

Labelling alcoholic drinks: percentage proof, original gravity, percentage alcohol or standard drinks?

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Abstract

Drivers who wish to stay 'under the limit', problem drinkers wishing to control their drinking and literally anyone who drinks alcohol and is concerned about their health are all increasingly exhorted to monitor their alcohol intake by counting 'standard drinks' (each containing 8-14 g, depending on the country in question). Unfortunately, the evidence presented in this paper suggests that this system permits many errors. In particular, it requires two assumptions to be met: (1) that drinks of the same beverage type (i.e. beer, wine, fortified wine or spirits) normally contain the same percentage of alcohol by volume; and (2) that people serve, or are served, alcoholic drinks in standard serves. It is shown that in practice the strength of drinks available for sale of a given beverage type varies widely and that 'atypical' strengths form a significant proportion of alcohol sales. Furthermore, whether drinking occurs in a private residence or on licensed premises, it is usual for quantities greater than the supposed Australian standard of 10 g to be served. In practice, most people are unaware of the strengths of different beverages or the rough equivalences between them. Even if they are taught the standard drink system, they cannot make allowances for 'atypical' variations in strength. It is suggested these problems could be readily overcome if all alcohol containers were labelled in terms of standard drinks. The benefits of such a labelling system are discussed with regard to health promotion, accident prevention and the accuracy of surveys of alcohol use.

Introduction

The promotion of sensible drinking, whether with regard to traffic safety or to general health, relies increasingly on advice to drinkers to monitor their consumption of alcohol. However, evidence is accumulating to the effect that the present methods of labelling the alcohol content of drinks, while an improvement upon past methods, often render such advice difficult to follow. The aim of this paper is to review some of this recent evidence in the light of the new National Policy on Alcohol's suggestion that all alcohol containers should have their alcohol content clearly labelled. It is the authors' view that while pursuing this suggestion would not of its own accord significantly reduce alcohol-related problems, the absence of such a system severely

limits the potential effectiveness of health promotion campaigns and programmes.

The need for clearer information on alcohol content was recognized by Australian Associated Brewers in 1978 [1]. Not only did they recommend a standard system for all beverages, they also recommended that drinks should be served in standard sizes, each containing a similar quantity of absolute ethyl alcohol (7.6-9.2 g, depending on beverage type). Given the extent of international trade in alcoholic drinks, it is important to note that the system of noting alcohol content by percentage of volume is being adopted almost universally by the significant alcohol-producing countries of the world. However, it is still possible for the diligent

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HOW MUCH IS TOO MUCH?

To be a sensible drinker, it's important to have an idea of your "safe" drinking levels as well as your patterns of drinking. These levels are different for men and women, because women's bodies are more vulnerable than men's to the effects of alcohol.

"DRINKSAFE" GUIDE

WOMEN: NO MORE THAN



2

Standard Drinks a Day

MEN: NO MORE THAN



4

Standard Drinks a Day

Each of the following contains roughly the same amount of alcohol. We call them standard drinks.



A middy of regular beer (285ml)



A small glass of wine (120ml)



A port or sherry (60ml)



A nip of spirits (30ml)

Figure 1. Guidelines for sensible drinking from the DRINKSAFE campaign, Health Department of Western Australia [2].

student of such matters to stumble across such colourful but unhelpful anachronisms as 'original gravity' and 'percentage proof'. If equipped with a good pocket calculator, it is sometimes possible to convert such data into alcohol content by volume. It is also necessary to know such formulae as: percentage alcohol by volume = (original gravity minus 1000) divided by 100, plus or minus 10%. While acknowledging the significance of this genuine advance by the alcohol industry, it is our intent in this paper to demonstrate that it is not yet possible to throw away our pocket calculators—at least not if we are to abide by modern guidelines for sensible drinking.

