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*Published in:*  
Birth

*DOI:*  
[10.1111/birt.12252](https://doi.org/10.1111/birt.12252)

*Publication date:*  
2016

*Document Version*  
Peer reviewed version

[Link to publication in Discovery Research Portal](#)

### *Citation for published version (APA):*

Symon, A., Rankin, J., Sinclair, H., Butcher, G., Smith, L., Gordon, R., & Cochrane, L. (2016). Peri-Conceptual and Mid-Pregnancy Alcohol Consumption: A Comparison between Areas of High and Low Deprivation in Scotland. *Birth*, 43(4), 320-327. DOI: 10.1111/birt.12252

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**Peri-conceptual and mid-pregnancy alcohol consumption:  
a comparison between areas of high and low deprivation in Scotland**

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This is the peer reviewed version of the following article: 'Peri-Conceptual and Mid-Pregnancy Alcohol Consumption: A Comparison between Areas of High and Low Deprivation in Scotland', *Birth*, which has been published in final form at <http://dx.doi.org/10.1111/birt.12252>. This article may be used for non-commercial purposes in accordance with Wiley Terms and Conditions for Self-Archiving.

## **Abstract**

**Background.** Alcohol-related mortality and morbidity among women has increased over recent decades, especially in areas of higher deprivation. Pre-pregnancy alcohol use is associated with continued consumption in pregnancy. We assessed whether general population alcohol consumption patterns were reflected among pregnant women in two Scottish areas with different deprivation levels.

**Methods.** Cross-sectional study in two health boards (HB1, lower deprivation levels, n=274; HB2, higher deprivation levels, n=236) using face-to-face 7-day Retrospective Diary estimation of peri-conceptual and mid-pregnancy alcohol consumption.

**Results.** A greater proportion of women in HB2 (higher deprivation area) sometimes drank peri-conceptually, but women in HB1 (lower deprivation area) were more likely to drink every week (49.6% vs 29.7%;  $p<.001$ ) and to exceed daily limits (six units) at least once each week (32.1% vs 14.8%;  $p<.001$ ). Following pregnancy recognition consumption levels fell sharply, but women in HB2 were more likely to drink above recommended daily limits (two units) each week (2.5% vs 0%;  $p<.05$ ). However, women in HB1 were more likely to drink frequently. Women with the highest deprivation scores in each area drank on average less than women with the lowest deprivation scores.

**Conclusions.** Heavy episodic and frequent consumption was more common in the lower deprivation area, in contrast with general population data. Eliciting a detailed alcohol history at the antenatal booking visit, and not simply establishing whether the woman is currently drinking, is essential. Inconsistent messages about the effects of alcohol in pregnancy may have contributed to the mixed picture we found concerning peri-conceptual and mid-pregnancy alcohol consumption.

**Keywords:** pregnancy; alcohol; deprivation; screening; teratogenesis

## Introduction

Scotland's troubled relationship with alcohol has long been recognised (1,2). Current estimates are that around 40% of women aged 16-44 drink above the recommended maximum of six units daily or 14 units weekly (3) (1 UK unit = 7.9g or 10ml of ethanol). Heavy episodic ('binge') drinking is strongly implicated in adverse health outcomes and unintended conception (4,5). While most women abstain following pregnancy recognition (6), delayed recognition is not unusual and this can defer the positive behaviour changes advocated for pregnant women (7). Not all women abstain from alcohol following pregnancy diagnosis. Given the known association between levels of pre-pregnancy and pregnancy drinking (8), it is important to establish an alcohol history in early pregnancy and not simply record current consumption levels, if any.

Pregnant women, and those planning a pregnancy, are advised to abstain (9,10). However, the lack of evidence establishing a safe level of consumption during pregnancy (11) constrains this message, and indeed a meta-analysis has claimed that 'moderate' consumption is not a risk factor for fetal malformation (12). While the Royal College of Obstetricians and Gynaecologists states that "the only way to be certain your baby is not harmed by alcohol is not to drink at all during pregnancy", it then goes on to recommend abstinence during the first three months. 'News frame analysis' in Australia has found that media reporting often portrays conflicting advice about alcohol in pregnancy, which does confuse women (13). Guidelines from the National Institute for Health and Care Excellence (NICE) also qualify the abstinence message: women are advised to avoid alcohol in the first three months, but those who continue drinking should drink "no more than 1 to 2 UK units once or twice a week" (14). Proposed revisions to the UK guidelines (15) follow the Nordic, US and Canadian 'precautionary approach' (i.e. advise complete abstinence).

