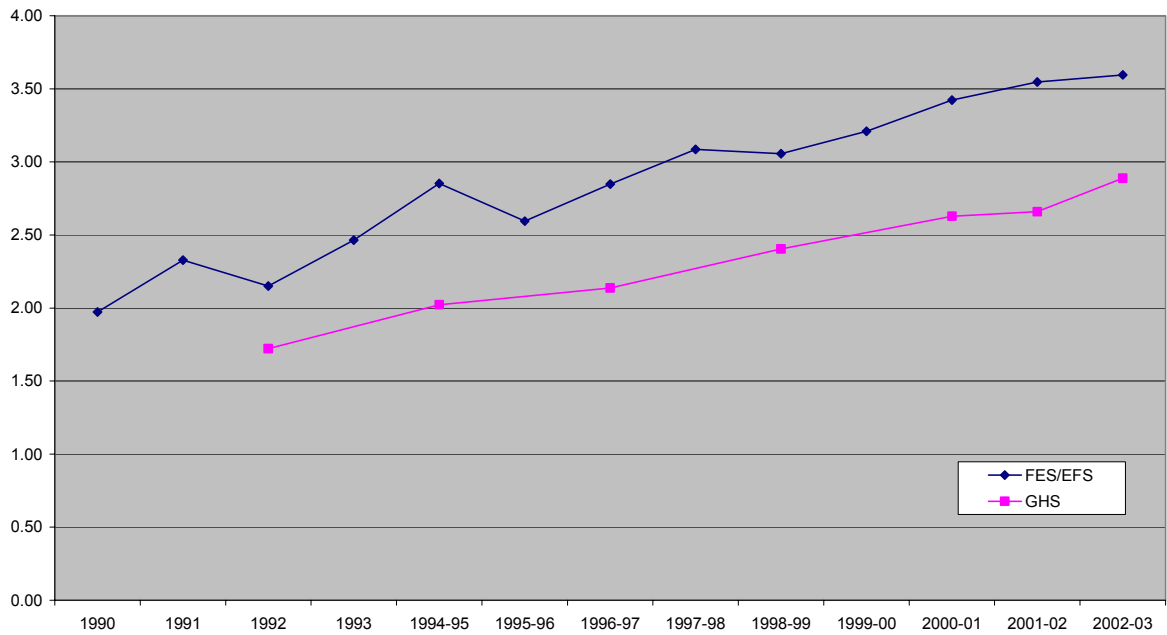


Figure 7 Weekly beer units per adult: FES/EFS and GHS

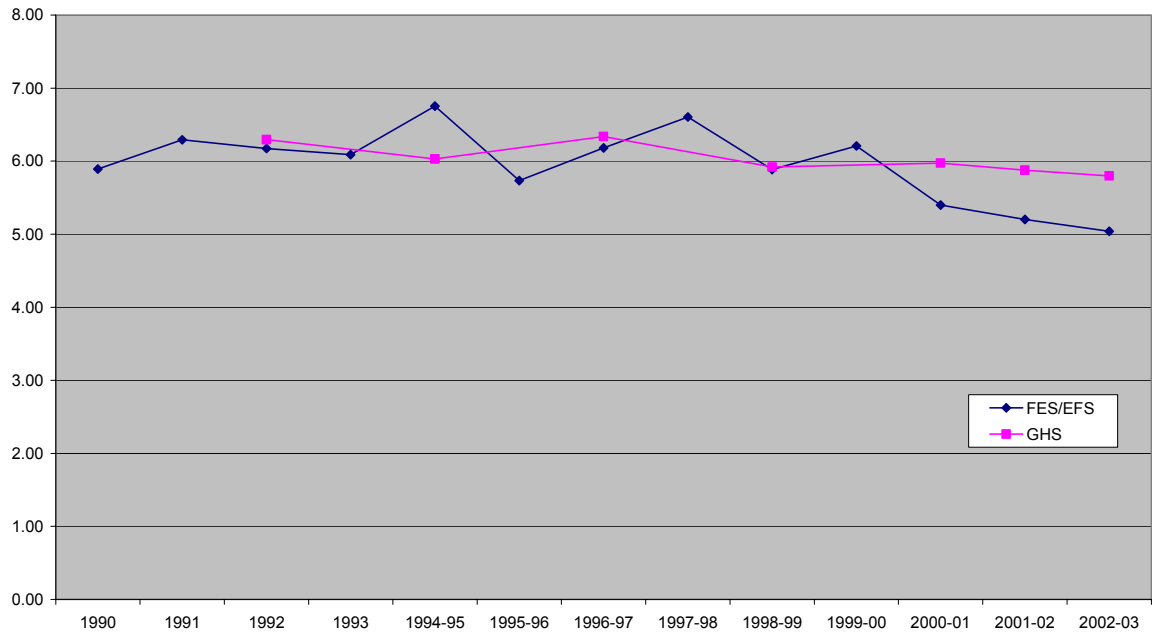