An increasing amount of written and electronic material is being produced in which clear guidelines are given concerning precise levels or limits as to what is safe when drinking alcohol. The recent DRINKSAFE campaign in Western Australia has, among other messages, suggested that men should drink no more than 4 standard drinks in a day, and women no more than 2, if they are to avoid present and future problems associated with drinking. This advice, and the definition of what constitutes a standard drink (now about 10 g of

pure ethyl alcohol), is presented in Fig. 1. Stricter enforcement of drink-driving legislation has also resulted in demand for, and provision of, information about how much it is possible to drink and still be under one or other of the various blood alcohol levels permitted in drivers in different states. A recent edition of the magazine of the Royal Automobile Club of Western Australia, *The Road Patrol*, provided the very detailed advice shown in Table 1 as to what men and women of average weight can drink over two hours and just be under the 0.08 level [3]. Other materials have been written specifically with the 'problem drinker' in mind. These have been sensitive to the complexity of the problem of monitoring alcohol intake and blood alcohol level by acknowledging the influence of body weight, the time over which alcohol is consumed and also variations in the strengths of commonly available drinks [4, 5] (Tables 2 and 3).

Given the apparent complexity, then, of monitoring one's drinking, it is hardly surprising that many people would appear to judge whether they are safe to drive based on their internal sense of intoxication rather than on a count of how many drinks they have consumed. It

Table 1. Guidelines for the number of drinks which an average person can consume over two hours while keeping blood alcohol level to below 0.08% [3]

Alcoholic beverage (percentage alcohol in parentheses)	Size of glass	Number of glasses	
		Average women (50 kg)	Average men (71 kg)
Beer			
Regular (5)	285 ml middy	2	4
Swan Gold (3.5)		3	6
Emu 2.2 (2.2)		5	10
Table wine (11)	120 ml wine glass	2	4
Sherry or port (18)	60 ml sherry glass	3	6
Spirits (37)	30 ml nip	3	6

Table 2. Guidelines for the number of UK 'units' of alcohol which can be consumed while keeping blood alcohol level to below 0.08%, from a controlled drinking manual [4]

Weight (stones)	Time (hours)				
	1	2	3	4	5
<i>Men</i>					
9-11	3.5	4	5	5.5	6.5
11-13	4	5	6	6.5	7.5
≥13	5	6	7	7.5	8
<i>Women</i>					
≤9	2.5	3	3.5	3.5	4
9-11	3	3.5	4.5	4.5	5.5
≥11	3.5	4.5	5.5	6	6.5

has been shown that while light drinkers are able to learn to discriminate blood alcohol levels from internal cues, heavier drinkers are usually unable to do so [6]. However, even the former will make large errors if they falsely believe drinks contain more or less alcohol than they actually do. Whatever methods drinkers actually use to gauge whether they are above or below a particular blood alcohol level, recent Australian research indicates that many people falsely believe they are beneath the legal limit when they leave licensed premises with the intention of driving home [7].

The importance of simple, readily understood information about the alcohol content of drinks is also very evident in clinical situations. For example, within the last year the first author has encountered one case of a man with advanced liver cirrhosis whose physician believed his occasional binges of five cans of beer to be within safe limits, and also one of a man with phobic anxiety whose general practitioner believed that his daily three cans of beer were doing him no harm. In

both instances a brief drinking history revealed that the drink in question had a strength of 9%. Thus, the first man was drinking *at least* 12 standard drinks per session, and the second approximately 105 per week—in both cases sufficient to worsen their present problem. These and other impediments to a clear understanding of one's own alcohol consumption will now be discussed.

Impediments to monitoring alcohol intake

Variations in strengths of different drinks

Part of the research programme concerned with this subject, currently underway at our Centre, involves analysing computer sales records for a full year from three representative liquor outlets in the Perth metropolitan area. We have supplemented these data by recording the type of labelling used to note the alcohol content of all drinks available in these stores. Our preliminary investigations have shown that the strengths

of the drinks available vary between 0.9% and 57.5%. The standard drink system illustrated in Fig. 1 is, of course, an attempt to help the consumer cope with such variety by indicating the equivalences of 'normal' strength drinks in the main classes, i.e. beers, wines and spirits. Preliminary results from analysing the stock of one such liquor store, with an annual turnover of \$1.25 m (all prices in Australian dollars), suggest that this indeed is just a rule of thumb as there is much variation in the strengths of alcoholic beverages even within such major classes. For example, we found spirits varying between 37% and 75.9%, wines from 8% to 14%, and beers from 0.9% to 11%. In the case of wines, these stated percentages are usually upper estimates, with the average strength of a particular brand often being 0.5% lower; this is to avoid the possibility of the manufacturer being penalized for apparent tax evasion if an unusually

