

University of Dundee

Peri-conceptual and mid-pregnancy drinking

Symon, Andrew; Rankin, Jean; Sinclair, Hazel; Butcher, Geraldine; Barclay, Kylie; Gordon, Rhona

Published in:
Journal of Advanced Nursing

DOI:
[10.1111/jan.13112](https://doi.org/10.1111/jan.13112)

Publication date:
2017

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., Barclay, K., Gordon, R., MacDonald, M., & Smith, L. (2017). Peri-conceptual and mid-pregnancy drinking: a cross-sectional assessment in two Scottish health board areas using a 7-day Retrospective Diary. *Journal of Advanced Nursing*, 73(2), 375-385.
<https://doi.org/10.1111/jan.13112>

General rights

Copyright and moral rights for the publications made accessible in Discovery Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from Discovery Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain.
- You may freely distribute the URL identifying the publication in the public portal.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Peri-conceptual and mid-pregnancy drinking:

***A cross-sectional assessment in two Scottish health board areas using a 7-day
Retrospective Diary***

Retrospective Diary assessment of peri-conceptual and mid-pregnancy drinking

Andrew SYMON, RM, MA [HONS], PHD (corresponding author)

Senior Lecturer, Mother and Infant Research Unit, University of Dundee, 11 Airlie Place
Dundee DD1 4HJ, Scotland, UK a.g.symon@dundee.ac.uk

Jean RANKIN, RM, MSc, PhD

Professor, Maternal, Child and Family Health, School of Health, Nursing and Midwifery,
University of the West of Scotland j.rankin@uws.ac.uk

Hazel SINCLAIR, RM, BSc

Vulnerability in Pregnancy Midwife, NHS Fife, Victoria Hospital, Kirkcaldy KY2 5RA
hazel.sinclair@nhs.net

Geraldine BUTCHER, RM, BSc [Hons], MM

Consultant Midwife, NHS Ayrshire and Arran, Crosshouse Hospital, Kilmarnock KA2 0BE
Geraldine.Butcher@aaaht.scot.nhs.uk

Kylie BARCLAY, MA [Hons], MSc

Researcher, School of Nursing & Health Sciences, University of Dundee
kyliebarclay@googlemail.com

Rhona GORDON, BSc [HONS]

Researcher, School of Nursing & Health Sciences, University of Dundee
rhona92@hotmail.com

Michelle MACDONALD, BSc [HONS]

Researcher, School of Nursing & Health Sciences, University of Dundee
michelle.macdonald8@nhs.net

Lesley SMITH, BSc (Hons), PhD

Reader in Maternal and Women's Public Health, Department of Psychology, Social Work & Public Health, Oxford Brookes University, Marston, OX3 0FL lesleymith@brookes.ac.uk

Acknowledgements

We thank all the pregnant women who agreed to discuss their personal drinking habits with us, and the clinic staff who helped firstly to identify potential participants, and then to facilitate suitable accommodation for the interviews.

We would like to thank Professor Iain Crombie, Dr Marie Renaud, Dr Suzanne Schweiger for their contribution to early discussions about this project, and Emma Tatnall for her help with data collection, and Dr Lynda Cochrane for statistical support.

No conflict of interest has been declared by the authors.

Funding

This study was funded by a grant from the Scottish Government.

Abstract

Aims. To evaluate the use of a 7-day Retrospective Diary to assess peri-conceptual and mid-pregnancy alcohol consumption.

Background. Alcohol consumption among women has increased significantly and is of international concern. Heavy episodic ('binge') drinking is commonplace and is associated with unintended pregnancy. Pre-pregnancy drinking is strongly associated with continued drinking in pregnancy. Routine antenatal assessment of alcohol history and current drinking is variable; potentially harmful peri-conceptual drinking may be missed if a woman reports low or no drinking during pregnancy.

Design. Cross-sectional study (n=510) in two Scottish health board areas.

Methods. Face-to-face Retrospective Diary administration from February to June 2015 assessing alcohol consumption in peri-conceptual and mid-pregnancy periods. Women were recruited at the mid-pregnancy ultrasound clinic.

Results. Of 510 women, 470 (92.0%) drank alcohol before their pregnancy; 187 (39.9%) drank every week. Retrospective assessment of peri-conceptual consumption identified heavy episodic drinking (more than six units on one occasion) in 52.2% (n=266); 19.6% (n=100) reported drinking more than 14 units per week, mostly at the weekend; 'mixing' of drinks was associated with significantly higher consumption. While consumption tailed off following pregnancy recognition, 5.5% (n=28) still exceeded the recommended daily 2-unit limit in pregnancy. Multivariable logistic regression identified that women who 'binged' peri-conceptually were 3.2 times more likely to do this.