Alcohol has known teratogenic effects (16), although there is uncertainty about the exact level at which these occur (12). Fetal Alcohol Syndrome has typical facial characteristics, and is a serious congenital condition characterised by neurological and behavioural impairment. Fetal Alcohol

Spectrum Disorder is also characterised by social, cognitive and behavioural maladjustment (17). The economic costs of these conditions to the health service, social care, and the educational and criminal justice systems (17,18) represent a significant taxpayer burden. Evaluation of alcohol consumption is part of the overall assessment in early pregnancy when a woman seeks professional support, but practitioners may feel uncomfortable doing this (19). One small-scale Australian survey found that while midwives felt confident in this role they lacked knowledge about risk levels (20). A more recent and larger Australian survey found that many midwives did not use the recommended screening tool or offer a brief intervention when indicated (21), suggesting that professional development in this area was needed. Perhaps unsurprisingly, estimates of alcohol consumption in pregnancy vary. Within the UK there are recent reports of between 25% and 40%, albeit mostly at low levels (22,23), but higher reports have been noted in the Netherlands (35-50%) (24), Spain (45%) (25) and Ireland (63%) (26). By contrast, rates in the USA are reported to be 8% (27). However, national data on overall consumption levels can mask significant regional variations in consumption patterns

While total alcohol consumption levels are not associated with deprivation (28), alcohol-related harm - as measured by hospital admissions and mortality rates (3) – is strongly associated with higher deprivation (3,29), and indeed the gap appears to be widening between least and most deprived areas (30). Heavy episodic ('binge') drinking is implicated as a significant factor (31). There are more areas of deprivation in the west of Scotland compared with the east, but it is not known whether the patterns of consumption reflecting these differences extend to the pregnant population. As part of a wider project examining alcohol in pregnancy, and at the request of public health officials in the Scottish Government, this study set out to compare levels and patterns of consumption in two Scottish health board areas - one in the east, one in the west – which have broadly comparable population levels but different deprivation levels.

## Methods

This was a cross-sectional study located in two Scottish health board (HB) areas: HB1 (east: lower deprivation levels) and HB2 (west: higher deprivation levels). These are part of the state-funded National Health Service. Deprivation was measured by the number of data zones within each area that were in the '10% most deprived' category (32). Data zones have an average population of 500-1,000 people. HB1 (in the east of Scotland) has a population of 354,000, and contains 24 (3.7%) of the '10% most deprived' data zones in the country; the higher deprivation area (HB2 - west) has a population of 368,000, and contains 62 (9.6%) of the '10% most deprived' data zones. Another indirect measure suggesting that HB2 has a more serious problem is the higher combined health service and local council per capita spending on alcohol and drug services - 41% higher than in the lower deprivation area (33). As requested by public health officials we analysed data at an area level, as well as examining patterns according to women's individual deprivation scores.

Women attending their mid-pregnancy ultrasound scan (usually 19-21 weeks gestation) were recruited. Invitation letters explaining the study were sent one week in advance. Researchers assessed eligibility when the women attended the clinic. Women were not approached if an anomaly had been identified on scan, or if they appeared upset. Those aged under 16 and those deemed unable to understand the study and complete the questionnaires were excluded. Consent was obtained after discussion in a private room before or immediately following the scan, whichever was convenient. Participants received a £10 'thank you' voucher.

In face-to-face discussion with a researcher, consenting women completed a standard socio-demographic data questionnaire; a deprivation score using the Scottish Index of Multiple Deprivation (SIMD) was calculated from their postcode (32). They then completed the shortened form Depression-Anxiety-Stress Scale (DASS-21) (34) comprising three self-report sub-scales measuring negative emotional states (each produce 0-21 sub-scale scores summed for a total score); the alcohol questionnaire used in routine practice in that health board - the Alcohol Use Disorders Identification

Test (AUDIT) (35) in HB2 and its 3-item version AUDIT-C (36) in HB1. Lastly, the researchers used a Retrospective Diary to record two separate estimations of week-long consumption (37,38). The first was for a typical week in the peri-conceptual period (“phrased as “Before you were pregnant / before you knew you were pregnant”) (Retrospective Diary 1); the second was for a recent typical mid-pregnancy week (Retrospective Diary 2). In discussion with the woman the researchers filled in information for all ‘drinking days’ in these specified timeframes: if the women drank at all; if they did, whether they had a ‘typical’ consumption pattern; on what days of the week they would ever drink; and whether they drank on their own or with others. If the woman did not drink alcohol every week in either time period, the frequency of ‘drinking weeks’ was recorded. Alcohol consumption patterns are reported in another paper (under review elsewhere).