strong consignment happens to be tested. Tables 4 and 5 illustrate the total numbers of brands of wines and beers available at different strengths, and also total sales for drinks of those strengths for 1987/88. Total sales for beers in that period amounted to \$340 000 and 630 000 g of alcohol. Since these tables were compiled the range of beers with strengths of between 2% and 2.5% has increased in Western Australia in response to a variety of factors. It is clear, therefore, that a small but significant proportion of total sales falls well outside the standard strengths upon which the standard drink system is based.

Variations in standard serves

Another assumption underlying the advice to count standard drinks and stay within certain limits is that

Table 3. *A guide to 'units' of alcohol in British drinks from a self-help manual [5]*

Drink	Units
1 pub measure ($\frac{1}{4}$ gill) of spirits (whisky, gin, vodka)	1
1 glass of fortified wine (sherry, martini, port)	1
1 glass of table wine (depending on strength)	1-2*
1 pint of beer or lager (depending on strength)	2-3**
1 pint of cider (depending on strength)	2-4***
1 can of beer or lager	1 $\frac{1}{2}$
1 bottle of 'super' or 'special' lager	2 $\frac{1}{2}$
1 can of 'super' or 'special' lager	4
1 bottle of table wine (depending on strength)	7-12*
1 litre bottle of table wine (depending on strength)	10-18*
1 bottle of fortified wine (sherry, martini, port)	14
1 bottle of spirits (whisky, gin, vodka)	30

* Wines vary considerably in strength. Some sparkling wines, for instance, contain up to 2 units per glass. If in doubt, check the alcohol content on the label: wine of strength 1 unit per glass will contain between 8% and 11% alcohol, whereas the stronger wines will be around 15% alcohol.

** Lighter beers and some lagers are about 2 units per pint. Some heavier beers, such as Guinness and some 'real ales', contain nearer 3 units per pint. Certain draught lagers, such as Beck's and Stella Artois, are also nearer 3 units per pint. Occasionally, you get beers and lagers which are even stronger than this.

*** Light ciders, such as Woodpecker and Autumn Gold, are just over 2 units per pint. Stronger ciders, such as Blackthorn and Strongbow, contain nearly 4 units per pint.

Table 4. *Number of brands of wine of different alcoholic strengths and their percentage of total wine sales for one liquor store in Perth 1987/88*

Percentage alcohol by volume	Number of brands	Percentage of sales
< 8	2	1.80
8-8.9	3	1.78
9-9.9	3	3.37
10-10.9	4	4.89
11-11.9	24	24.55
12-12.9	47	59.07
13-13.9	7	3.73
14-14.9	1	0.84

Table 5. Number of brands of beer of different alcoholic strengths and their percentage of total beer sales for one liquor store in Perth 198-88

Percentage alcohol by volume	Number of brands	Percentage of sales
<2	2	0.44
2-2.9	6	0.16
3-3.9	3	14.11
4-4.9	13	17.80
5-5.9	22	64.97
6-6.9	6	0.59
7-7.9	4	1.92
≥8	1 (11%)	0.03

Table 6. Sizes of beer glasses respondents believed they used for drinking on licensed premises [8]

Glass	Size (ml)	Males (n=121)		Females (n=44)	
		Percentage	n	Percentage	n
Pony	140	0.8	1	4.5	2
Glass	200	20.7	25	40.9	18
Middy	285	67.8	82	54.5	24
Stubbie or can	385	4.1	5	—	—
Schooner	425	2.5	3	—	—
Pint	600	1.6	2	—	—
Jug	1140	2.5	3	—	—