Conclusion. Significant peri-conceptual consumption levels suggest a substantial proportion of alcohol-exposed pregnancies before pregnancy recognition. Not taking a detailed alcohol

history, including patterns of consumption, will result in under-detection of alcohol-exposed pregnancies. The Retrospective Diary offers practitioners a detailed way of enquiring about alcohol history for this population.

Keywords

alcohol consumption, binge drinking, teratogenesis, pregnancy, antenatal, prenatal care, midwives, questionnaires.

SUMMARY STATEMENT

Why is this research needed?

- Alcohol consumption in women has increased significantly over recent years and is a factor in unintended pregnancies. Pre-pregnancy drinking is strongly associated with continued drinking in pregnancy.
- Assessment of alcohol consumption in pregnancy is sensitive because of its known teratogenicity. Concerns exist about the accuracy of current alcohol screening instruments and of current screening practice by midwives.
- A failure to establish an accurate alcohol history including peri-conception consumption patterns, means that some alcohol-exposed pregnancies may not be detected.

What are the key findings?

- Alcohol consumption patterns vary widely in terms of frequency and amount and types of drink consumed. Over half reported heavy episodic peri-conceptual drinking; one fifth exceeded recommended weekly limits.
- Most drinking occurred at the weekend and those who mixed their drinks drank on average twice as much as those who did not.
- Using the retrospective diary, the pregnant women were able to provide detailed reports of alcohol consumption levels and patterns for the peri-conceptual and mid-pregnancy periods.
- Heavy episodic (binge) drinking peri-conceptually was a strong independent predictor of drinking more than 2 units on a single occasion following pregnancy recognition.

How should the findings be used to influence policy / practice / research / education?

- Midwives need to understand the importance of taking a detailed alcohol history and should be provided with the time and resource to undertake this. To make an accurate diagnosis of fetal alcohol syndrome/alcohol related behaviour disorder later on it is essential to have confirmation of maternal drinking.
- Pregnant women should be encouraged to monitor their alcohol intake and be aware of the potential dangers of alcohol, particularly in the early weeks of pregnancy.

INTRODUCTION

High alcohol consumption is a recognised feature across Europe (Popova *et al.* 2007). Despite the attempts of public health measures to curb excessive drinking, consumption levels remain high, often due to heavy episodic or ‘binge’ drinking (Gilligan *et al.* 2012, Scottish Government 2012, Glock *et al.* 2015). While there are well-documented concerns about the accuracy of self-report estimates (Stockwell *et al.* 2008, Burns *et al.* 2010) there is also general agreement that consumption levels are high and indeed Scotland has among the highest rates of consumption and of alcohol-related deaths in Europe (Cook 2012). The gender gap which had seen high consumption as more a problem for men has narrowed in younger drinkers (Guise & Gill 2007, Scottish Government 2015a). Alcohol-related health statistics for women are a growing concern in parts of Scotland (Shipton *et al.* 2013) where 40% of women aged 16-44 drink above daily and/or weekly recommended levels (Scottish Government 2015a).

BACKGROUND

Heavy episodic drinking in particular is associated with unintended conception (Naimi *et al.* 2003), which itself is implicated in delayed pregnancy recognition. Prompt recognition is important if optimal health-related behaviour is to be followed, particularly if the pregnancy was unplanned (Terplan *et al.* 2014). Edwards and Werler (2006) found a median time to pregnancy recognition of 31 days. If prolonged, the time between conception and pregnancy recognition may be crucial (Parackal *et al.* 2013) since pre-pregnancy behaviours are likely to persist. Pre-pregnancy drinking is strongly predictive of pregnancy drinking (Skagerström *et al.* 2011, Mallard *et al.* 2013), so it is important when taking an alcohol history in pregnancy to include pre-conceptual levels and patterns.

