

Estimation of alcohol consumption

Can student health professionals accurately estimate alcohol content in commonly occurring drinks?

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**Key words:**

Alcohol, health literacy, health professionals, evidence-based approach, numeric approach, public health

**Abstract**

**Objectives:** Correct identification of alcohol as a contributor to, or comorbidity of, many psychiatric diseases requires health professionals to be competent and confident to take an accurate alcohol history. Being able to estimate (or calculate) the alcohol content in commonly consumed drinks is a pre-requisite for quantifying level of alcohol consumption. The aim of this study was to assess this ability in medical and nursing students

**Methods:** A cross-sectional survey of 891 medical and nursing students across different years of training was conducted. Students were asked the alcohol content of 10 different alcoholic drinks by seeing a slide of the drink (with picture, volume and % alcohol by volume-ABV) for 30 seconds.

**Results:** Overall the mean number of correctly estimated drinks (out of the 10 tested) was 2.4, increasing to just over 3 if a 10% margin of error was used. Wine and premium strength beers were underestimated by over 50% of students. Those who drank alcohol themselves, or who were further on in their clinical training did better on the task, but overall the levels remained low.

**Conclusions:** Knowledge of, or the ability to work out, the alcohol content of commonly consumed drinks is poor, and further research is needed to understand the reasons for this and the impact this may have on the likelihood to undertake screening or initiate treatment.

### Introduction

Alcohol consumption is the third leading risk factor (after hypertension and tobacco smoking) responsible for the global burden of disease and is a causal factor in more than 200 health conditions (World Health Organisation, 2014), including mental, behavioural and neurological disorders, cardiovascular disease, cirrhosis, cancers, accidents, injuries and poisoning (Lim et al., 2013).

Clinicians in all settings have the opportunity to influence patients' drinking habits by appropriate screening for alcohol consumption and offering relevant advice. There are numerous reports and guidelines advocating the integration of screening for alcohol use disorders (AUDs) across clinical settings (Moriarty et al., 2010; NICE, 2010) and for the accurate assessment of alcohol intake to be regarded as a core clinical competency (Sinclair et al., 2012; NICE, 2011). Yet despite this recognition, and a robust evidence base for Identification and Brief Advice (IBA) as an effective means of reducing health harms (NICE, 2010), it remains poorly implemented (Wilson et al., 2011).

Being able to work out the number of units, (otherwise known as standard drinks) in commonly consumed beverages is a basic 'health literacy' needed to be able to use the Alcohol Use Disorders Identification Test (AUDIT) (Saunders et al., 1993) or other standard screening tools. Without this basic skill to accurately quantify the amount of alcohol consumed and feel confident enough to reflect it back to patients, which is the basis for IBA, (Heather, 2010), health professionals are unlikely to develop the more complex skills required to appropriately target evidence based pharmacological and psychological treatments for alcohol use disorders (AUDs) correctly.

Within general psychiatric populations, the prevalence of alcohol use disorders is well documented (Weaver et al., 2003; Sinclair et al., 2008), and yet management of it as a comorbid condition is often poor. A recent UK audit of inpatient psychiatric services (Paton et al., 2015) found that only 34% (252/735) of patients requiring detoxification from alcohol as part of their admission had the number of units consumed by a patient prior to admission recorded in the notes, despite NICE guidelines that the decision to undertake alcohol detoxification of a patient should be informed by the **current daily alcohol intake (NICE, 2011)**.

One reason why professionals may not take an accurate, quantified alcohol history is because they may lack the basic ability to do so. The aim of this study was to assess the ability of healthcare students to identify the alcohol content of commonly consumed alcoholic drinks and examine the associations with stage of training and their own drinking habits.

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### **Methods**

#### *Design*

This was a cross sectional survey of 891 medical and nursing students from the University of Southampton. Participants were asked to estimate the number of 'standard drinks' (1 UK unit = 10ml or 8g of pure alcohol) contained in ten commonly consumed drinks together with questions about socio-demographic characteristics and their own level of alcohol consumption, using the first 3 (consumption) questions of the Alcohol Use Disorders Identification Test (AUDIT-C)(Saunders et al., 1993).

The study was approved by the University of Southampton School of Medicine Ethics Committee (Approval no. SOMSEC024.08)

#### *Participants and Procedure*

A lecture slot was requested from the course co-ordinator for each academic year group (one lecture per year group), included in the study, none of which were after any formal teaching on alcohol (to prevent a skew in knowledge in some groups). Students attending the given lectures were provided with a brief outline of the research and given the option to opt out at that point. All students were actively encouraged to participate, and requested to do so on their own and not confer. All questionnaires were anonymous.