people can identify standard-sized glasses and indeed, even if they are not able to do so, that most alcohol is consumed from standard-sized serves. A recent study examined in detail people's knowledge of standard drinks, their use of containers of different sizes and the amounts that they poured themselves in their homes and that they received when drinking in bars [8]. Three hundred and sixty individuals aged 18-45 were interviewed (44% men and 56% women) from a sample of 634 households in which it was ascertained that one of the occupants fell within the required age group. One focus of the interview was to discover the size of glass respondents believed they typically used when drinking different beverages on licensed premises. In order to identify these, life-size pictures were presented of the full range available, that is to say wine glasses able to contain 90-250 ml, beer glasses of 140-1140 ml capacity, and spirits in half measures to double measures, i.e. 15-60 ml. Table 6 illustrates the variation among both men and women in their belief as to the usual size of glass in which beer was served to them on licensed premises.

Surveys conducted by the Australian Bureau of Statistics (ABS) [9] have shown that most people usually drink at home, although people under 25 are more likely to drink on licensed premises. The range of glasses available for drinking at home is obviously going to be

even wider than the above, and furthermore, Carruthers's study found that the amounts people typically poured themselves of their preferred beverage tended to be well in excess of a 'standard serve' [8]. Although there were slight differences according to age and sex, overall it was found that for wines the subjects poured usually between 1.2 and 1.5 standard drinks per serve, for beers between 1 and 1.3 standard drinks per serve, and for spirits between 1 and 2.1 standard drinks per serve.

Variations in container size

If glass sizes are so variable as to be an unreliable guide regardless of the setting in which alcohol is consumed, perhaps container sizes might be a better guide. We are unaware of research which has examined this issue, but everyday, and also clinical, experience would suggest that many people recall how much they drink in terms of the number of containers they have got through rather than the number of glasses. Of course, these vary from beverage types as widely as do strengths and glass sizes typically used and so do not offer an alternative solution. It will be noted later, however, that marking the total content of an alcohol container in terms of standard drinks does have certain unique advantages over other labelling systems.

Variations in methods of depicting alcohol content

It has already been noted that various methods have been, and to some extent are still being, used to depict the content of alcoholic drinks, or rather variations in their strength. So far in our preliminary investigations into the stock of Perth's liquor stores we found two examples of, admittedly imported, beers which did not mention alcohol content as percentage alcohol by volume; in fact, one mentioned 'original gravity'. It was also usual to find that the size of print used to signify percentage alcohol by volume of drinks is so tiny that even if you can find it, it is sometimes hard to read, and is certainly impossible to read for people with poor eyesight. Other problems which may present themselves to the unwary are that the American use of the term 'percentage proof' differs from the British one; thus, for American 'percentage proof' one can divide by 2 to arrive at percentage alcohol by volume, whereas for British 'percentage proof' the ratio is nearer to 2:3.

Are drinkers currently able to overcome these impediments?*Discrepancy between self-reported and actual alcohol consumption*

Whenever comparisons have been made in various countries between the estimated total consumption of a population based on surveys and the amounts of alcohol actually sold, large discrepancies have been found [10, 11]. In ABS surveys of Australian people, self-reported consumption has been estimated to account for only 41% of total sales of alcohol [9]. Many factors can be posited for this shortfall, particularly failures of memory and conscious or unconscious underestimates to avoid embarrassment; Carruthers's work suggests that failures to pour standard amounts may also be contributing to the shortfall [8]. In addition, not all surveys have enquired as to the brands of drink in different beverage classes which people typically consume, and hence other

errors may be creeping in. Thus, it appears likely that at least a proportion of the above shortfall can be accounted for by confusing labelling on alcohol containers.

Knowledge and use of 'standard drinks'

In Carruthers's survey, conducted in early 1988, 46% of the total sample claimed to have heard of the term 'standard drink', with the majority citing the media as the source of this information [8]. In the UK, the term 'unit' is employed, where one unit of alcohol equals approximately 8 g of ethyl alcohol. In a study to be described in more detail shortly, it was found that 69% of a community sample had previously heard of the term 'units' of alcohol and 29% claimed to have counted their drinks employing the system [12]. We are unaware of any Australian studies which have attempted to assess to what extent people ever attempt to count their drinks in standard drink sizes.

