Affordability of alcohol in Europe.

The "Big Mac" affordability measure.

Measuring the affordability of alcohol across countries is difficult because price alone tells us little. Factors such as the average wage and the price of other goods in the economy are just as relevant to researchers investigating how affordable alcohol is in different countries. The Big Mac index was introduced by The Economist magazine in 1986 as a means to compare currency valuations across countries[1]. The Big Mac sandwich was chosen due to it being a product that is the same wherever it is sold, but one which local franchise operations have some leeway in setting the price of. If the price of alcohol in one country is compared to the price of the Big Mac sandwich in that country, then this gives a useful indication as to whether alcohol is relatively cheap or expensive in that country in comparison to others. It has been used in the past to look at the affordability of cigarettes in a similar manner[2].

The WHO Alcohol Control Database[3] provides a usual price comparison table for the European Union (the UK figures are an estimate provided by the IAS and, as such, are not used in the graphs later on in this document. They serve as a useful indication for UK based researchers. Where possible, the IAS has replicated the original calculation technique used for all other countries for which data is provided):

Country	Price of Beer (0.5 litres) in Euros	Price of Wine (0.75 litres) in Euros	Price of Spirits (0.7 litres) in Euros	Price of a Big Mac in Euros	Beer / Big Mac index	Wine / Big Mac index	Spirits / Big Mac index
Austria	0.67	4.05	6.7	2.75	0.24	1.47	2.44
Belgium	0.94	2.44	11.7	3.3	0.28	0.74	3.55
Bulgaria	0.21	1.14	1.8				
Cyprus							
Czech Republic	0.23	1.18	3.19	1.78	0.13	0.66	1.79
Denmark	0.92	4	10.75	4.25	0.22	0.94	2.53
Estonia	0.56	3.85	4.78	1.89	0.3	2.04	2.53
Finland	1.4	4.65	14.8	3.2	0.44	1.45	4.63
France	0.66	2.29	11	3	0.22	0.76	3.67
Germany	0.8	3	7	2.65	0.3	1.13	2.64
Greece							
Hungary	0.52	0.98	4.06	2	0.26	0.49	2.03
Ireland	2.1	9.07	13.09	3	0.7	3.02	4.36
Italy	1.66	3	14.45	2.8	0.59	1.07	5.16
Latvia	0.49	2.39	5.15	2.61	0.19	0.92	1.97
Lithuania	0.4	3.04	5.07	1.78	0.22	1.71	2.85
Luxembourg	0.82	3.5	7.4	3.29	0.25	1.06	2.25
Malta	0.19	1.27	19.2				
Netherlands	0.6	2.63	8.74	2.95	0.2	0.89	2.96
Poland	0.43	2.15	5.59	1.35	0.32	1.59	4.14
Portugal	0.55	1.55	4.81	2.58	0.21	0.6	1.86
Romania	0.31	1.55	1.08				

Slovakia	0.52	2.77	5.44	1.91	0.27	1.45	2.85
Slovenia	1.36	2.25	9.63	2.05	0.66	1.1	4.7
Spain	0.68	0.77	8.62				
Sweden	1.05	5.94	21.27	3.55	0.3	1.67	5.99
UK	0.93	1.73	6.33	2.62	0.35	0.66	2.42

Affordability index, consumption and harm measures.

Using the WHO Alcohol Control Database, the IAS has used the Big Mac index data to compute an affordability index measure for each country in the European Union where the relevant data is available. The higher the value, the more affordable alcohol is in that country.

Alongside this is provided the level of alcohol consumption per head in each country. These figures come from the 2004 WHO Global Status on Alcohol[4].

The WHO Alcohol Control Database contains many useful estimates for measuring alcohol related harm in various countries. However, for the EU countries for which there is a reliable affordability measure the Database does not supply a figure for every measure provided. For this reason, the 2004 WHO Global Status on Alcohol is referred to when putting together a measure for alcohol-related harm. This report provides the standardised mortality rates (per 100,000) for acute and chronic disease and injury, by WHO regional subgroupings, with the data for the most recent year available in each country.