Figure 8 Weekly alcopops units per adult: FES/EFS and GHS

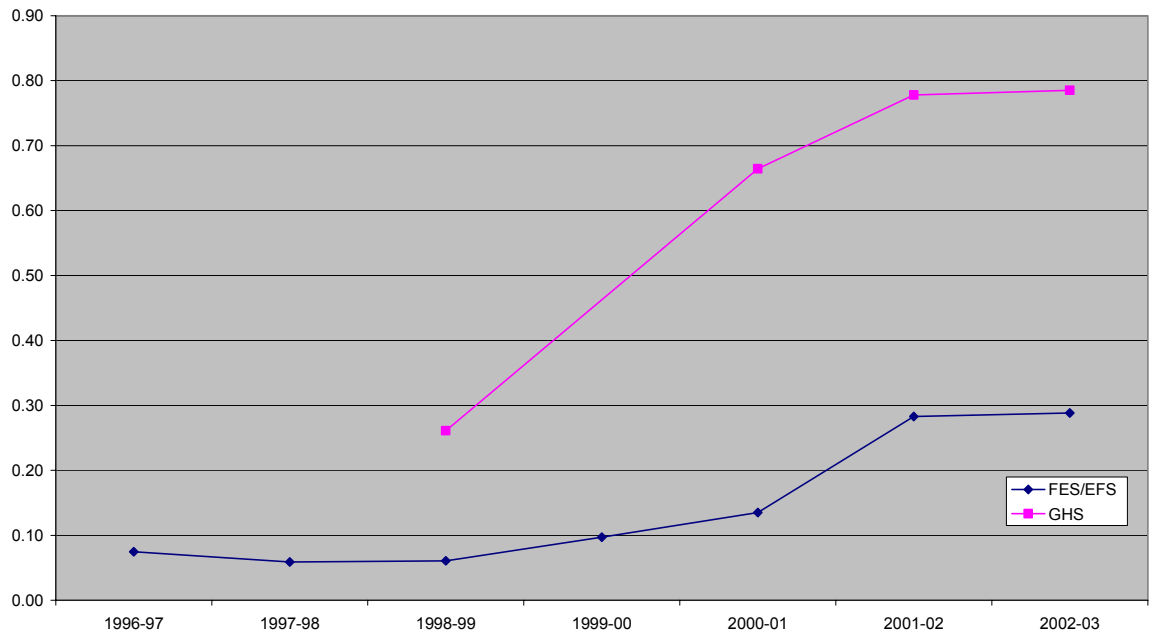


Figure 9: FES/EFS weekly household expenditure on 'other drinks'