Estimates of alcohol consumption during pregnancy range in Europe from 35-50% in the Netherlands (Health Council of the Netherlands 2005) to 45% in Catalonia (Garcia-Algar *et al.* 2008) and 63% in Dublin (Barry *et al.* 2006). The latest UK Infant Feeding Survey data suggest that 40% of pregnant women continue to drink (HSCIC 2012), albeit usually at low levels. One difficulty with obtaining accurate data is that large-scale surveys such as the Infant Feeding Survey are retrospective, estimating pre-pregnancy and pregnancy consumption levels only after the baby's birth. Problems of recall may also be compounded by social desirability bias (Muggli *et al.* 2015). In addition, some surveys focus on overall consumption levels, not on consumption patterns. Although most women are said to stop drinking once they realise they are pregnant (Parackal *et al.* 2013), it is evident that some continue to drink despite widespread publicity of the potential problems. Heavy episodic drinking in particular is associated with teratogenic effects (Khalil & O'Brien 2010) ranging from miscarriage during first trimester (Kesmodel *et al.* 2002) to oral clefts (Meyer *et al.* 2010) to fetal alcohol syndrome (FAS) (Khalil & O'Brien 2010) and fetal alcohol spectrum disorder (FASD) and a higher stillbirth risk (Ornoy & Ergaz 2010).

However, a lack of firm evidence has led to conflicting advice about whether there is a 'safe' level of alcohol consumption at any stage of pregnancy (Ornoy & Ergaz 2010, Mather *et al.* 2015). Nordic countries take the 'precautionary principle': given that there is no evidence of a safe limit, complete abstinence is advocated (Leppo *et al.* 2014). In the UK the message is less clear cut. Duncan *et al.* (2012) note that the message has changed over time and varies depending on which health agency or media outlet is offering the advice. The Royal College of Obstetricians and Gynaecologists advises women to abstain and especially in the first three months of pregnancy (RCOG 2015), a position endorsed by the Scottish Government (2015b) and the Royal College of Midwives (RCM 2015). However, while the National Institute for Health and Care Excellence (NICE), a non-departmental body sponsored by the Department of

Health for England, also recommends abstinence, it goes on to advise women who continue drinking that they should drink ‘no more than 1 to 2 UK units once or twice a week’ (NICE 2014: 18). The difference in advice is marginal, but any difference is potentially confusing.

Uncertainty from mixed messages is compounded by a lack of consensus over optimum assessment of alcohol consumption. This is typically made at the first antenatal ‘booking’ visit, but the stigma associated with drinking during pregnancy (Muggli *et al.* 2015) may lead to under-reporting (Phillips *et al.* 2007). Many different questionnaires such as TWEAK and T-ACE (Russell 1994) have been tried in maternity care in the UK, but concerns have been expressed concerning TWEAK’s sensitivity (NHS HS 2010). Savage *et al.* (2003) note that several standard measures including TWEAK and T-ACE focus on alcohol dependence rather than levels and patterns of consumption, a focus which may miss clinically significant but non-dependent consumption. Burns *et al.*’s (2010) systematic review found that TWEAK’s performance as a stand-alone tool was questionable and some areas have recently replaced it with AUDIT (WHO 2003) or its three-question version AUDIT-C (Bush *et al.* 1998). However, although AUDIT can identify the existence of heavy episodic drinking (Savage *et al.* 2003), it does not determine when this occurred, which in pregnancy terms is problematic because of the different teratogenicity associated with alcohol exposure at different gestations (Whitty & Sokol 1996).

Despite these various attempts to furnish midwives with an effective tool, some practitioners are said to be uncomfortable about asking alcohol-related questions (Nevin *et al.* 2002) and there is evidence that some midwives feel inadequately trained in this regard (Gilinsky 2010, Winstone & Verity 2015). If information about overall consumption levels and of the pattern of drinking is incomplete or missing this makes the targeting of sensitive interventions much harder. Improving the accuracy of assessment is crucial.

Over the years various instruments have been produced to try and encourage accurate reporting, including Sobell and Sobell's (1995) TimeLine FollowBack (TLFB) approach which tracks consumption on all 'drinking days' through a pictorial diary. Similar to this is the well-established Retrospective Diary (RD) approach (Shakeshaft *et al.* 1999, Gmel & Rehm 2004). This has been shown over time to work effectively in various populations (Werch 1989, Heeb & Gmel 2005), but not to our knowledge with pregnant women in the UK. For this reason we tested the utility of a RD questionnaire against standard instruments in two health board (HB) areas of Scotland.