The report notes, "these are not purely alcohol-related deaths. Traffic injuries, for example, also depend on the development of the transport system in a country, traffic or car densities, or road safety issues. Similarly, liver cirrhosis in many countries do not have a high alcohol involvement, but are related to poor sanitary condition (poor drinking water quality causing high levels of hepatitis infections and liver disease). Also, the numbers here do not imply that alcohol is responsible for all deaths from say cirrhosis of the liver or mouth and oropharynx cancer – with exception of alcohol use disorders, the standardized mortality rates shown here are derived from the total number of deaths from the eight causes chosen irrespective of whether alcohol was a direct or indirect contributor to the deaths."[4]

These considerations are of much importance when attempting to assign a value to the level of alcohol-related harm within each country. However, it should be noted that it is likely that the variation across the countries studied here with regards to, say, road safety or sanitation conditions, is likely to be less than that seen in a worldwide comparison. Hopefully this goes some way to strengthening this measure as a valid manner in which to compare alcohol-related harm across the EU countries studied. A useful future study could look at alcohol-attributable DALYs in each country studied as an alternative measure of alcohol-related harm.

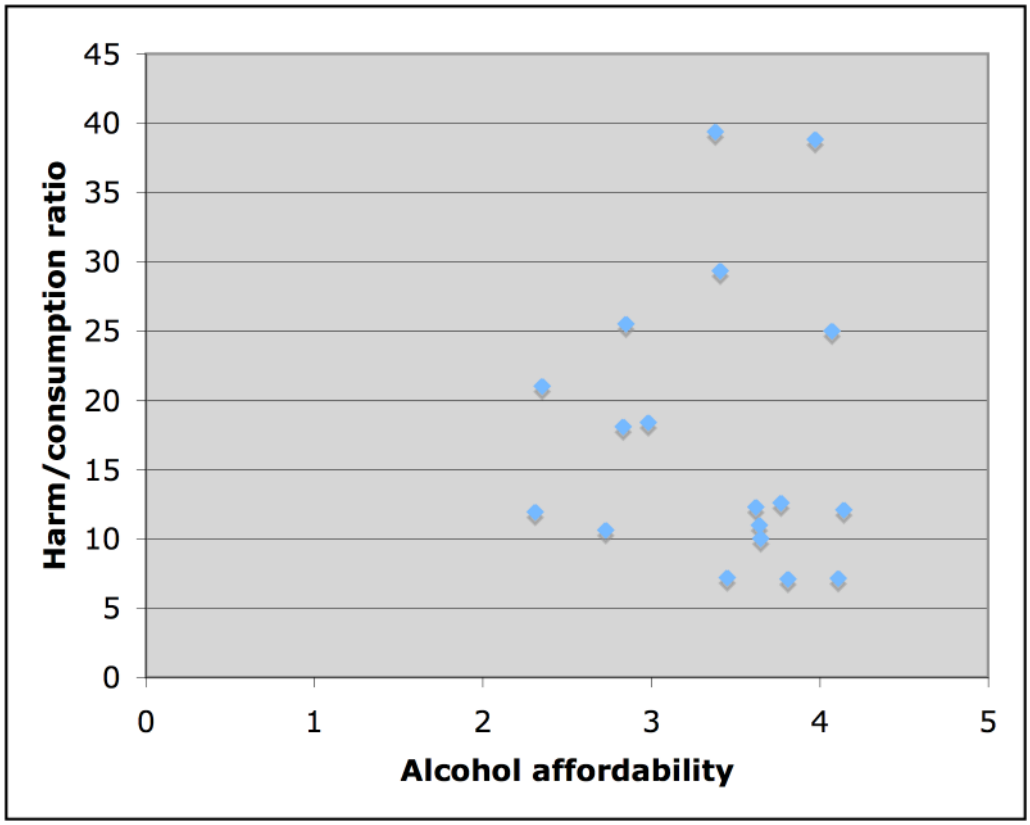
Combining the consumption and harm figures for each country gives a value for the harm/consumption ratio. This is a useful measure as it gives a standardised measure of the harm resulting from alcohol consumption, irrespective of the level of total

alcohol consumption in each country. Some countries have high levels of per capita consumption but low levels of harm, while others have relatively low levels of consumption but high levels of harm. The higher the value for the harm/consumption ratio, the more harm a country suffers from alcohol consumption, regardless the level of total alcohol consumption in that country.