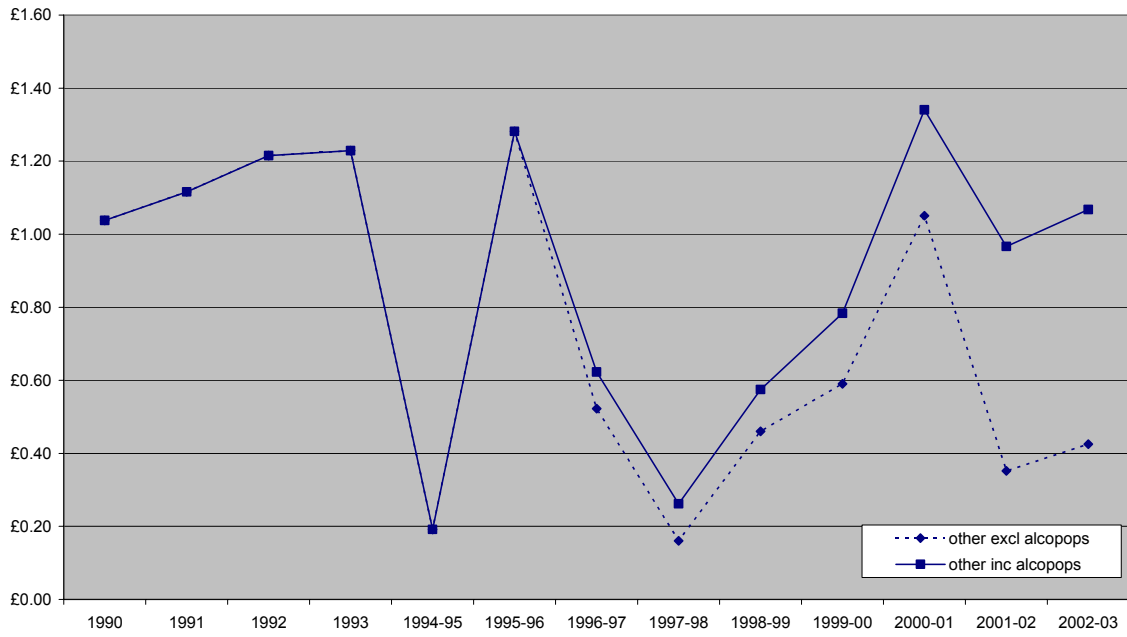
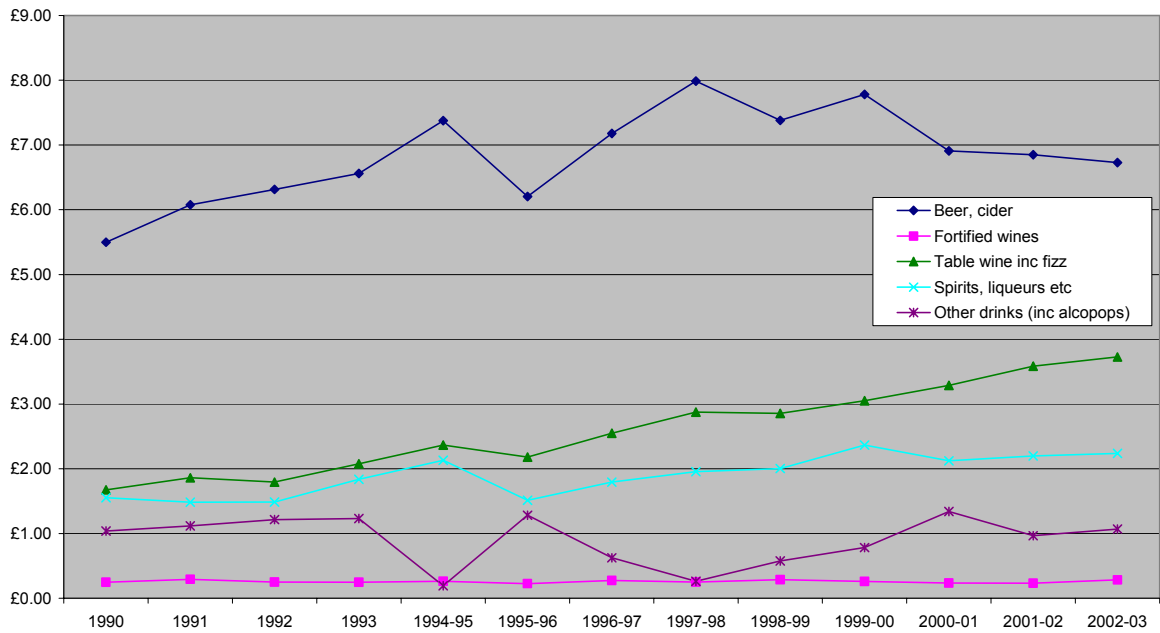