Information from the Retrospective Diaries in both areas generated daily and weekly unit consumption totals which we matched against recommended limits. For the ‘peri-conceptual’ period we used the existing limits for non-pregnant women: no more than six units on a single occasion; no more than 14 units a week (the limit for women). Given anecdotal reports of high consumption we also used the limit for men (no more than 21 units a week). For pregnant women the limits were no more than two units on a single occasion, and no more than 4 units a week, reflecting the NICE guideline of not more than 1-2 units once or twice a week. Actual-size ‘flashcards’ (laminated cards showing the most popular drinks in actual size) were used to prompt recall and accuracy over drink sizes. When excessive consumption was identified, the woman was offered details of local support services: the Vulnerability in Pregnancy midwife (HB1) or Alcohol Counselling Service (HB2). Ethical approval for this study was granted by the East of Scotland Research Ethics Committee 1 (ref. 14/ES/0023).

## Results

We recruited 510 women (lower deprivation area [HB1] - 274; higher deprivation area [HB2] – 236; response rate 73.8%). The two groups were similar in terms of age, parity, ethnicity and smoking status (Table 1).

Consumption patterns varied: while women in the higher deprivation area were significantly more likely to say they did drink alcohol pre-pregnancy (97.0% vs 87.6%), women in the lower deprivation area were more likely to do so at least weekly (49.6% vs 29.7%) (Table 2). Drinkers in HB1 (the area of lower deprivation) were also more likely to drink above recommended levels: 32.1% said they ‘binged’ at least once a week compared with 14.8% in HB2 (the area of higher deprivation) (Table 3); and 25.0% of HB1 drinkers said they consumed more than 14 units a week compared with 17.5% in HB2 ( $p < .05$ ). A greater proportion of women in HB1 also said they exceeded the recommended upper limit for men: 10.8% compared with 7.0% in HB2 (Table 3).

In addition, we compared the least and most deprived quintiles within each health board area for peri-conceptual consumption. In both areas women in the least deprived quintile drank on average slightly more per week, but neither difference was statistically significant.

The temporal pattern of peri-conceptual alcohol use was very similar in both areas, with most consumption taking place on Saturdays, and very few saying they drank during the week (Figure 1).

While the numbers who drank following pregnancy recognition fell sharply, the temporal pattern of predominantly weekend drinking continued. Of the 92 who said they had drunk alcohol since pregnancy recognition, 50 said this had been on a single occasion. However, 16 continued to drink every week.

Women in the higher deprivation area were slightly more likely to say they had drunk alcohol at least once following pregnancy recognition (21.6% vs 14.9%;  $p = .057$ ); they were also more likely to say they had exceeded the recommended upper limits for pregnancy on a single occasion (4.2% in the



lower deprivation area vs 7.4% in the higher deprivation area;  $p < .05$ ) (Table 4) and had also exceeded the four-unit weekly limit (3.5% vs 0.8%;  $p = .094$  [Yates' correction]). However, such occasions were infrequent, and it was women in the lower deprivation area who were significantly more likely to say they drank every week in pregnancy (36.6% vs 2.0%; Table 2).

In most cases the amount consumed in a 'drinking week' following pregnancy recognition was small (lower deprivation area - mean 1.9 units; range 0.7 – 6.75; higher deprivation area - mean 3.0 units; range 0.4 – 24.0). Only nine women said they ever drank on their own peri-conceptually (one of these also said she drank on her own while pregnant); all the remainder said they only drank with family and/or friends.

## Discussion

The significant differences we found between the two health board areas in this study are not easily characterised. Firstly, while women in the higher deprivation area were more likely to say they sometimes drank alcohol before they knew they were pregnant, women in the lower deprivation area were significantly more likely to drink at least once each week and to drink above recommended levels. This related to both heavy episodic ('binge') drinking - above six units on a single occasion, and to exceeding the recommended weekly limits for women (14 units). This confounded the expectation that heavier episodic drinking might be found in the area with higher deprivation levels as suggested by data for the general population (29).