Participants were provided with a paper copy of the questionnaire, which corresponded with a PowerPoint presentation displaying one slide per drink for 30 seconds, for each of the 10 drinks included. Each slide contained a picture of the alcoholic drink, the quantity and the percentage alcohol by volume (%ABV). The timing (30 seconds per drink) was designed to give enough time to think through, calculate or estimate the alcohol content, and keep students engaged. It also is a reasonable reflection of the clinical situation where it is unlikely that health professionals would spend longer than 30 seconds on this task in a busy clinical situation. Questionnaires were collected immediately after the task. The drinks included within the survey were representative of the major drink groups, and where possible generic drink representations were used (see Figure1).

*Insert Figure 1 here*

#### *Statistical Methods*

Data were analysed using SPSS(SPSS Inc, 2009). The primary outcome measure was the number of correct units of alcohol in each of the 10 alcoholic drinks displayed. Each correct response was then summed to generate a total score for each participant. As some of the drinks displayed did not

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contained whole integer units of alcohol, two metrics were calculated for each response. Firstly whether the student had given the exact number of units, and second whether they had estimated the number of units correctly to the nearest 10%. 10% rather than the nearest whole unit was chosen as a better reflection of accurate estimation of units of alcohol as the drinks displayed ranged from 0.01 – 28 units of alcohol. As the number of correct responses was not normally distributed, non-parametric methods were used.

## Results

891 students completed the survey, 80.1% of whom were under 25 years old. 59.5 % were Medical and 40.5% were Nursing Students. There were significant differences between the two groups; women made up 94.2% of nursing students, compared with 62.0% of medics ( $\chi^2$  118.7;  $p < 0.0001$ ).

882/891 students completed the AUDIT-C for their own alcohol consumption. Medical students were more likely than nursing students to describe themselves as non-drinkers, 70/527 (13.3%) of medical students compared with 17/360 (4.7%) of nursing students respectively ( $\chi^2$  17.7;  $p < 0.0001$ ). A score of 5 or more on the AUDIT-C indicates the individual is possibly drinking at increasing or higher risk levels – (AUDIT-C positive); 239/524 (45.6%) medics, and 199/358 (55.6%) nursing students had a score of 5 or more on the AUDIT- C ( $\chi^2$  8.47;  $p = 0.004$ ). Overall 49.9% of the sample scored themselves as being AUDIT –C positive.

Table 1 shows the accuracy (both exact and within 10%) for the number of units contained in the ten drinks shown

*Insert table 1 about here: Accuracy of Estimation of units for each drink*

The drinks most likely to have the number of alcohol units **underestimated** by more than 10% were; a large glass of wine (by 51.4% of participants), a pint of premium strength lager (51.6% of participants) and a can of super strength larger (54.1% of participants). *Overestimates* were most common for near zero alcohol strength beer and alcopops (by 58.6% and 49.6% of participants respectively).

*Insert Table 2 about here: Mean number of correct responses by category*

The mean number of correctly estimated drinks (out of the 10 tested) was 2.4, increasing to just over 3 if the 10% margin of error was used. As can be seen from Table 2, non- drinkers significantly underperformed the task relative to those who drank alcohol, as did nursing students relative to

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medical students and pre-clinical students (across disciplines) relative to those in their clinical years. Overall however, the level of ability was low. Even the subgroup with the highest number of correct responses (the medical students in their clinical years) only estimated a mean of 3.7 drinks correctly. In the whole sample 29 /891 (3.25%) students correctly estimated 8 or more drinks to within 10% and only 2 students (0.002%) correctly estimated the alcohol content of all 10 drinks (within 10% margin).

*Insert Figure 2 about here*

## Discussion

Participants commonly underestimated the amount of alcohol in half the drinks shown, and this was most likely for wine and premium and super-strength beer. Although students performed poorly overall, there was a slight improvement in the later years, suggesting some improvement in knowledge with increased exposure to alcohol or alcohol teaching which does occur during the medical (but not nursing) clinical courses. The study is limited by the self-report nature of the survey, and the self-selected nature of students who attend lectures. However, it could be anticipated that this group would not be worse than a non- attenders in terms of their competence at this task.

Following the first UK alcohol unit guidelines in 1987 (Webster-Harrison et al., 2002) a study showed that doctors failed to obtain accurate alcohol histories and made frequent errors in estimating alcohol units (Barrison et al., 1980), and in 1989 Stockwell and Stirling published results showing the calculation of unit values for less commonly consumed drinks to be frequently incorrect (Stockwell and Stirling, 1989). Webster-Harrison et al. (2001) reported similar findings in the ability of GPs and practice nurses to correctly translate the alcohol content of six different drinks into units (Webster-Harrison et al., 2001).

