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PRACTICAL DEMONSTRATION OF PERSONAL DAILY CONSUMPTION LIMITS: A USEFUL INTERVENTION TOOL TO PROMOTE RESPONSIBLE DRINKING AMONG UK ADULTS?

JAN GILL* and FIONA O'MAY

Faculty of Health and Social Sciences, Queen Margaret University, Edinburgh, EH12 8TS, UK

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Abstract — Aims: The aim of this study was to investigate the utility of a short, practical pouring exercise as a means of illustrating the details of the UK 'Sensible Drinking guidelines. **Methods:** Participants ($N = 297$, 53% male) recruited at four Edinburgh employment sites, each completed a short non-standardized questionnaire and poured their 'usual measure of wine or spirit' into a glass (purchased from four 'high street' outlets). The actual and estimated unit content of their poured drinks and reactions to feedback were noted. Participants were informed of their daily limit of consumption in terms of this drink. **Results:** On average, drinks contained 2.05 UK units. Only 27% ($N = 79$) of respondents estimated the unit content of their drink within 10% of the true value. Of drinkers, 20.5% ($N = 61$) indicated that the results of the pouring test would influence their future pouring (70% of these were women). When informed of daily limits of consumption in terms of personal drink measure, 46% ($N = 132$) of drinkers indicated they would usually exceed this. **Conclusion:** A practical demonstration of health guidelines presented in terms of personal drinking habits may contribute to dissemination of responsible drinking messages. Preliminary evidence suggests women may be particularly open to this approach. The utility of this intervention is underscored by recent figures highlighting the increasing preference for home drinking.

INTRODUCTION

The human and financial cost of inappropriate alcohol consumption continues to be a subject of shared international concern. Within Europe it has been estimated that 23 million individuals are dependent on alcohol in any one year while one member country, the UK, has the dubious honour of being described as in the 'premier league' of binge drinking nations (Anderson and Baumberg, 2006). Within the UK, the number of alcohol-related deaths more than doubled in the period 1991–2005 (ONS, 2006), and in Scotland, the death rates for males and females were double the rates for the UK as a whole in 2002–04 (National Statistics, 2007). In Scotland the annual cost of alcohol abuse has been estimated at around £900 million (Scottish Executive, 2007). It has been reported that in a typical drinking week, 49% of Scottish men and 39% of women exceed daily guidelines for consumption (Scottish Executive Health Department, 2003) on their heaviest drinking day.

The need to address these issues has been debated by politicians and media alike. Several government-led documents have been published in response (Cabinet Office, 2004; Department of Culture, Media and Sport, Office of the Deputy Prime Minister and the Home Office, 2005; Scottish Executive, 2007). The latter document, published by the Scottish Executive, a 'Plan for Action on Alcohol Problems' details a 3 year programme covering the period 2007–10. One explicit aim is to encourage individuals *'to take personal responsibility for* [their] *own drinking habits'* (p. 2).

Guidance on responsible, 'safe', daily drinking limits has been enunciated within the UK 'Sensible Drinking' message introduced in 1995; 2–3 UK units for women and 3–4 UK units for men are recommended (Department of Health, 1995). (One UK unit being defined as 8 g of alcohol, i.e. one small glass of wine, one measure of spirit or one half pint of average strength beer/lager/cider) Critically, it was suggested that guidance on daily amounts could be *'helpful in deciding how much to drink on a single occasion and thus help people to avoid drunkenness'* (p. 24).

It can be argued that the successful dissemination of the 'Sensible Drinking' message will be in part dependent on a clear understanding of the term 'unit' used to quantify personal alcohol consumption. Previous work by the authors among the general public (Gill and Donaghy, 2004), and university students (Gill *et al*., 2002; 2007) has, however, suggested that the assumption that a 'self' poured drink, supposed to equate to one unit of alcohol, is subject to considerable error. The drink of wine or spirit routinely poured outwith licensed premises, was found to contain on average two, not one, UK standard units. In short, the potential impact of the present UK Sensible Drinking message may be threatened in part, by poor understanding and application of the substance of the message itself.