Because of the crucial link between pre-pregnancy and pregnancy drinking we focussed on the time before the pregnancy started (or before the woman knew she was pregnant) as well as the pregnancy period itself. Elsewhere we report on the correlation of the RD and the existing alcohol questionnaires routinely used in the study sites (AUDIT-C and AUDIT), as well as its relationship with hair alcohol metabolites and measures of maternal wellbeing. Elsewhere we also report an assessment of the feasibility of conducting alcohol metabolite analysis from hair samples; we obtained samples from a quota of thirty women to do this, that number being determined by the cost of laboratory analysis. This paper reports on the identification by the RD questionnaire of alcohol consumption levels and patterns in relation to: i) peri-conceptual; and ii) mid-pregnancy consumption in women from two health board areas of Scotland.

THE STUDY

Aims

We aimed to evaluate a 7-day retrospective diary measuring alcohol consumption among pregnant women concerning the peri-conceptual period and in mid-pregnancy.

Design

A cross-sectional study located in the ultrasound scan clinics in two Scottish health boards. Our sample size calculation (80% power, 5% significance level and effect size 0.2) was based on the latest available Scottish births total. Using the proportion sign test and the G Power package, we estimated a total sample of $n=456$ to detect 5% drinking above recommended safe levels (14 units a week peri-conceptually). Potential participants were sent an invitation letter one week before their planned scan appointment.

Participants

Pregnant women attending their mid-pregnancy ultrasound scan between February and June 2015. Women under 16 and those deemed unable to understand the study and complete the questionnaires were ineligible. Women were not approached if clinic staff indicated an anomaly had been identified, or if the woman appeared upset. Researchers obtained consent after discussion in a private room before or immediately following the scan, whichever was convenient. Those consenting received a £10 'thank you' voucher.

Data collection

Women completed paper-based questionnaires face-to-face with the researcher, of whom there were four covering clinics on different days. These comprised a socio-demographic data form; the DASS-21 (Lovibond & Lovibond 1995); the local standard questionnaire (either AUDIT-C or AUDIT); and two RD forms: RD1 for the peri-conceptual period ('phrased as 'Before you were pregnant / before you knew you were pregnant') and RD2 for a recent typical week. The RD forms identified if the women drank at all; if so, whether they had a 'typical' drinking pattern; on what days of the week they would ever drink; whether they drank on their own or with others; and what they drank on 'drinking days'. The RD generated daily and weekly unit consumption totals which were used to identify when and by how much women drank in excess of recommended levels. 'Flashcards' - visual cues of actual-size drinks - were used to prompt recall and accuracy over drink sizes. All forms were subsequently entered onto a laptop Excel file which calculated alcohol unit totals. Face-to-face completion of the AUDIT/AUDIT-C took two minutes; the RD typically took five minutes.

Ethical considerations

We assured the women that everything they divulged would be treated in the strictest confidence, with no information being included in their clinical case notes. We acknowledged that those who had consumed excessive amounts of alcohol, especially before they realised they were pregnant, may have experienced adverse feelings about this. All women exhibiting any such signs were given relevant local contact details (local alcohol counselling service / specialist midwife). Ethical approval was granted by the East of Scotland Research Ethics Committee 1 (ref. 14/ES/0023).

Data analysis

Appropriate measures of central tendency (mean, median) and dispersion (standard deviation, range) were calculated for continuous variables (age, daily and weekly alcohol units, SIMD score). We created five new categorical variables using frequency and quantity of alcohol unit intake: three for peri-conceptual drinking: '6 or more units on any one occasion' (the definition of a binge); 'More than 14 units a week' (up to 14 being 'lower risk' for women; NICE 2010); 'More than 21 units a week' (up to 21 being 'lower risk' for men at the time of the study; NICE 2010). For drinking since pregnancy recognition, we used two cut-offs based on NICE (2014) advice: a maximum of two units on any one day and a maximum of four units in a week. Categorical data were summarised as frequencies and proportions (peri-conceptual drinking; drinking during pregnancy; smoking status). Multivariable linear regression models were used to estimate the association between mixing drinks and average units consumed peri-conceptually; this analysis was adjusted for maternal age, SIMD score and smoking status. Multivariable logistic regression was used to explore factors associated with drinking more than 2 units on any occasion during pregnancy. Factors explored were age, SIMD score, smoking status, mixing drinks on a Friday night, mixing drinks on a Saturday night, peri-conceptual binge drinking and DASS-21 score. For both linear and logistic regression analyses, factors were selected for addition to the models if they were plausibly associated with peri-conceptual or pregnancy alcohol intake respectively. Data were analysed using SPSS version 22. Results were considered statistically significant if $p < 0.05$ in a two-tailed test.