We found that women with lower deprivation scores in both areas had higher average consumption than the women with higher deprivation scores. The Scottish Government acknowledges this apparent paradox: while the burden of alcohol-related mortality and morbidity "is greatest among those living in the most deprived areas", women in the highest income households are more likely than women in the lowest income households to drink at hazardous or harmful levels (3). This highlights the importance of research concerning the influence of other determinants of alcohol-related harm, such as diet and other lifestyle factors. Societal attitudes to women's consumption of alcohol have changed: Killingsworth notes that in many ways middle class women are expected to drink (39). We found that most consumption was at the weekend for both time periods in both areas, suggesting that many women are ignoring the message about not concentrating weekly consumption on just one or two days a week.

The overall numbers drinking following pregnancy recognition fell sharply, as is usually the case (6), but not all accept the abstinence message. Women in the higher deprivation area (HB2 - west) were more likely to say they had consumed alcohol at some stage while pregnant, and to have exceeded the recommended weekly limit. However, such consumption was occasional rather than frequent. Women in the lower deprivation area (HB1 - east) were much more likely to continue drinking every

week. Claims that moderate consumption is not harmful (12) may engender ‘mixed messages’. Current thinking, reflected in the UK’s proposed revised guidelines (15), is that abstinence is the only safe option (40).

Several factors may have influenced our findings: participants would be familiar with the standard alcohol questionnaire from their own area, but we also used a Retrospective Diary which was new to them. These instruments correlated moderately well, but the Retrospective Diary elicited admissions of significantly higher consumption levels (41). Recall, denial, social desirability bias and stigma can all affect the reporting of alcohol consumption (42). Indeed the self-report approach has been criticised for under-estimating the proportion of high-risk drinkers (43), and the use of several standard tools as ‘stand-alone’ instruments in pregnancy has been questioned (44). Using actual size ‘flash cards’ may have mitigated the issue of women under-estimating drink sizes.

Survey respondents may be more open with people who are not health professionals (45). The fact that our data were not recorded in the women’s clinical records may have contributed to greater accuracy than occurs in routine clinical practice. However, it is difficult to account for the varying reports of alcohol consumption patterns between the two areas. Public health specialists in the Scottish Government had suspected that heavy episodic drinking might be higher in the higher deprivation area because they are higher in the general population in similar areas; alcohol-related harm is disproportionately found in poorer areas (29). Our finding that excess consumption was more common in the lower deprivation area echoes other reports that while binge drinking is more common in more deprived areas, overall consumption was higher in less deprived areas (46).

Midwifery attitudes to screening for alcohol use may be a factor. While we did not formally assess these, it became apparent during the study that abstinence during pregnancy was more strongly advocated in the lower deprivation health board area. A change in Danish midwives’ attitudes has been noted over the years (47), with abstinence now more likely to be recommended. As noted in the Introduction, the UK abstinence message current at the time of the study is somewhat tempered

(10,14), perhaps by an awareness that some women will continue to drink irrespective of health advice. Even the new proposed guidelines (15), which advocate abstinence, try to reassure women that for “low levels of drinking in pregnancy... the risks are probably low”.

We did not assess the knowledge, attitudes or practice of the midwives in these areas, but were aware that some midwives in one of the units were uneasy about asking questions. One Swedish study (48) found that midwives believed their knowledge regarding alcohol was good, and yet they were not good at detecting risky pre-conceptual consumption. Jones et al’s qualitative Australian study (49) found that the alcohol conversation between pregnant woman and midwife was brief, being limited to screening questions at the first visit. Given the disparities we found between the two areas this is an issue which requires further investigation. Variation in practice regarding advice about health-related behaviour, noted in other issues such as smoking in pregnancy, can limit effectiveness of health promotion (50).

Our finding that most women who drink alcohol stop once they realise they are pregnant echoes findings from elsewhere (6,51). However, a small proportion continued to drink. Given the association between pre-pregnancy and pregnancy consumption (8), and concerns about the social, emotional and financial costs of Fetal Alcohol Syndrome / Fetal Alcohol Spectrum Disorder, establishing an alcohol history as well as any current consumption is vital.