Since that time, the patterns of alcohol consumption have changed; the strengths of many beers and wines have increased, as have some standard measures. While there is debate about whether it would be better to use grams or ml of pure alcohol to define alcohol content (Nutt and Rehm, 2014) rather than units, the underlying concept is the same. Our results show that drinks which have increased in strength in recent years were underestimated; compared to those drinks that were lower than average strength ABV, which were overestimated by the majority of participants. Of concern is that 45.6% of medics, and 55.6% of nursing students surveyed appeared to be drinking at increased risk levels, although may be under-estimating the amount that they drink. Just fewer than 10% of our sample defined themselves as non-drinkers, and they had the lowest levels of competence in this area, which has implications for education and training of health professionals, who have had less exposure to

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alcohol. There are a large number of factors which may account for the low levels of 'health literacy' in this area; poor general numeracy, little education on taking an alcohol history, not understanding the links between alcohol and health, all of which need further exploration. In addition the alcohol industry has gone out of its way to market alcohol brands as a form of social identity (Hastings et al., 2010) rather than give indicators of 'doses' of alcohol being drunk, making it more difficult to quantify alcohol this way.

Being able to accurately quantify alcohol intake as part of a clinical history is now acknowledged (within the UK at least) as a core medical competency across all disciplines (Sinclair et al., 2012), but the results of this study suggests that it remains (even in those who are given some teaching in this area) a poorly developed skill. The first three questions of WHO alcohol screening tool the Alcohol Use Disorders Identification Test (AUDIT)(Saunders et al., 1993) is the recommended alcohol screening tool across many health settings (NICE, 2010), and focusses on the amount of alcohol consumed. To be completed accurately requires reasonable numeracy and a basic knowledge of (or ability to work out) the alcohol content of drinks. This study suggests that many students, are unlikely to be able to correctly complete the AUDIT-C or be able to teach patients how to do so, thereby missing many opportunistic teachable moments (Crawford et al., 2004).

A further complication is that there is no international consensus on a single standard drinks size, which ranges from 8g -14g of pure ethanol in different countries (see Figure 3) (2015). This means that international studies require calibration of results of alcohol consumption when using standardised tools such as AUDIT-C, and further highlights the need for accuracy in taking an alcohol history so as not to compound the error.

*Insert Figure 3 about here*

Given the exponential relationship between levels of alcohol consumption and many health harms, treating alcohol related conditions requires a shift in perspective from a categorical to a risk based approach to its management (Rehm et al., 2014). A recent 'ten point plan' put forward to operationalise this risk-based approach to reduce the global morbidity and mortality from alcohol (Nutt and Rehm, 2014) suggests as the first action, that individuals (including health professionals) 'know their number' in terms of alcohol intake, in the same way that they know blood pressure measurement and cholesterol levels. The results of this study suggest that even health professionals are some way from having the skills to do this.

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This lack of competence at a very basic level makes it potentially difficult for clinicians to drive forward the top-down policy approaches of screening and brief advice that are already established but poorly implemented (Wilson et al., 2011; National Confidential Enquiry into Patient Outcome and Death, 2013). Understanding how best to overcome these barriers to implementation requires further work, but this study suggests that there are differences in knowledge between those who do, and do not, drink requiring potentially different approaches to staff engagement and training.

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The Authors declare that there is no conflict of interest

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**Figure1: Example of Question presentation**

## Question 2



**How many units of alcohol are contained in this glass of wine?**

**12.0% ABV**  
**250ml ('large glass')**

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The Alcoholic drinks shown (30 seconds per slide) were:

	Correct number of units
1. Bottle of Wine 13% ABV, 75cl	9.75
2. Large glass of wine, 12% ABV 250ml	3
3. Double rum & coke, 40.0% ABV, 50ml	2
4. Bottle of Alco pops, 5.0% ABV, 275ml	1.4
5. Pint Premium strength Lager, 5.3% ABV, 568ml	3
6. Half Pint normal strength Beer, 3.5% ABV, 284ml	1
7. Can of Tennents Super, 9.0% ABV, 440ml	4
8. Pint of Cider, 4.5% ABV 568ml	2.5
9. Bottle of Kaliber, 0.5% ABV, 330ml	0.2
10. Bottle of Whiskey, 40% ABV, 70cl	28

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**Table 1: Alcohol content (in units) content (in units) of ten commonly consumed drinks and students' accuracy in calculating each unit value.**