Validity, reliability and rigour

The study protocol was reviewed by the Scottish government (as funder) and our steering group consisting of experienced alcohol researchers and a lay person. To ensure consistency of approach, training in recruitment and interview skills was provided for the researchers, whose

experiences – in particular recruitment rates and levels of recorded drinking - were reviewed at monthly meetings.

RESULTS

In total 510 women were recruited between February - June 2015, slightly exceeding our target because of the need to continue recruiting to reach our quota of hair samples for a separate analysis (see Background section). When compared with a random sample of women attending that clinic, questionnaire respondents were found to be similar in terms of age, deprivation score (Scottish Government 2012) and ethnic group, but were more likely to be primiparous and, in one of the health board areas only, to be smokers. Detailed socio-demographic and other personal data are reported in another paper.

Frequency of alcohol consumption

We first established whether women drank at all, the frequency of drinking if they did and whether they continued to drink once they knew they were pregnant. While 187 (39.9%) said that before becoming pregnant they would drink alcohol at least once every week, most said that they interspersed such ‘drinking weeks’ with ‘non-drinking weeks’. Alcohol consumption dropped sharply following pregnancy recognition (Table 1). Alcohol consumption was heavily centred on Fridays and Saturdays (Figure 1). Figures add up to more than 100% as some women drank on more than one day a week.

Exceeding recommended limits

Over half the participants admitted to drinking above recommended daily limits at least occasionally in the peri-conceptual period; over a fifth did so weekly (Table 2). Twenty-eight

women (5.5%) said they had drunk more than the recommended two units a day since finding out they were pregnant (Table 2).

We explored which factors were associated with continued pregnancy drinking (more than two units on a single occasion) using multivariable logistic regression. Women who reported at least one episode of peri-conceptual binge drinking were 3.2 times more likely to drink >2 units on a single occasion during pregnancy than women who did not report an episode of binge drinking (95% CI 1.1-9.0) adjusting for smoking, Friday night and Saturday night mixing of drinks and DASS-21 score. There were no significant effects associated with smoking (Odds ratio [OR] 2.1, 95% CI 0.90-4.8), Friday night (OR 2.2, 95% CI 0.73-6.3) and Saturday night mixing of drinks (OR 1.3, 95% CI 0.56-2.9) and DASS-21 score (OR 1.04, 95% CI 0.99-1.07) when each were explored in turn adjusting for all other factors in the model.

Types of alcohol and context of drinking

The RD asked women to specify what types of alcohol they drank. On Saturday (the highest consumption day) 196 women drank varying amounts of wine and 177 drank spirits (Figure 2). Six women admitted to drinking on their own peri-conceptually; one also said she drank on her own during pregnancy. All others said they only drank with family and/or friends.

Nearly two-fifths of these women (n=145; 38%) said they drank more than one type of alcohol. Of the 110 who 'mixed' and who drank spirits (the most common drink for those 'mixing') 46 (42%) also drank shots, 42 (38%) drank wine, 19 (17%) drank 'Alcopops', 16 (15%) drank beer and 11 (10%) drank cocktails. Women who mixed their drinks on a Friday or Saturday night consumed more units on average than those who drank only one type of alcoholic drink. Mixing drinks on a Friday night, mixing drinks on a Saturday night and being a smoker were

associated with higher average alcohol unit consumption whilst controlling for all other factors in the regression model (age group and SIMD quintile). Average increase for mixing on a Friday was 8.5 units (95% CI 5.4–11.05), for a Saturday 6.8 (95% CI 5.2–8.5) and for smokers 3.1 units (95% CI 1.9–4.2). Age group and SIMD quintile were not significantly associated with higher alcohol unit intake when controlling for other factors in the model.

How many drinks?

The researchers administering the RD reported that the ‘flashcards’ often prompted women to increase the reported amount consumed at home with regard to glasses of wine (small to medium; medium to large) and to a lesser extent for spirits. The median number of units consumed on a ‘drinking day’ ranged from 3.4 (on Mondays and Thursdays) to 5 on Fridays and 6.8 on Saturdays. In terms of numbers of drinks consumed on a Saturday by individual women, the greatest range was seen in spirits, ‘shots’ and beer (Figure 3).