All figures are given to 2 d.p. Countries without an affordability calculation and the UK are excluded from the graphs that follow.

Country	Alcohol affordability index	Total recorded alcohol per capita consumption (15+) in litres of pure alcohol	Standardised mortality rates (per 100 000) for acute and chronic disease and injury	Harm/consumption ratio
Austria	3.62	12.58	155.01	12.32
Belgium		10.06		
Bulgaria		7.13	192.05	26.94
Cyprus		6.67		
Czech Republic	4.14	16.21	196.19	12.10
Denmark	3.77	11.93	150.41	12.61
Estonia	3.38	9.85	388.33	39.42
Finland	2.83	10.43	188.96	18.12
France	3.45	13.54	97.34	7.19
Germany	3.64	12.89	141.66	10.99
Greece		9.30	97.46	10.48
Hungary	4.07	11.92	298.09	25.01
Ireland	2.31	14.45	172.81	11.96
Italy	2.73	9.14	97.04	10.62
Latvia	3.97	9.31	361.68	38.85
Lithuania	3.41	12.32	361.76	29.36
Luxembourg	3.81	17.54	124.57	7.10
Malta		6.74	179.14	26.58
Netherlands	3.65	9.74	98.00	10.06
Poland	2.98	8.68	159.68	18.40
Portugal	4.11	12.49	89.31	7.15
Romania		7.63	257.13	33.70
Slovakia		12.41		
Slovenia	2.85	6.55	167.20	25.53
Spain		12.25	88.47	7.22
Sweden	2.35	6.86	144.29	21.03
UK	2.38	10.39	159.74	15.37

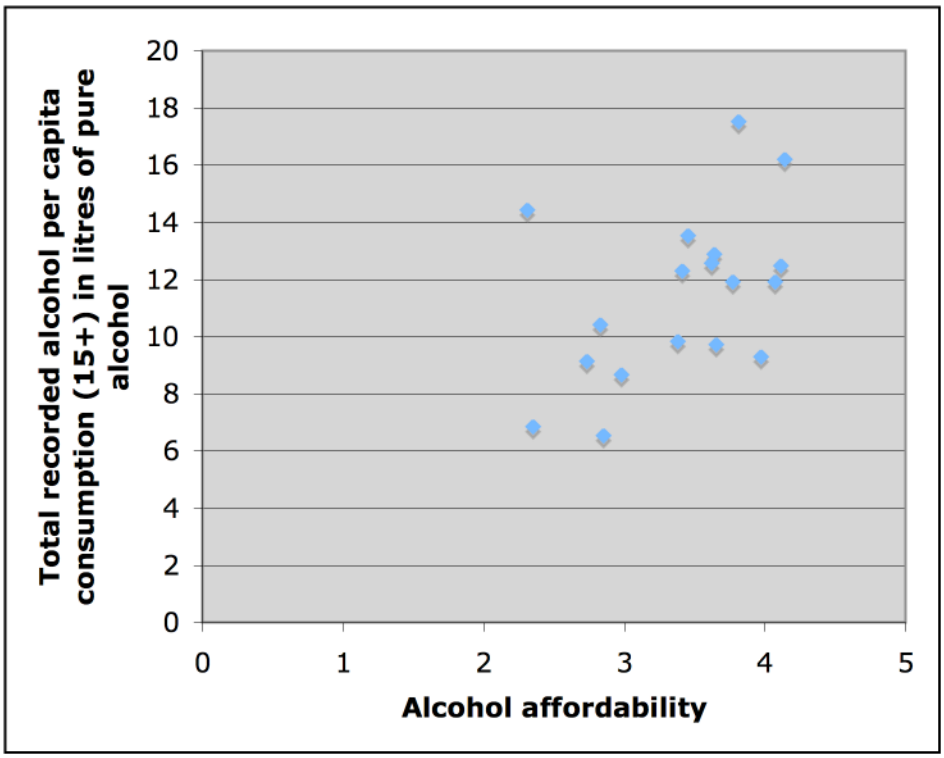
Affordability and the harm/consumption ratio in the EU



This graph shows that there is no detectable relationship between alcohol affordability and the harm/consumption ratio in the EU. The R^2 value[†] for this relationship is 0.0014, which is very small indicating that no real relationship between the two measures exists. With a p value of 0.88, we are unable to reject the null hypothesis of no relationship between the two variables.