From these findings, the present work, the development of a brief intervention tool, emerged. By extending our previous study design, we have attempted to illustrate, in a very practical way, the UK Sensible Drinking daily limits of consumption by asking adults to pour an alcoholic drink, estimate its unit content and then respond to feedback detailing its actual unit content, and, crucially, their daily limit of consumption in terms of this poured drink. We made one additional change to our previous protocol; in an attempt to reproduce more closely home pouring conditions, the glasses used in this study were not the standard varieties supplied in places like public houses, which we had used previously, but a variety of those commonly available for purchase from well known UK retail outlets.

*Author to whom correspondence should be addressed at: Subject area of Nursing, Faculty of Health and Social Sciences, Queen Margaret University, Corstorphine, Edinburgh, EH12 8TS, UK. Tel: 0131 317 3563;
E-mail: jgill@qmu.ac.uk

METHODS

Data collection and participants

Data were collected during a ten-day period in December 2006. The sample was one of convenience. Study participants were either employees ($N = 205$) of a major UK financial institution (three sites were visited on three consecutive days), or, staff and students located at an academic institution in the same city ($N = 99$). Potential participants at each location were advised of the project using a poster or by e-mail. The nature of the 'pouring test' was purposely not described at this time. No exclusion criteria operated other than a participant being younger than 18 years of age (the legal age for purchasing alcohol within the UK).

At each location, a small screened table was employed, located close to, or within, the staff canteen facilities, and individuals were approached during their working day, at break or meal times, by one of four independent researchers and invited to participate in the study.

Measures

After reading the information sheet and indicating consent, a short questionnaire, which requested details of a participant's age range, gender, frequency of alcohol consumption and frequency of consumption at home or in public houses/clubs was completed by the researcher. Each participant was then asked to name their drink of preference and if they ever drank wine or spirit. They then selected a bottle of drink from a choice of (a) red wine (b) white wine (c) whisky or (d) vodka; and secondly a glass from a range obtained from four well known UK 'High Street' stores (four wine glasses and a tall and short spirit glass) and poured the drink/glass they would '*pour for themselves or a guest at home*'. If the respondent said that they did not drink at home or, that they did not drink wine or spirit, they were asked to pour 'a glass of wine for a *guest* in their home'. A second researcher then measured the volume of poured drink and, using prepared tables, calculated its unit content and secondly, the number of '*poured*' drinks which equalled the daily limit for this participant's gender.

Participants were then asked if (i) they could recall the recommended limit for the number of UK alcohol units which can be consumed in a single day for their gender and (ii) how many units they would estimate were in their poured drink. Next, their verbal reaction to both the actual unit content of their poured drink, and their daily limit of consumption expressed in terms of their personally poured drink, were noted.

In an attempt to gauge the impact of the visual illustration of drink unit content, participants were asked if the size of drink that they would pour in future would be influenced by the results of the pouring exercise. Two final questions were asked; first, about personal use of the UK Sensible Drinking message to guide alcohol consumption; and second, sought suggestions as to what strategies might help maintain drinking 'within a healthy limit'.

The volume of drink poured into each glass was measured using a glass measuring cylinder (tolerance 1 ml). The glasses were then cleaned and prepared for the next interview. For each drink poured an error was calculated; the difference between the estimated unit content and the actual unit content expressed as a percentage of the actual unit content.

The entire interview took around 5 min. All wine glasses were labelled on the manufacturer's packaging as 'small'. Their volumes were: glass A, 360 ml; glass B, 250 ml; glass C, 300 ml; and glass D, 360 ml; thus, the maximum unit contents were 4.3, 3.0 , 3.6 and 4.3 UK units respectively, assuming a 12% (v/v) wine. (For comparison, UK licensing trade glasses contain statutory etched line measures at 125 ml, 175 ml and 250 ml (1.5, 2.1 and 3.0 UK standard units)).

To minimize the possibility that participants could have time to consider what was an appropriate volume of drink to pour, no advance information of the pouring test was given. In addition, each participant was asked to delay discussing details of the study with colleagues. It was for this same reason that each employment site was visited on a single day only.

To encourage participation in the study and to ensure confidentiality and the neutrality of the researchers, minimal demographic data and personal consumption levels relating to participants were recorded.

UK standard alcohol units contained within each drink were calculated assuming an alcohol content of 40% (v/v) for whisky, 37.5% for vodka and 12% (v/v) for wine.

All statistical tests were two-sided, and probability values $\leqslant 0.05$ were considered significant. Data were analysed using SPSS for Windows version 13.0.

Approval for the study was obtained from the University Research Ethics Sub-Committee and from the Human Resources department of the financial institution.