Knowledge of the alcohol content of different beverages

The available data indicate clearly that people's knowledge of the relative strengths of different types of beverage as well as their strengths in absolute terms is very poor. As shown in Table 7, the subjects in Carruthers's survey [8] often felt unable even to guess the content of various widely available drinks, and when they did errors were frequently made. Widespread confusion about the relative strengths of different beverages was clearly shown in a study reported recently by Anderson & Wallace [13]. In their survey of attenders at nine family practice surgeries on a single day, 561 respondents were asked as to the safe daily levels of different beverages. All subjects reported higher safe levels for beer in comparison with wine and spirits, this difference being highly significant for men.

Table 7. *Distribution of knowledge of the percentage alcohol (volume/volume %) of various alcoholic beverages [8]*

Drink (percentage alcohol in parentheses)	Males (%)			Females (%)		
	Don't know	Correct ^a	Incorrect	Don't know	Correct ^a	Incorrect
Beer (3.5)	31	55	14	81	9	10
Beer (4.9)	19	76	5	70	22	8
Wine (12)	56	28	15	81	7	13
Spirits (38.5)	47	30	22	80	5	15
Spirits (45)	65	6	29	87	2	12
Fortified wine (18)	64	19	17	88	6	6
Wine cooler (3.7)	61	24	15	77	11	11
Liqueur (28)	68	4	28	84	3	12

^a A level of accuracy of 90% was required for answers to be coded as 'correct', e.g. beer between 3% and 4%, or 4.4% and 5.4%.

Errors caused by unusually high or low alcohol content in drinks

That many people are ignorant of the concept of a standard drink and of the usual percentage alcohol content of drinks may not be a reflection of the potential value of these systems. We need to know how well people can count their drinks in standard drinks under ideal circumstances, i.e. when alcohol containers are clearly labelled and they have been taught the standard drink system. This question was addressed in a study employing 217 attenders at a road safety educational display in the UK. The use of the unit system was tested for beers, lagers and wines, some of which were not of standard strengths [12]. Subjects were asked to estimate the alcohol content of nine brands of alcoholic drink; most subjects applied the system accurately for lager, beer and wine of standard strength. However, 19% to 25% of subjects estimated that 'low' alcohol drinks (approximately 1% alcohol by volume) were totally alcohol-free. The alcohol content of 2 pints of an extra strong beer (8.6% alcohol by volume) was underestimated by as many as 99% of subjects. Furthermore, 89% underestimated the strength of 2 pints of an extra strong beer (10.9% alcohol by volume) and 51% underestimated the strength of 3 glasses of a strong wine (13% alcohol by volume). The extent of these under-

estimates is illustrated for the extra strong lager, which was considered by as many as 48% of respondents to be half or less than half of its actual strength. It is important to note that prior to these tests subjects had passed a brief test of their understanding of the unit system, and also that they were directed to study carefully the information about alcohol content on the bottles and cans of drink provided. Some of these results are summarized in Table 8.

After completing these tests the subjects were given feedback concerning the correct answers to each of the questions. They were then asked for their opinions about whether bottles and cans of drink should show their alcohol content in units. As shown in Table 9, a large majority considered this to be a good idea.

What can be done to facilitate accurate monitoring of alcohol intake?

It is clear from the above discussion that, even supposing drinkers wish to make a genuine effort to carefully monitor their alcohol consumption for any purposes, the obstacles they must overcome are many. They must choose from many different kinds of

Table 8. Percentages of subjects underestimating, overestimating and correctly estimating the number of units in one pint or one wine glass (as appropriate) of the displayed drinks (n=104) [12]

Type of drink	Type of response (%)	Strength of drink		
		Standard	Low	High
Wine	Underestimate	1	0	51
	Correct	77	71	42
	Overestimate	22	29	7
Lager	Underestimate	10.5	19	99
	Correct	77	57	1
	Overestimate	12.5	24	0
Beer	Underestimate	7.5	25	89.5
	Correct	85	62.5	8.5
	Overestimate	7.5	12.5	2

Table 9. Subjects' views on labelling alcoholic drinks in 'units' [12]