Of the 92 women who admitted to drinking following pregnancy recognition, 55 were classified as occasional or frequent heavy episodic drinkers pre-pregnancy (i.e. consumed six or more units on one occasion) and 25 drank above recommended weekly limits (14 units). Of the 28 women who said they drank in excess of two units a day following pregnancy recognition, 23 had admitted to heavy episodic drinking before they knew they were pregnant. The remaining five had reduced consumption from moderate levels but had not stopped altogether.

DISCUSSION

Our cross-sectional mid-pregnancy study using a 7-day RD in two Scottish health board areas obtained detailed reports of peri-conceptual and mid-pregnancy drinking levels and patterns. These showed that a substantial proportion of women exceeded daily and/or weekly recommended drinking levels before pregnancy or pregnancy recognition. While the existence of hazardous and sustained drinking above recommended levels among women of childbearing age is well documented (Popova *et al.* 2007, Scottish Government 2015a), it is concerning that this is still prevalent in women leading up to and even after the time of conception. The early days and weeks of a pregnancy are a time of rapid organ development and the potential teratogenic effects of continuing heavy episodic drinking are a matter of concern (Khalil & O'Brien 2010, Mather *et al.* 2015).

Many of the women reported they had reduced or stopped drinking after pregnancy recognition. We found fewer women reported any alcohol intake after pregnancy recognition compared with other reports from across Europe (Health Council of the Netherlands 2005, Barry *et al.* 2006, Garcia-Algar *et al.* 2008). Nonetheless, around 6% of women reported drinking in excess of recommended levels whilst pregnant (NICE 2014) and some even on a weekly basis. Our study found that women who reported an episode of binge drinking peri-conceptually were more likely to continue drinking during pregnancy.

In both the peri-conceptual and mid-pregnancy periods most drinking occurred at the weekend, with wine and spirits being the most popular drinks. Mixing of drinks was commonplace and mixing drinks was a strong predictor of heavier consumption, perhaps due to losing track of

units and drinks. Heavy weekend drinking is well documented, particularly among the young (Neighbors *et al.* 2007, Kuntsche & Cooper 2010), with the rise in female consumption levels being of particular concern (Measham & Østergaard 2009, Smith & Foxcroft 2009).

While any self-reported behaviour such as alcohol intake is susceptible to social desirability bias or denial (Davis *et al.* 2010), the use of the RD facilitates a thorough exploration of drinking habits over varying periods of time. We opted for a one-week period to limit difficulties recalling over a longer time period (Hoepfner *et al.* 2010) and indeed we found evidence of significant peri-conceptual heavy episodic drinking which was not picked up by AUDIT and AUDIT-C. It has similarities with the TimeLine Follow Back (TLFB) approach (Sobell & Sobell 1995) which also tracks consumption on all ‘drinking days’ through a pictorial diary which prompts recall and response. However, the RD covers a shorter time period and takes less time to complete. Despite the inclusion of thumbnail images on the AUDIT form explaining the unit content of different drinks there is evidently confusion in the general public over what units mean (Lovatt *et al.* 2015). Indeed, some of the women expressed confusion over this; focussing on the type and number of drinks seemed to be more straightforward for the women. The incorporation of the ‘flashcards’ appeared to encourage accuracy and detailed reporting. While the RD takes longer to administer than either AUDIT or AUDIT-C, it encouraged greater honesty about heavy episodic and sustained consumption. Indeed, elsewhere we report that the participants in this study admitted to much higher peri-conceptual consumption when completing the RD than when completing the standard alcohol questionnaires (AUDIT and AUDIT-C).

In the UK the first opportunity to assess a pregnant woman's alcohol history is likely to be when she attends her antenatal 'booking' visit, usually at around 10-12 weeks' gestation. It is clearly important to take an accurate alcohol history at this stage, but the evidence on how comfortable or effective midwives are with asking such questions is thin. While Jones *et al.*'s (2011) small-scale Australian survey found that midwives were confident in this regard, they lacked knowledge about risk levels. Practitioners elsewhere appear not to be so confident (Nevin *et al.* 2002, Gilinsky 2010, Winstone & Verity 2015), with existing screening tools either not being used appropriately (Payne *et al.* 2014) or lacking accuracy (Burns *et al.* 2010). One recent study showed 16/203 (8%) of midwives in England and Wales used a standard alcohol screening questionnaire to gather information on drinking behaviour (Smith *et al.* in submission). Who carries out alcohol screening can be questioned; at a busy antenatal booking visit midwives may complain that they have insufficient time. Kishore *et al.*'s (2011) US study found that medical assistants were an effective substitute for delivering alcohol screening and brief interventions. While the setting is different, one of the blocking factors – lack of practitioner time – is common to both. We concede that persuading those organising busy antenatal clinics to set aside ten minutes for taking an alcohol history is not an easy task.