RESULTS

Sample demographics

During four days of sampling, 304 participants completed the questionnaire and pouring test. Of these, seven (2.3% of the sample), indicated that they were non-drinkers. All but one was a woman. The results given below refer only to those classified as drinkers ($N = 297$). Among drinkers, 52.9% were men ($N = 157$), 47.1% were women ($N = 140$). Participant numbers within each age group are shown in Table 1.

Men were poorly represented in the youngest and oldest age groups, and just under half of all men belong to one age group. Women were more evenly distributed between the age groups but were poorly represented in the oldest age group. Men were significantly different from women in terms of age group distribution ($\chi^2 = 26.965$, df $= 4$, $P < 0.0001$).

Drinking frequency and location

Among all drinkers, 97.6% ($N = 290$) claimed 'ever' to drink wine/whisky, while 80.3% ($N = 126$) men and 62.9% ($N = 88$) of women reported weekly drinking. Home drinking 'often' or 'occasionally' was reported by 97.5% ($N = 153$) of men and 93.6% ($N = 137$) of women. A significant difference in drinking frequency was noted between genders ($\chi^2 = 11.46$, df $= 2$, $P = 0.003$); 80.3% of men drank weekly compared to 62.9% of women.

Table 1. Number of drinkers in each of the five age groups split by gender

Age range	18–24 years	25–34 years	35–44 years	45–54 years	55+ years	Total
Men (% of group)	10 (6.4%)	37 (23.6%)	70 (44.6%)	29 (18.5%)	11 (7.0%)	157 (100%)
Women (% of group)	36 (25.7%)	39 (27.9%)	35 (25.0%)	22 (15.7%)	8 (5.7%)	140 (100%)
Total	46 (15.5%)	76 (25.6%)	105 (35.4%)	51 (17.2%)	19 (6.4%)	297 (100%)

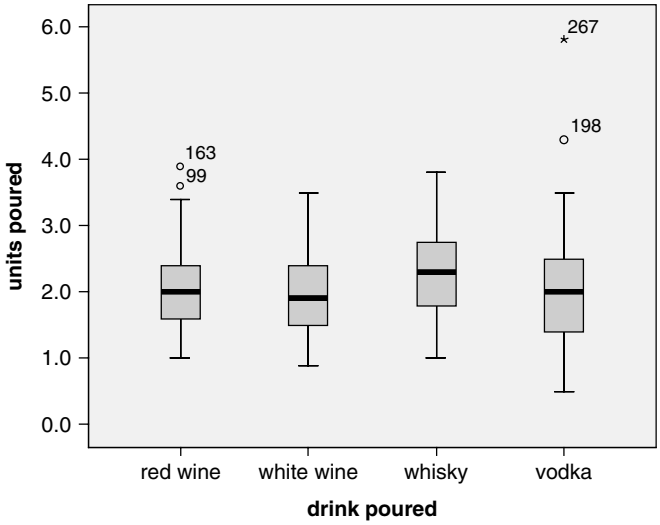

Fig. 1. Number of UK units poured in a 'drink' of each of the four alcoholic drinks. (Boxes represent the upper and lower quartiles of the distribution, with the dark bar showing the median. Circles show outliers. Whiskers delineate the maximum and minimum of remaining data that lie outside the quartiles. Extreme points indicated by asterisks.).

Recall of UK daily guidelines

Just under half (49.2%) of all participants did not know daily guidelines for their gender or provided an inaccurate answer. Precise answers were supplied by 8.1% of drinkers ($N = 24$). Significant differences between the genders ($\chi^2 = 12.555$, df $= 2$, $P = 0.002$) were evident in the distribution of answers to this question. Among women, 61.4% offered an answer that was correct or within one UK unit, while for men, the figure was 41.4%.

Almost 80% ($N = 235$) of all participants claimed not to use the UK 'Sensible Drinking' Guidelines to guide drinking. There were no differences between the genders in this respect.

UK unit content of self-poured drinks

The average drink poured by all drinkers contained 2.05 UK units (95% CI = 1.970–2.125; SD = 0.678, $N = 297$). The unit content of drinks poured with each of the four types of alcohol are summarized in Table 2 and in Figure 1.

When comparing the combined data for each gender, there was no significant difference between the unit content of the drink poured by men compared to women. When data for each drink were analysed separately only one gender difference was noted; men poured significantly more red wine than women ($t = 2.034$, $df = 122$, $P = 0.044$).