[†] The R^2 value is a statistical term also named the coefficient of determination. The term provides some detail on the goodness of fit in a regression. It does not explain causality and there are limitations to its use. Nonetheless, it is a useful indicator when making simple comparisons such as those in this paper. When a regression line fits the observations exactly the value of R^2 will be the maximum value of 1. "If there is no apparent relationship between the values"[5] then R^2 will be close to 0. R^2 may be interpreted as the proportion of the variation in one measure that is explained by the other measure. In this case, 0.14% of the variation between countries in the harm/consumption ratio is accounted for by affordability, which, at less than 1%, is a very small proportion.

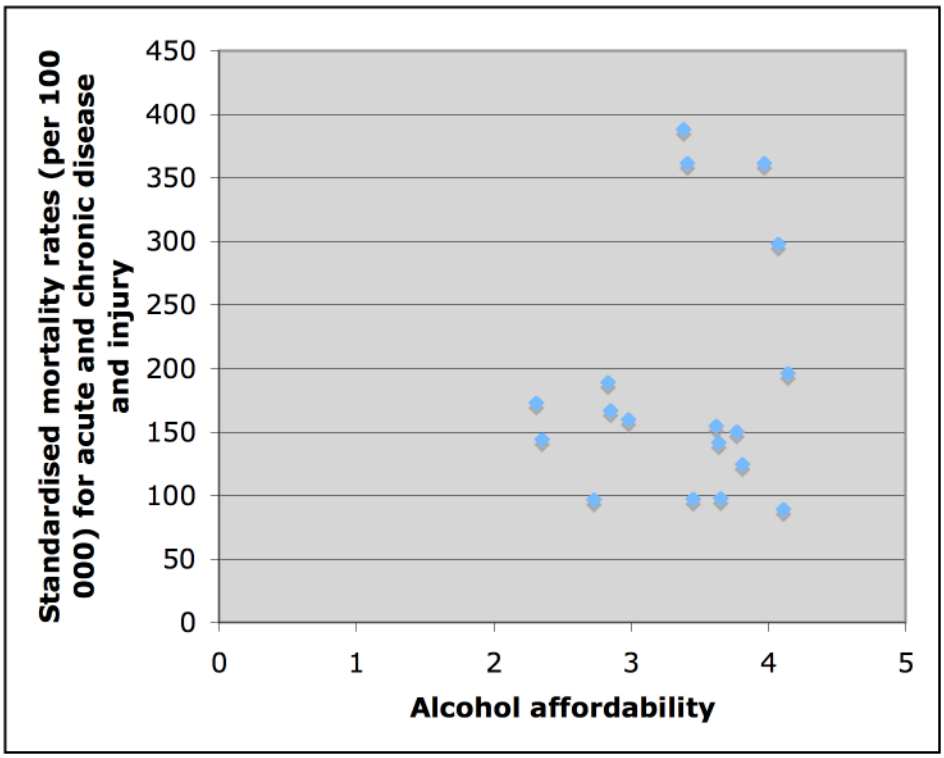
Affordability and alcohol consumption in the EU



The R^2 value here is 0.22 and this is statistically significant ($p = 0.048$[‡]) indicating a relationship between affordability and consumption. 22% of the variation between countries' alcohol consumption is accounted for by affordability.

[‡] In statistical tests, the p value gives "the exact probability of a Type 1 error (a rejection of a true null hypothesis), if the null hypothesis is true"[5]. The lower the p-value, the more confident we can be that there is indeed a relationship between our measures. By convention, a p-value of 0.05 or less is accepted as statistically significant, such that we can be confident that there is genuinely a relationship between our measures. At this level, we might expect a false positive once for every twenty statistical tests conducted.

Affordability and levels of alcohol-related harm in the EU



The R^2 term here is 0.030, which is low suggesting there is no discernible relationship between affordability and harm. The p value given is 0.49 so we are unable to reject the null hypothesis of no relationship between the two variables. Affordability of alcohol therefore does not help explain differences in alcohol-related harm across the EU.