In the UK, women planning to get pregnant are advised not to consume alcohol once they conceive (NICE 2014). However, it was evident that some participants had experienced mixed messages about alcohol, both before and following conception. It is possible for a woman to 'binge drink' (defined in the UK as at least six units or more on one occasion (NHS Choices 2014; RCOG 2015) twice a week and yet remain under the NICE (2010) recommended weekly limit for women of 14 units). Recommended daily limits have been introduced to address this anomaly (DH 2008), but it is apparent that understanding of recommended limits is incomplete (House of Commons STC 2012).

This study shows that assessments of both peri-conceptual and pregnancy drinking are required. If some midwives feel inadequately trained to do this, or believe they do not have sufficient time, then potentially hazardous and/or teratogenic consumption may be missed. If health services are serious about tackling alcohol abuse then sufficient resources must be allowed to make accurate assessments at this critical time.

Limitations

This study only included two Scottish health board areas; we cannot say whether similar results would be found elsewhere. The study areas do not have great ethnic diversity. The 7-day diary, as administered here in a retrospective manner, is open to the same criticism as many other self-reported alcohol assessment tools. Our finding that 18% reported any drinking in pregnancy is somewhat lower than other UK estimates, although clinical staff in one of the areas confirmed that the abstinence message is strongly advocated. We did not ask about unplanned pregnancy or about the timing of pregnancy recognition which may have clarified the distinction between pre- and post-conception drinking. Irregular drinking such as birthdays and holidays are not captured well using the AUDIT or RD. Our overall estimates of peri-conceptual and pregnancy drinking may, therefore, be under-estimated.

CONCLUSION

This is the first study to show that mixing drinks was a strong predictor of heavier consumption in women of this age group. One harm prevention strategy could focus on advice to avoid mixing drinks. We found some evidence to confirm the link between pre-pregnancy and pregnancy drinking reported in the wider literature, particularly when infrequent but heavy.

The substantial levels of peri-conceptual consumption suggest a risk of alcohol-exposed pregnancies. However, these may go unrecognised if the woman stops drinking once she is aware that she is pregnant and if the midwife's alcohol assessment during the antenatal booking appointment does not explore drinking behaviour during the peri-conceptual period. Existing alcohol screening instruments do not capture well the complexity of drinking patterns. As we found, some women engage in heavy episodic drinking without exceeding recommended weekly pre-pregnancy limits. The retrospective diary offers a detailed way of enquiring about alcohol history for this population.

References

- Barry S., Kearney A., Daly S., Lawlor E., McNamee E., Barry J. (2006) *The Coombe Women's Hospital Study of Alcohol, Smoking and illicit Drug use, 1987-2005*.
http://www.drugs.ie/resourcesfiles/research/2007/Coombe_Women's_Hospital_Alcohol_et_c_Report_1987-2005.pdf
- Burns E., Gray R., Smith L.A. (2010) Brief screening questionnaires to identify problem drinking during pregnancy: a systematic review. *Addiction*, 105(4), 601-614
- Bush K.R., Kivlahan D.R., McDonell M.B., Fihn S.D., Bradley K.A. (1998) The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. *Arch Intern Med* 158: 1789–1795.
- Collins R.L., Kashdan T.B., Koutsky J.R., Morsheimer E.T., Vetter C.J. (2008) A Self-Administered Timeline Followback to Measure Variations in Underage Drinkers' Alcohol Intake and Binge Drinking. *Addictive Behaviors*, 33. (1): 196-200
- Cook R. (2012) Social Exclusion in Scotland. The Scotland Institute.
<http://www.scotlandinstitute.com/wp-content/uploads/2012/07/Social-Exclusion-July-2012.pdf>
- Davis C.G., Thanke J., Vilhena N. (2010) Social desirability biases in self-reported alcohol consumption and harms. *Addictive Behaviours*, 35: 302-311
- DH [Department of Health] (2008) Reducing Alcohol Harm: health services in England for alcohol misuse. London, Department of Health
- Duncan E.M., Forbes-Mackay K.E., Henderson S.E. (2012) Alcohol Use During Pregnancy: An Application of the Theory of Planned Behavior. *Journal of Applied Social Psychology*, 42. (8): 1887-1903