Influence of glass selection on unit content of wine poured

Pouring data were also analysed to compare the unit content of the drink poured in each of the glasses (Table 3). Significant differences were evident when the UK unit content of the drink poured in the B glass (the smallest) was compared to the A glass ($t = 2.863$, $df = 97.02$, $P = 0.005$), the C glass ($t = 2.039$, $df = 125$, $P = 0.044$) and the D glass (Mann-Whitney U-test = 519.5, $Z = -2.174$, $P = 0.030$).

The size of the glass did appear to influence the amount of wine poured. A positive correlation which was not significant was found between the maximum volume of the wine glass and the units of wine poured (Spearman rho = 0.949, $P = 0.051$). However, this finding is tentative, as a choice of only four wine glasses was available for use by participants.

(There was no significant difference between the unit content of the drink poured in the tall and short spirit glasses).

Error in estimate of unit content of poured drink

By comparing the actual unit content of the drink poured by the participants with their estimate of its content, an error figure for each participant was calculated. In total, 26.6% ($N = 79$) of all participants estimated the unit content of their drink within 10% of its true value (the 'Exact' group), 34.0% ($N = 101$) overestimated (the 'Over' group), 32.0% ($N = 95$) underestimated (the 'Under' group) while 7.4% ($N = 22$) offered no estimate ('Do Not Know' group). No gender differences were detected when comparing the frequency of these four categories.

The characteristics of the four 'error type' groups were explored further as detailed in Table 4.

Among those who underestimated the unit content of their poured drink (32% of all drinkers), the average poured drink contained 2.34 units of alcohol. This was significantly more units of alcohol than either the 'Exact' group ($t = 3.914$, $df = 167.6$, $P < 0.001$) or the 'Over' group ($t = 5.016$, $df = 194$, $P < 0.001$). Their reported frequency of drinking was not too dissimilar to those in the 'Exact' group, 72.6% reported weekly drinking. All members of the 'Under' group poured drinks which exceeded one unit of alcohol. However, when asked to estimate the drink's unit content, five group members guessed the contents to be less than one unit, and 22 individuals suggested the 'traditional' one unit. Only 26.3% of them claimed that the results of the pouring test might influence their future pouring of drinks.

Influence on future pouring

Following feedback of the unit content of their poured drink and the number of these drinks which constituted their daily limit for alcohol consumption to participants, all drinkers were asked if this information might influence their future pouring

Table 2. Mean UK unit content of participant-poured alcoholic drinks for each of the four drink choices ($N = 297$)

Drink	N	Men (N)	Women (N)	Mean UK unit content	95% CI	SD	Range (UK units)
Red wine	124	78	46	2.03	1.92–2.13	0.59	1.0–3.9
White wine	97	41	56	1.99	1.87–2.11	0.60	0.9–3.5
Whisky	23	22	1	2.33	2.00–2.66	0.76	1.0–3.8
Vodka	53	16	37	2.09	1.83–2.35	0.95	0.5–6.0
Total	297	157	140				

Table 3. Mean UK unit alcohol content of drinks poured in each of the six commercially available glasses

Glass (maximum volume, ml)	N	Mean units poured	95% CI	SD	Range
A (360)	57	2.12	1.95–2.29	0.65	1.0–3.5
B (250)	43	1.81	1.67–1.94	0.44	1.0–2.9
C (300)	84	2.00	1.88–2.12	0.54	0.9–3.6
D (360)	34	2.14	1.91–2.37	0.66	1.1–3.9
Short	61	2.13	1.90–2.35	0.89	0.5–6.0
Tall	16	2.30	1.81–2.79	0.91	0.9–3.7

(A = glass A, B = glass B, C = glass C, D = glass D, short and tall = tumblers). The maximum volume of each wine glass is shown in brackets.

of drinks. On the basis of this response, they were split into 'Yes' ('Will influence my pouring in future.'), and 'No' ('Will not influence my pouring in future.') groups. Groups were compared on a variety of parameters; drinks poured, drinking frequency, and so on, but only gender distribution appeared to distinguish one group from the other (females comprised 70.5% of the 'Yes' group, and 41.3% of the 'No' group). ($\chi^2 = 16.583$, df = 1, $P < 0.001$).