European Union rankings

The following table ranks European Union countries according to four alcohol-related criteria. For some criteria, comparable information for all countries is not available.

Affordability	Total recorded alcohol per capita consumption (15+) in litres of pure alcohol	Standardised mortality rates (per 100 000) for acute and chronic disease and injury	Harm/consumption ratio
1.Czech Republic	1.Luxembourg	1.Estonia	1.Estonia
2.Portugal	2.Czech Republic	2.Lithuania	2.Latvia
3.Hungary	3.Ireland	3.Latvia	3.Romania
4.Latvia	4.France	4.Hungary	4.Lithuania
5.Luxembourg	5.Germany	5.Romania	5.Bulgaria
6.Denmark	6.Austria	6.Czech Republic	6.Malta
7.Netherlands	7.Portugal	7.Bulgaria	7.Slovenia
8.Germany	8.Slovakia	8.Finland	8.Hungary
9.Austria	9.Lithuania	9.Malta	9.Sweden
10.France	10.Spain	10.Ireland	10.Poland
11.Lithuania	11.Denmark	11.Slovenia	12.Finland
12.Estonia	12.Hungary	12.UK	13.UK
13.Poland	13.Finland	13.Poland	14.Denmark
14.Slovenia	14.UK	14.Austria	15.Austria
15.Finland	15.Belgium	15.Denmark	16.Czech Republic
16.Italy	16.Estonia	16.Sweden	17.Ireland
17.UK	17.Netherlands	17.Germany	18.Germany
18.Sweden	18.Latvia	18.Luxembourg	19.Italy
19.Ireland	19.Greece	19.Netherlands	20.Greece
	20.Italy	20.Greece	21.Netherlands
	21.Poland	21.France	22.Spain
	22.Romania	22.Italy	23.France
	23.Bulgaria	23.Portugal	24.Portugal
	24.Sweden	24.Spain	25.Luxembourg
	25.Malta		
	26.Cyprus		
	27.Slovenia		

Appendix.

Unrecorded alcohol consumption.

Total recorded alcohol per capita consumption is the most reliable estimate available for use in the comparison between consumption levels in different countries. However, there is also a varying amount of unrecorded consumption that this figure does not pick up. This may result from, for example, the home production of alcoholic beverages. Very few countries have attempted to accurately investigate their true level of unrecorded alcohol consumption. However, some studies have been conducted to try and discover the extent of such consumption.

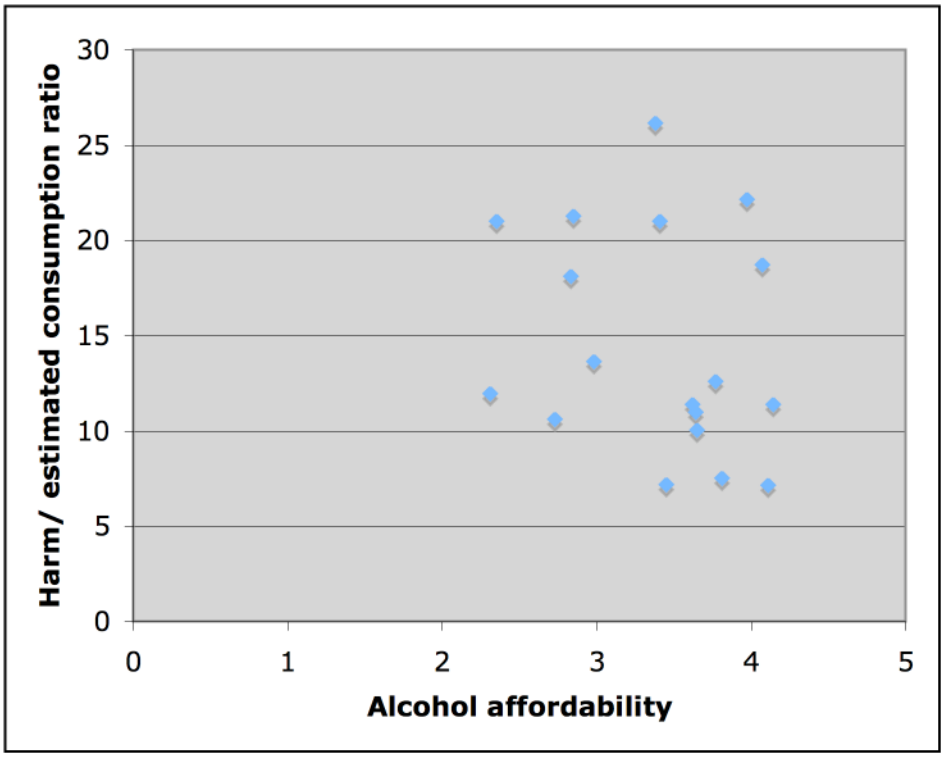
The ECAS (European Comparative Alcohol Studies) project attempted to do just this[6]. It found that the approximate level of unrecorded alcohol consumption in the countries studied ranged from around 0.5 litres of pure alcohol per inhabitant aged 15 or over, up to around 2 litres.