The inconsistencies we found - women in the higher deprivation area were more likely to drink pre-conceptually, but less likely to drink to excess; and were more likely to drink following pregnancy recognition but less likely to do so frequently - suggest that pre-conceived ideas about where consumption is likely to be most problematic should be treated with caution. While practitioners must be aware of risk factors for harmful consumption this must not be allowed to evolve into preconceptions about likely consumption patterns, notwithstanding Robert Louis Stevenson’s wry comment that Scots “generally take to drink” (1). Some women ignore the abstinence message. Those who drink frequently and sometimes to excess should receive targeted interventions. Whether the

broad focus on attempting to eradicate alcohol consumption during pregnancy altogether is effective is open to debate.

While the participants in this study were broadly representative of pregnant women attending that clinic, primiparous women and, in the lower deprivation area, smokers were more likely to be recruited. The Scottish health board areas in this cross-sectional study are not ethnically diverse. We cannot say whether a longitudinal study would confirm our analysis or if our findings would apply elsewhere. As with any retrospective study, recall bias may have been an issue. We have also acknowledged the limitations of using self-report measures.

We did not ask about unplanned pregnancy or about the timing of pregnancy recognition. Doing so might have clarified the distinction between pre- and post-conception consumption, although the peri-conceptual form was phrased “Before you were pregnant / before you knew you were pregnant”. The study design was constrained by the use in the two areas of different (albeit very similar) screening instruments for routine practice (AUDIT and AUDIT-C). However, comparisons between areas are based on the levels reported using the retrospective diary.

## **Conclusion**

This study found that the pattern of alcohol consumption in two different areas of Scotland cannot be simply characterised. The belief that the area with higher levels of deprivation would have more potentially harmful patterns of consumption was not borne out, although the prevalence of teetotalism was indeed lower in that area. Many variables affect alcohol consumption, and describing levels and patterns of consumption is complex. Practitioners who encounter women in early pregnancy have a duty to elicit a comprehensive history, which includes a detailed record of alcohol consumption patterns predating the pregnancy. Sensitively done, this approach requires time which busy practitioners may feel they do not have. However, the potential dangers of not identifying harmful drinking patterns are too severe to ignore.

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**Table 1** Socio-demographic and parity variables in Scottish cross-sectional study of alcohol consumption during pregnancy: study participants compared with sample of non-participants attending the same clinic, 2015

	HB1		HB2	
	Study	Non-study	Study	Non-study
	n (%) or Mean [SE]	n (%) or Mean [SE]	n (%) or Mean [SE]	n (%) or Mean [SE]
Age	28.6 [0.3]	29.3 [0.4]	28.9 [0.4]	29.0 [0.4]
Parity				
0	116 (42.3)	60 (30.0)	104 (44.1)	108 (40.0)
1	106 (38.7)	84 (42.0)	91 (38.6)	83 (30.7)
2	44 (16.1)	41 (20.5)	29 (12.3)	37 (13.7)
3+	8 (3.0)	15 (7.5)	12 (5.0)	42 (15.2) *
Ethnic group				
African, Caribbean, Black	2 (0.7)	1 (0.5)	2 (0.8)	0 (0.0)
Asian, Asian Scottish, Asian British	2 (0.7)	3 (1.5)	-	1 (1.3)
Mixed	1 (0.4)	3 (1.5)	1 (0.4)	0 (0.0)
White Scottish, White British, White Other	268 (97.8)	192 (96.0)	233 (98.7)	74 (98.7)
Scottish Index of Multiple Deprivation				
Deciles 1-2 [most deprived]	58 (21.8)	46 (24.1)	75 (32.9)	56 (29.2)
3-4	68 (25.6)	53 (27.8)	74 (32.4)	58 (30.2)
5-6	48 (18.1)	33 (17.3)	28 (12.3)	28 (14.6)
7-8	38 (14.3)	33 (17.3)	31 (13.3)	29 (15.2)
9-10 [least deprived]	54 (20.3)	26 (13.6)	20 (8.8)	21 (10.9)
Smoking				
Non-smoker	174 (63.5)	88 (82.2)	140 (59.3)	53 (69.7)
Previous smoker	64 (23.4)	9 (8.4)	69 (9.2)	14 (18.4)
Current smoker	36 (13.1)	10 (9.3)	27 (11.4)	9 (11.8) ***

\* p<.05

\*\*\* p<.001

**Table 2 Overall prevalence and frequency of alcohol consumption before and after pregnancy recognition - Scottish cross-sectional study, 2015**