Reaction to daily allowance result

Participants were told the number of their poured drinks which constituted their daily limit of alcohol consumption and their reaction to this number was noted. Ten participants offered no response. Of those that did ($N = 287$), 46% ($N = 132$) suggested that they would exceed this amount of alcohol on a single day or at the weekend. A smaller percentage (32.4%, $N = 93$) felt that this daily limit was 'about right', they would drink within it. Just under one-tenth of respondents (9.4%, $N = 28$) were surprised that the daily limit was this high. The answers of a small number of participants suggested the daily limit for alcohol consumption was in fact the level at which the health benefit of alcohol consumption would be evident ($N = 4$), as if it was a requirement rather than a guideline.

Suggested initiatives which might help people to drink 'within a healthy limit'

In total, 89 participants offered no comment (a few misunderstood the question). Of the 208 who responded, the most common answer was one suggesting that information could be provided for the drinker through the labelling/marking of bottles, the etching of glasses, use of standard glass sizes (35.6%, $N = 74$). A slightly smaller percentage (32.7%, $N = 68$) was of the view that personal judgement/common sense prevailed. Of the remaining range of answers, the most common were 'greater advertising of the alcohol health message and its contents' (8.7%, $N = 18$) and 'medical evidence stressing dangers' (7.2%, $N = 15$).

DISCUSSION

Studying a convenience sample of Scottish adults, we have confirmed our previous finding that the average self-poured drink of wine or spirit contains two, not one, units of alcohol. Additionally, we can now suggest that this is also likely to be true when pouring into a style of wine glass more appropriate to the home setting.

Several facts relating to use of the UK Sensible Drinking message have also emerged. First, around 80% of this sample claimed not to use this message to guide their drinking, and around 50% could not quote (or provided inaccurate estimates of) the daily Sensible Drinking guidelines for their gender, while just under three-quarters (73.4%) could not provide a reasonable estimate of the UK unit content of their poured drink. The group which guessed the unit content of their poured drink with some degree of accuracy (within 10%), nevertheless poured a mean drink of 1.95 UK units. This finding suggests that for some among the population, the double measure is not poured in ignorance.

When made aware of the daily limits of consumption in terms of their poured drink, around one half (46%) said that they would exceed this on a single weekday or at the weekend. Around 20% of drinkers felt that the practical pouring test result might influence their pouring in future (70% of this group were female).

One additional finding provides preliminary evidence for a positive correlation between glass size and volume of wine poured. The difference between the mean volume of wine poured in the largest glass compared to the smallest was 0.33 UK units. It is noteworthy that all the wine glasses purchased for this survey were marketed as '*small*' wine glasses.

The finding that self-poured drinks are likely to contain generous measures confirms our previous work (Gill *et al*., 2002; Gill and Donaghy, 2004; Gill *et al*., 2007) and that of others (White *et al*., 2003; 2005). The importance of this fact being appreciated by those who monitor consumption by survey method is clear. (The assumption that one drink equals

Table 4. Characteristics of four 'error type' groups

Error type group	*N*	Mean UK unit content of poured drink (range)	Guess/estimates mean 95% CI SD range (UK units)	Number of subjects in group whose guess = exactly 1 unit	Reaction to pouring result	Percentage reporting weekly drinking (*N*)	Percentage of group claiming the pouring test result might influence future pouring
Exact	79	1.95 (0.9–3.5)	2.00 1.88–2.12 0.55 1.00–3.5	5		75% (60)	16.7% (13)[a]
Over	101	1.84 (0.5–3.8)	2.66 2.48–2.85 0.93 1.5–6.0	0	58.4% 'not surprised' 41.6% 'surprised'	70% (70)	16.8% (17)
Under	95	2.34 (1.2–6.0)	1.55 1.45–1.66 0.51 0.5–3.00	22	44.2% 'not surprised' 55.8% 'surprised'	72.6% (69)	26.3% (25)
DNK	22	2.08 (1.0–3.3)				68% (15)	27.2% (6)
Total	297						

[a] 1 non-response. 'Exact' = estimating within 10% of the true UK unit content of the participant's poured drink, 'Over' = overestimating the unit content by 11% or more, Under = underestimating the unit content by 11% or more, DNK = unable to offer an estimate.

one unit of alcohol is subject to considerable error. In fact only eight participants (2.7% of drinkers) poured one or fewer units). The message is further underscored by recent data suggesting that in Scotland both women and men are more likely to drink at home (where drink sizes for wine and spirit are likely to be controlled by the drinker) than in public houses and clubs (Scottish Executive Health Department, 2003).