An alternative study, by Rehm and Gmel, looked at a wider range of countries[7]. The estimates found in this study are here added to the total recorded consumption figures used previously in this paper to investigate whether the inclusion of unrecorded alcohol consumption alters the results found.

Country	Alcohol affordability index	Alcohol consumption estimate (recorded plus unrecorded)	Standardised mortality rates (per 100 000) for acute and chronic disease and injury	Harm/ estimated consumption ratio
Austria	3.62	13.58	155.01	11.41
Belgium		10.56		
Bulgaria		10.13	192.05	18.96
Cyprus		6.67		
Czech Republic	4.14	17.21	196.19	11.40
Denmark	3.77	11.93	150.41	12.61
Estonia	3.38	14.85	388.33	26.15
Finland	2.83	10.43	188.96	18.12
France	3.45	13.54	97.34	7.19
Germany	3.64	12.89	141.66	10.99
Greece		9.3	97.46	10.48
Hungary	4.07	15.92	298.09	18.72
Ireland	2.31	14.45	172.81	11.96
Italy	2.73	9.14	97.04	10.62
Latvia	3.97	16.31	361.68	22.18
Lithuania	3.41	17.22	361.76	21.01
Luxembourg	3.81	16.54	124.57	7.53
Malta		6.74	179.14	26.58
Netherlands	3.65	9.74	98	10.06
Poland	2.98	11.68	159.68	13.67

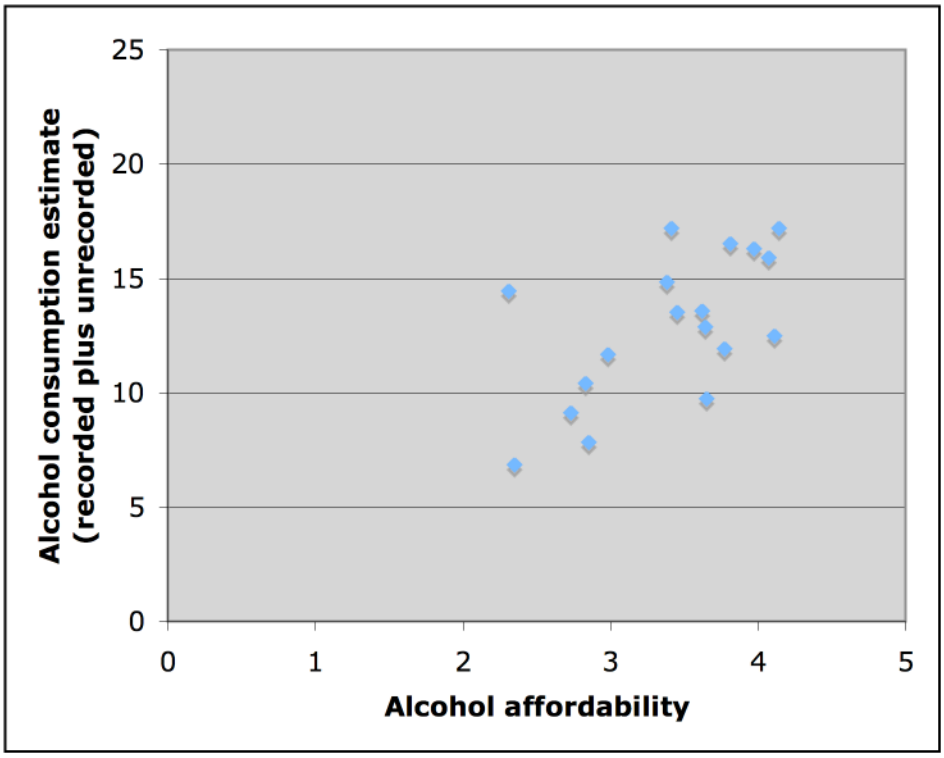
Portugal	4.11	12.49	89.31	7.15
Romania		11.63	257.13	22.11
Slovakia		19.41		
Slovenia	2.85	7.85	167.2	21.30
Spain		13.25	88.47	6.68
Sweden	2.35	6.86	144.29	21.03
UK	2.38	10.39	159.74	15.37