	Responses (percentages in parentheses)			
	Yes	No	Don't know	Total
"Do you think it would be a good idea for bottles and cans of alcoholic drink to display their alcohol content in units?"	198 (91)	8 (4)	11 (5)	217 (100)

alcoholic beverage, each of which comes in many different brands, is packaged in many differently sized containers and is served in varying amounts into glasses of various shapes and sizes. Information about the content of these drinks is variously unintelligible, absent or almost invisible. Attempts to guide the discerning drinker through all this confusion have increasingly depended on the concept of a standard drink based on the assumption that normal serves of various beverages come containing a fixed amount of alcohol—between 8 and 10 g. Unfortunately, it would appear that these assumptions are false in a sufficient number of instances to suggest that advice to count drinks in this way can actually be misleading. Different brands of the same kind of beverage may differ dramatically in alcohol content, they are usually served in serves larger than those suggested when the system is described, different authorities both between and within different countries define standard drinks in different ways, and even when the system is understood the labelling of alcohol containers is such that people are unable to make allowances for variations in strength between different brands of the same kind of beverage.

Australia's new National Health Policy on Alcohol recently approved by the Ministerial Council on Drug Strategy was supplemented by a series of suggested strategies for achieving the objectives outlined in the policy document. One of the suggested strategies was "the depiction of the alcohol content of beverages on all containers of alcoholic beverages in a way readily understandable by the public". From the above considerations, how is this worthy objective to be realised? It is our contention that there needs to be consistency between the measures of alcohol content used in information promoting sensible drinking and on containers of alcohol themselves, and that the only way of achieving this is for both to employ a universally agreed standard or unit of alcohol. Experiments are currently underway at our Centre in Perth to test the hypothesis that labelling drink containers clearly in terms of their content in 'standard drinks' will permit accurate monitoring of alcohol intake despite variation both in glass size and in alcohol content of alcoholic beverages. While such a system may be of limited benefit for alcohol containers containing a great number of units of alcohol, or when the drinker does not see the original container from which the drink is poured, for example, at some parties and in unlicensed premises, it is our contention that the adoption of such a system would facilitate greater awareness of the diversity of strengths of different drinks and an accurate awareness of personal alcohol intake. Other advantages of such a system might be as follows.

(a) By the very introduction of such a system of labelling, interest, and therefore awareness, of the

concept of a standard drink or unit of alcohol would be generated.

- (b) Since the system does not require safe levels of drinking to be printed on containers, or explicit warnings to be added, there should be little opposition from the alcohol industry to such a measure.
- (c) Unlike almost any other educational strategy to promote sensible drinking, exposure to this information would be directly proportional to the amount of drinking that a person does.

It has been suggested by prominent writers on the subject of preventing drug- and alcohol-related problems in society that no initiative should be seen in isolation from any other. The so-called 'systems' approach to prevention states in essence that the net effect of all the elements of a social system combined are greater than the sum of their individual parts [14]. Ensuring that the information given out on alcohol containers and by health promoters is both consistent and readily understood by consumers is an example of playing the system to its full advantage: either measure on its own is likely to be relatively ineffective. Thus, the introduction of labels for alcohol content in terms of standard drinks or units would need to be supported by other educational activities and materials. Another element in the 'prevention system', which the introduction of this measure would undoubtedly benefit, is that of research, and in particular research involving surveys of alcohol consumption. Paradoxically, it might seem, a clearer understanding of how much alcohol we consume *may* result in the levels of recommended safe alcohol consumption being revised upwards, since presumably widespread confusion about amounts of alcohol that we drink will have resulted in underestimates of the level of drinking that is safe.

Acknowledgements

We thank Sue Carruthers for permission to quote her as yet unpublished research report prepared as a Curtin University of Technology Master's dissertation. We would like to thank our other colleagues at the National Centre for Research into the Prevention of Drug Abuse for opportunities to discuss the ideas expressed in this paper and to Professor David Hawks in particular for helpful comments on an early draft. We are also most grateful to Mariella Vallesi for her swift and expert typing and to Professor Nick Heather for permission to use the material in Table 2 and Fig. 2.

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