Figure 10 FES/EFS weekly expenditure by type of drink



**Table 1 General methodology: comparison of surveys**

<b>Aspect of methodology</b>	<b>National Food Survey (NFS)</b>	<b>Family Expenditure Survey (FES)</b>	<b>Expenditure and Food Survey (EFS)</b>	<b>General Household Survey (GHS)</b>
<b>Aims</b>	To provide information about domestic food consumption and expenditure	To estimate household income and expenditure, in particular, for providing weights for the RPI	To estimate household income and expenditure for the RPI, and to provide information about domestic food consumption	A multi-purpose survey monitoring a range of aspects of the lives of households and families, including health, education, housing
<b>Reason for inclusion of data on alcohol</b>	As an item brought into the home for domestic consumption	As a category of household expenditure	As an item brought into the home for domestic consumption, and as a category of household expenditure	To monitor changing patterns of alcohol consumption and behaviour
<b>Area covered</b>	GB	GB	GB	GB
<b>Survey period</b>	Every year to 2000/01	Every year to 2000/01	Every year from 2001/02	Every year except 1997/98, 1999/00. Drinking questions in alternate years
<b>Field period</b>	Continuous except Christmas/New Year	Continuous except Christmas/New Year	Continuous except Christmas/New Year	Continuous except Christmas/New Year
<b>Population sampled</b>	Private households	Private households	Private households	Private households
<b>Unit of analysis</b>	Household	Household	Household	Household and individual
<b>Achieved sample size</b>	6,000 households	6,500 households	6,500 households	8,500 households, 16,000 adults aged 16 and over
<b>Data collection method</b>	Face-to-face interview about the household, and a 7-day diary kept by the person mainly responsible for the domestic food arrangements	Face-to-face interview about income, and a 14-day record of expenditure kept by each adult (and, from 1998/99, children aged 7-15)	Face-to-face interview about income, and a 14-day record of expenditure kept by each adult and each child aged 7-15	Face-to-face interviews with all adults
<b>Response rate</b>	Food diary obtained from about 65% of eligible households	Expenditure diaries obtained from all adults in about 60% of eligible households	Expenditure diaries obtained from all adults in about 60% of eligible households	All or most adults interviewed in about 70% of households
<b>Data capture</b>	CAI for interview from 1996/97, hand-written diary coded and keyed centrally	CAI for interview from 1994/95, hand-written diary coded and keyed centrally	CAI for interview, hand-written diary coded and keyed centrally	CAI from 1994/95
<b>Information available on alcohol consumption</b>	Household expenditure on and volume of alcohol purchased and brought into the home	Household expenditure on alcohol	Household expenditure on alcohol, with some information on volumes	Adults' usual weekly volume consumed
<b>Separate estimates for spirits</b>	Insofar as the diary keeper records the type of alcohol that was brought into the home	Insofar as the diary keeper records the type of alcohol that was bought	Insofar as the diary keeper records the type of alcohol that was bought	Yes, specific questions asked about different types of drink, of which one is spirits
<b>Estimate of spirits coverage (from grossing to Customs 1992 clearance data)</b>	25%	45%	45%	50%

**Table 2 GHS spirits consumption by sex and age, 1992 and 2002**

	Average weekly units		Increase	Bases	
	1992	2002		1992	2002
<b>Men</b>					
16-24	1.84	2.82	54%	1133	760
25-44	1.81	1.81	0%	3046	2360
45-64	2.84	3.08	8%	2595	2295
65+	2.93	3.01	3%	1589	1396
Total	2.35	2.60	11%	8363	6811
<b>Women</b>					
16-24	1.71	3.35	95%	1244	891
25-44	1.37	1.56	15%	3482	2777
45-64	1.72	1.60	-7%	2817	2571
65+	1.01	1.37	35%	2145	1693
Total	1.43	1.73	21%	9688	7932
<b>All adults</b>					
16-24	1.77	3.11	75%	2377	1651
25-44	1.57	1.68	7%	6528	5137
45-64	2.26	2.30	2%	5412	4866
65+	1.83	2.11	16%	3734	3089
Total	1.86	2.13	15%	18051	14743