Affordability and the harm/ estimated consumption ratio in the EU



The inclusion of unrecorded alcohol consumption has not affected the relationship between alcohol affordability and the harm/estimated consumption ratio. An R^2 value of just 0.057, while higher than the value obtained without including unrecorded consumption, still suggests no relationship is discernible between the two variables. A p value of 0.34 means we are unable to reject the null hypothesis of no relationship between the two variables.

Affordability and estimated alcohol consumption in the EU



The R^2 value here is now 0.37, a statistically significant result (p=0.008). This higher value suggests that the addition of unrecorded alcohol consumption to the consumption measure has strengthened the apparent relationship between alcohol affordability and consumption. Affordability accounts for 37% of the variation in countries' estimated consumption, counting both recorded and unrecorded consumption

European rankings using estimated consumption measure.

These are the revised European rankings when unrecorded consumption is used in the consumption estimate.

Affordability	Alcohol consumption estimate (recorded plus unrecorded)	Standardised mortality rates (per 100 000) for acute and chronic disease and injury	Harm/ estimated consumption ratio
1.Czech Republic	1.Slovakia	1.Estonia	1.Malta
2.Portugal	2.Lithuania	2.Lithuania	2.Estonia
3.Hungary	3.Czech Republic	3.Latvia	3.Latvia
4.Latvia	4.Luxembourg	4.Hungary	4.Romania

5.Luxembourg	5.Latvia	5.Romania	5.Slovenia
6.Denmark	6.Hungary	6.Czech Republic	6.Sweden
7.Netherlands	7.Estonia	7.Bulgaria	7.Lithuania
8.Germany	8.Ireland	8.Finland	8.Bulgaria
9.Austria	9.Austria	9.Malta	9.Hungary
10.France	10.France	10.Ireland	10.Finland
11.Lithuania	11.Spain	11.Slovenia	11.UK
12.Estonia	12.Germany	12.UK	12.Poland
13.Poland	13.Portugal	13.Poland	13.Denmark
14.Slovenia	14.Denmark	14.Austria	14.Ireland
15.Finland	15.Poland	15.Denmark	15.Austria
16.Italy	16.Romania	16.Sweden	16.Czech Republic
17.UK	17.Belgium	17.Germany	17.Germany
18.Sweden	18.Finland	18.Luxembourg	18.Italy
19.Ireland	19.UK	19.Netherlands	19.Greece
	20.Bulgaria	20.Greece	20.Netherlands
	21.Netherlands	21.France	21.Luxembourg
	22.Greece	22.Italy	22.France
	23.Italy	23.Portugal	23.Portugal
	24.Slovenia	24.Spain	24.Spain
	25.Sweden		
	26.Malta		
	27.Cyprus		

Sources:

1. http://www.economist.com/markets/bigmac/about.cfm
2. Lal A., Scollo M. Big Mac index of cigarette affordability. Tobacco Control, Sep 2002, 11(3): 280-2.
3. http://data.euro.who.int/alcohol/
4. *Global Status Report on Alcohol 2004*, 2004. World Health Organization.
5. Dougherty, C. *Introduction to econometrics*. Oxford University Press, New York, 2002, p 66.
6. *European Comparative Alcohol Study (ECAS)*. Swedish National Institute of Public Health.
7. Rehm J., Gmel G., eds. Alcohol per capita consumption, patterns of drinking and abstention worldwide after 1995. Appendix 2. *European Addiction Research*, 2001, 7(3): 155-157.