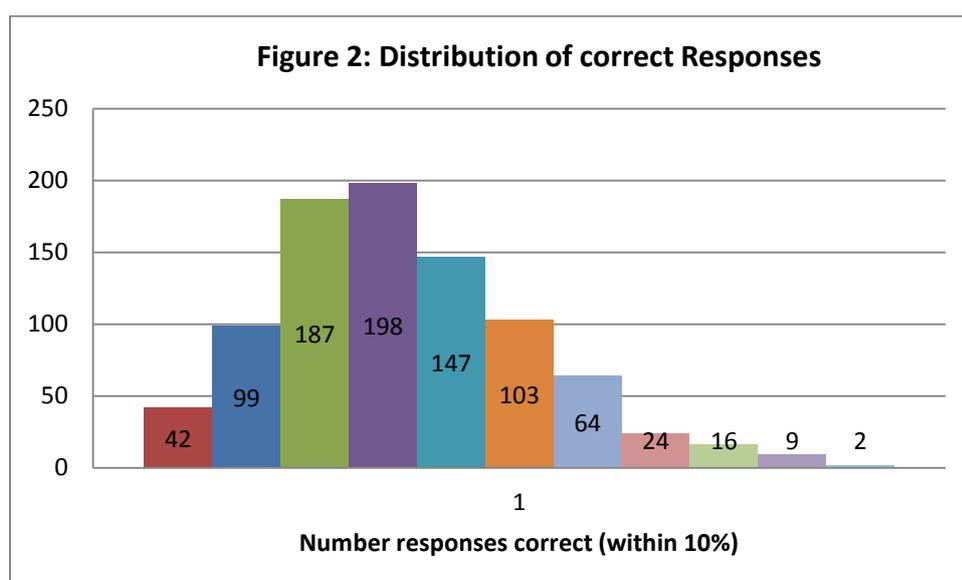
Parameters given for each drink and (correct number of units)	Students identifying correct number of units in each drink N (%)	Students identifying number of units in each drink to nearest 10% N (%)	Underestimation of unit content by more than 10% N (%)	Overestimation of unit content by more than 10% N (%)
Bottle of wine 13% ABV, 75cl (9.75 units)	2 (0.2)	354 (39.7)	356 (40)	181 (20.3)
Large glass of wine, 12% ABV, 250ml (3 units)	317 (35.6)	319 (35.8)	458 (51.4)	110 (12.3)
Double rum and coke, 40% ABV, 50ml (2 units)	467 (52.4)	468 (52.5)	24 (2.7)	392 (44)
Bottle of Alcopops, 5% ABV, 275ml (1.4 units)	14 (1.6)	220 (24.7)	221 (24.8)	442 (49.6)
Pint premium strength Lager, 5.3% ABV, (3 units)	296 (33.2)	304 (34.1)	460 (51.6)	120 (13.5)
Half pint normal strength Beer, 3.5% ABV, 284ml (1 unit)	527 (59.1)	528 (59.3)	37 (4.2)	312 (35)
Can of Tennents Super, 9% ABV, 440ml (4 Units)	250 (28.1)	257 (28.8)	482 (54.1)	143 (16)
Pint of Cider, 4.5% ABV 568ml (2.5 units)	103 (11.6)	120 (13.5)	382 (42.9)	380 (42.6)
Bottle of Kaliber, 0.5% ABV, 330ml (0.2 units)	67 (7.5)	67 (7.5)	294 (33)	522 (58.6)
Bottle of Whisky, 40% ABV, 70cl (28 units)	85 (9.5)	239 (26.8)	417 (46.8)	223 (25)

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Table 2: Mean number of correct responses by category

	Mean (Standard deviation)	Test (z)	P value
No. Correct	2.39 (1.47)		
No. within 10% correct	3.05 (1.80)		
<b>By gender (accuracy within 10%):</b>			
Male	3.36 (2.12)	-1.925	0.054
Female	2.97 (1.66)		
<b>Drinking status (accuracy within 10%)</b>			
Non-drinker	1.79 (1.19)	-7.343	<0.0001
Drinker	3.19 (1.79)		
<b>Clinical Group (accuracy within 10%)</b>			
Preclinical	2.76 (1.50)	- 3.507	< 0.0001
Clinical	3.26 (1.94)		
<b>Nursing students (accuracy within 10%)</b>			
Preclinical	2.33 (1.31)	-3.338	< 0.001
Clinical	2.91 (1.53)		
<b>Medical students (accuracy within 10%)</b>			
Preclinical	3.07 (1.79)	-3.809	< 0.0001
Clinical	3.70 (2.02)		

Figure 2: Distribution of correct (accuracy within 10%) Responses



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**Figure 3: Differences in sizes of 'standard drinks' internationally**