## Appendix Figures

Figure A1: Comparison of Quantity-Frequency (QF) surveys: spirits units per adult per week

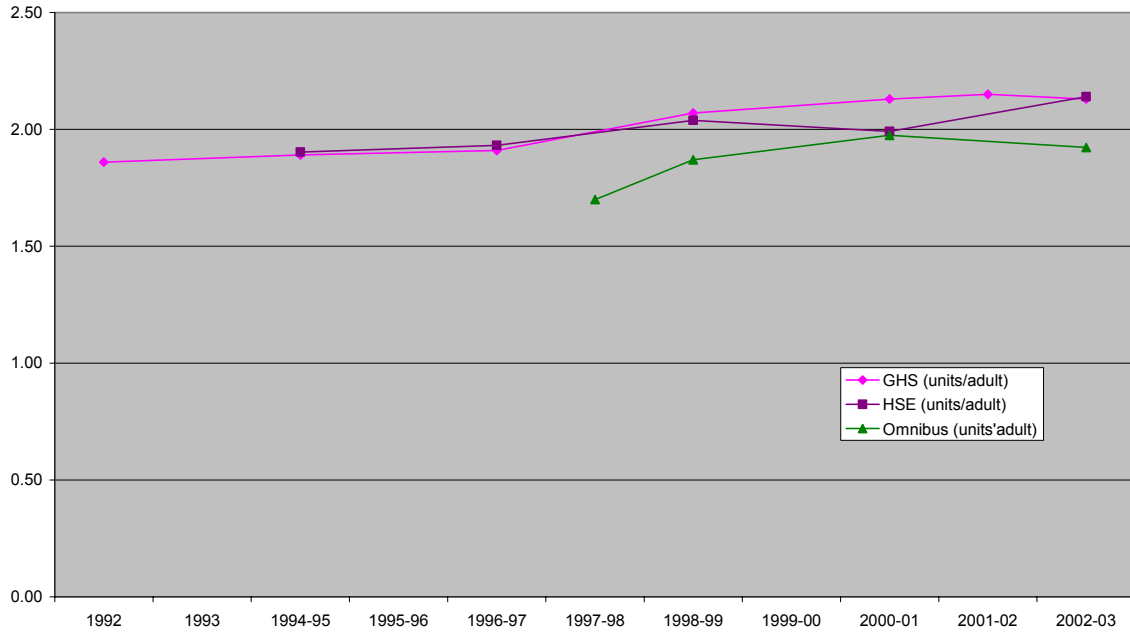


Figure A2: Comparison of Quantity-Frequency (QF) surveys: beer units per adult per week