The relatively high percentage claiming not to use the UK Sensible Daily Guidelines to influence their personal consumption (80%) is similar to that found by us amongst students (86%) enrolling into university and supermarket shoppers in Scotland (77%) (Gill and O'May, 2006; Gill and O'May, 2007). The percentage (46%) admitting that they would be likely to exceed their daily limits is slightly lower than the figures quoted for men (63%) and women (57%) in a recent Scottish survey (Scottish Executive Health Department, 2003).

Several aspects of the present findings in relation to female drinking merit discussion. There is evidence suggesting that while drinking levels are undeniably high in Scotland, the drinking of men may have stabilized, but that of women continues to rise (Scottish Executive Health Department, 2003). Certainly, recent figures for liver disease among women in Scotland give cause for concern; female deaths due to liver disease rose by 424% in the period 1980–2003 (NHS National Services Scotland, 2005). Health statistics support the argument proposing development of interventions specifically targeted at women. Given the fact that in this study, women were more likely than men to respond positively to the intervention, future work might consider exploring the impact of this intervention in women of different socio-demographic groups, and in larger numbers, to permit age group comparisons.

This study has several limitations. The sample was one of convenience, and heavy or problem drinkers may well have avoided participation. Some age groups were poorly represented in the sample. This is particularly so for the older age groups of both genders and the younger males. The sample was recruited exclusively from employed or student groups. Further testing with other population groups is essential. It is also possible that some answers to the questionnaire were guesses (of the unit content of a poured drink) or were said to please the researcher (claiming that the intervention would influence future pouring) or conceal ignorance of drink measures, (denying any impact of the intervention). We also cannot be certain that a comment that the intervention would influence future pouring guarantees a positive influence, from a health perspective.

The responses of study participants to questions seeking suggestions for initiatives which might help people to drink within a healthy limit indicate that some of the duty to promote responsible drinking within the UK may lie with both manufacturers of drink (35.6% of respondents favoured measures designed to aid the consumer quantify their consumption like drink labelling, bottle marking, etc.), and, second, of glassware—there is preliminary evidence from this study to suggest, as seems intuitively reasonable, that increasing glass size is associated with increased volume of poured drink. (It is interesting that all wine glasses used in this study were marketed as 'small'.) There are implications for restaurants and such places, where wine glasses of a variety of sizes and shapes are evident. In such settings, it may be very difficult for the drinker who genuinely wishes to drink responsibly, to do so.

In some counties, drink labelling policies are more established than in the UK, and some findings would caution that the evidence for successful translation of knowledge into changed behaviour is poor (Hilton, 1993; Mackinnon *et al*., 2001; Stockley, 2001). However, calls for mandatory drink labelling within the UK have been made (Webster-Harrison

et al., 2002; Webster-Harrison and Barton, 2002; Anon., 2001) and a recent survey of European Union citizens reported that around three-quarters favoured the addition of warning labels to bottles (Eurobarometer, 2007). Among supermarket shoppers in England, 93% support for drinks being 'unit-labelled' has been reported (Webster-Harrison *et al*., 2002). This figure is slightly higher than that found by ourselves amongst a similar sample in Scotland (75%) (Gill and O'May, 2006) and students (68%) (Gill and O'May, 2007). In 2007, a partnership agreement between the Scottish Executive and the alcohol industry was published (Partnership Agreement: Scottish Executive and the Alcohol Industry, 2007). This document contains a commitment to 'share consumer research on promoting sensible drinking and responsible retailing'. It is not legally binding.

The findings presented here merit repetition of the study using a larger and more representative group, but certainly a large percentage of this sample did not use the current health message in the UK to guide their drinking. A redrafting enabling responsible drinking may be timely. On the basis of the alcohol content of the drinks poured in this study, it may be appropriate for women to consider a rewording of the sensible drinking guidelines to 'one drink per day'. In this study, 20% ($N = 28$) of women poured 2.5 or more units in a single drink. (The daily limits for women are 2–3 units.) Also of relevance, is the fact that a relatively common response to the discussion of personal daily limits of consumption was that this limit would not be exceeded through the week, but that units could and would be saved for the weekend. Any rewording of health guidelines needs to address this confusion more emphatically.

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