	<u>Pre-pregnancy (pre-pregnancy recognition)</u>			<u>During pregnancy (since finding out was pregnant)</u>		
	HB1 (East) n (%)	HB2 (West) n (%)	Total n (%)	HB1 (East) n (%)	HB2 (West) n (%)	Total n (%)
Do you drink alcohol at all?	240/274 (87.6)	229/236 (97.0)	469/510 (91.9) ***	41/274 (14.9)	51/236 (22.0)	92/510 (18.0)
Frequency of drinking pattern						
Every week	119 (49.6)	68 (29.7)	187 (39.9) ***	15 (36.6)	1 (1.9)	16 (17.4) *** ∞
At least once every 1.5 – 4 weeks	75 (31.3)	91 (39.7)	166 (35.4)	6 (14.6)	3 (5.9)	9 (9.8)
At least once every 4.1 – 8 weeks	17 (7.1)	25 (10.9)	42 (8.9)	4 (9.8)	8 (15.7)	12 (13.0)
At least once every 8.1 – 13 weeks	15 (6.3)	21 (9.2)	36 (7.7)	3 (7.3)	3 (5.9)	6 (6.5)
At least once every 13.1 – 26 weeks	5 (2.1)	18 (7.9)	23 (4.9)	13 (31.7)	36 (70.6)	49 (53.3)
At least once every 26 or more weeks	10 (4.2)	5 (2.2)	15 (3.2)			

\*\*\*  $p < 0.001$

∞ Yates' correction

**Table 3 Scottish cross-sectional study: alcohol consumption above recommended limits in the peri-conceptual period, 2015**

	<u>In excess:</u>		<u>In excess:</u>		<u>Well in excess:</u>	
	<u>more than 6 units daily</u>		<u>more than 14 units weekly</u>		<u>more than 21 units weekly</u>	
	HB1	HB2	HB1	HB2	HB1	HB2
	N=240 n (%)	N=229 n (%)	N=240 n (%)	N=229 n (%)	N=240 n (%)	N=229 n (%)
Drinking above recommended limits (n=).	146 (60.8)	120 (53.4)	60 (25.0)	40 (17.5) *	26 (10.8)	16 (7.0)
Frequency of this:						
At least once weekly	77 (32.1)	34 (14.8) ***	39 (16.3)	17 (7.4) **	16 (56.7)	8 (3.5)
At least once every 1.5 – 4 weeks	47 (19.6)	49 (21.4)	15 (6.3)	14 (6.1)	5 (2.1)	5 (2.2)
At least once every 4.1 – 8 weeks	11 (4.6)	18 (7.9)	4 (1.7)	2 (0.9)	3 (1.3)	1 (0.4)
At least once every 8.1 – 13 weeks	5 (2.1)	11 (4.8)	1 (0.4)	4 (1.7)	1 (0.4)	0 (0.0)
At least once every 13.1 – 26 weeks	4 (1.7)	7 (3.1)	0 (0.0)	3 (1.3)	0 (0.0)	2 (0.9)
At least once every 26 or more weeks	2 (0.8)	1 (0.4)	1 (0.4)	0 (0.0)	1 (0.4)	0 (0.0)

\* p<0.05      \*\* p<0.01      \*\*\* p<0.001

**Table 4** Scottish cross-sectional study: alcohol consumption above recommended limits during pregnancy, 2015

	<u>In excess:</u>		<u>In excess:</u>	
	<u>more than 2 units on any one day</u>		<u>more than 4 units weekly</u>	
	HB1 N=240 n (%)	HB2 N=229 n (%)	HB1 N=240 n (%)	HB2 N=229 n (%)
Numbers drinking above recommended limits.	10 (4.2)	17 (7.4)	2 (0.8)	8 (3.5)
Frequency of this:				
At least once weekly	6 (2.5)	0 (0.0) **	2 (0.7)	0 (0.0)
At least once every 1.5 – 4 weeks	2 (0.8)	1 (0.4)	0 (0.0)	0 (0.0)
Less than every 4 weeks	2 (0.8)	16 (7.0) ***	0 (0.0)	8 (3.5) ** ∞

\* p<0.05      \*\* p<0.01      \*\*\* p<0.001

∞ Yates' correction

**Figure 1** Days of the week on which women drank (peri-conceptual period) – Scottish cross-sectional study

*The total figures add up to more than 100% as some women drank on more than one day a week.*