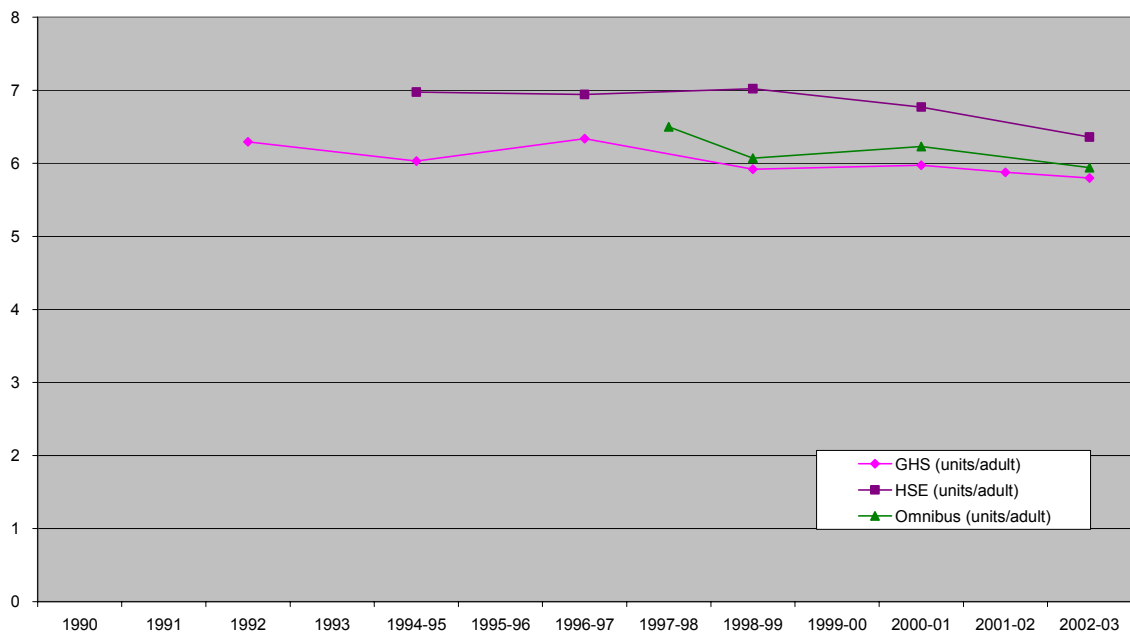


Figure A3: Comparison of Quantity-Frequency (QF) surveys: wine units per adult per week

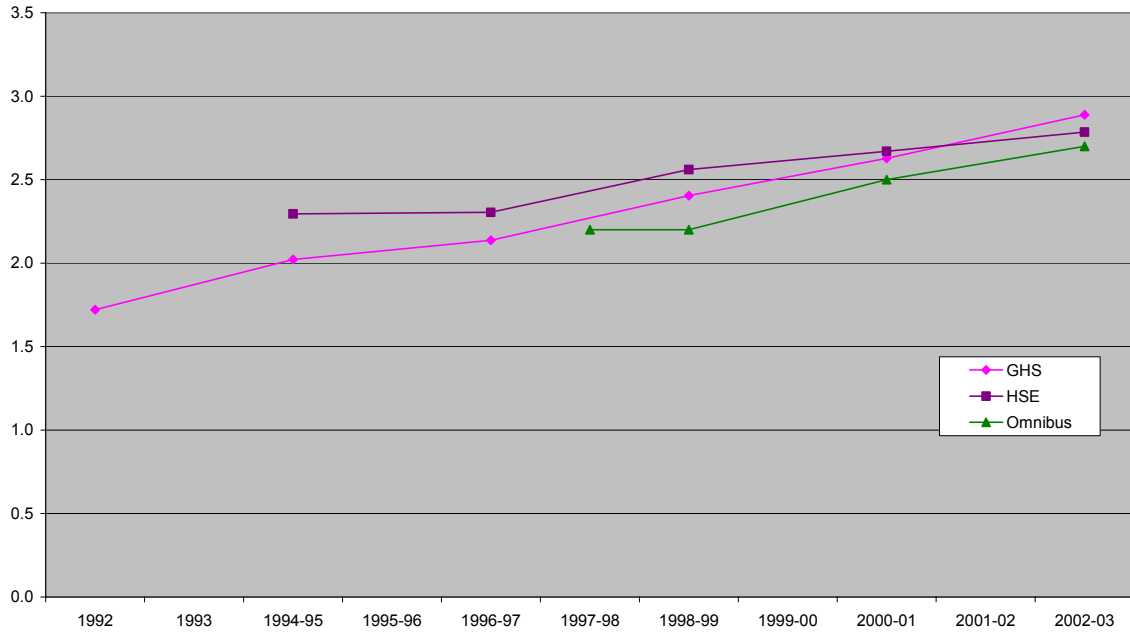


Figure A4: Comparison of Quantity-Frequency (QF) surveys: alcopops units per adult per week