- Edwards E.M., Werler M.M. (2006) Alcohol consumption and time to recognition of pregnancy. *Maternal and Child Health Journal* 10: 467–472
- Ethen M.K., Ramadhani T.A., Scheuerle A.E., Canfield M.A., Wyszynski D.F., Druschel C.M., Romitti P.A. (2009) Alcohol Consumption by Women Before and During Pregnancy. *Maternal and Child Health Journal*, 13: 274–285
- Finer L.B., Henshaw S.K. (2006) Disparities in rates of unintended pregnancy in the United States, 1994 and 2001. *Perspect Sex Reprod Health*, 38: 90–6.
- Finer L.B., Zolna M.R. (2014) Shifts in Intended and Unintended Pregnancies in the United States, 2001–2008. *American Journal of Public Health*, 104, S1: S43-S48. doi: 10.2105/AJPH.2013.301416
- Fraser S.L., Muckle G., Abdous B.B., Jacobson J.L., Jacobson S.W. (2012) Effects of binge drinking on infant growth and development in an Inuit sample. *Alcohol*, 46(3): 277–283.)
- Garcia-Algar O., Kulaga V., Gareri J., Koren G., Vall O., Zuccaro P., Pacifici R., Pichini S. (2008) Alarming Prevalence of Fetal Alcohol Exposure in a Mediterranean City. *Therapeutic Drug Monitoring*, 30. (2): 249-254
- Gilinsky A. (2010) *Alcohol-related health promotion in maternity services: factors associated with midwifery practice in NHS Tayside*. NHS Tayside, Dundee
- Gilligan C., Kuntsche E., Gmel G. (2012) Adolescent drinking patterns across countries: associations with alcohol policies. *Alcohol And Alcoholism*, 47. (6): 732-7
- Glock S., Klapproth F., Müller B.C. (2015) Promoting responsible drinking? A mass media campaign affects implicit but not explicit alcohol-related cognitions and attitudes. *British Journal of Health Psychology*, 20(3): 482-97. doi: 10.1111/bjhp.12130.

- Gmel G., Rehm J. (2004) Measuring alcohol consumption. *Contemporary Drug Problems*, 31: 467-540
- Guise J.M., Gill J.S. (2007). 'Binge drinking? It's good, it's harmless fun': a discourse analysis of accounts of female undergraduate drinking in Scotland. *Health Education Research*, 22(6): 895-906.
- Health Council of the Netherlands (2005) *Risks of alcohol consumption related to conception, pregnancy and breastfeeding*. Den Haag, NL.
<http://healthcouncil.eu/en/publications/gezonde-voeding/risks-of-alcohol-consumption-related-to-conception-pregnancy-and>
- Heeb J-L., Gmel G (2005) Measuring alcohol consumption: A comparison of graduated frequency, quantity frequency and weekly recall diary methods in a general population survey. *Addictive Behaviors* 30 (2005) 403–413
- Hoeppner B.B., Stout R.L., Jackson K.M., Barnett N.P. (2010) How good is fine-grained Timeline Follow-back data? Comparing 30-day TLFB and repeated 7-day TLFB alcohol consumption reports on the person and daily level. *Addictive Behaviors*, 35. (12): 1138-1143
- House of Commons STC [Science and Technology Committee] (2012) Alcohol guidelines: Eleventh report of session 2012-12. HC 1536. London, House of Commons
- HSCIC [Health and Social Care Information Centre] (2012) *Infant Feeding Survey 2010*. Leeds, HSCIC.
- Jones S.C., Telenta J., Shorten A., Johnson K. (2011) Midwives and pregnant women talk about alcohol: what advice do we give and what do they receive? *Midwifery*, 27: 489-96

- Kesmodel U., Wisborg K., Olsen S.F., Henriksen T.B., Secher N.J. (2002) Moderate alcohol intake and the risk of spontaneous abortion. *Alcohol & Alcoholism*, 37 (1): 87-92.
<http://dx.doi.org/10.1093/alcalc/37.1.87>
- Khalil A., O'Brien P. (2010) Alcohol and pregnancy. *Obstetrics, Gynaecology and Reproductive Medicine*, 20(10): 3
- Kishore V., Lynch S., Pichon J., Theall K., Johnson S., Roberson E., Hinton S. (2011) Knowledge, attitudes and practice relating to hazardous alcohol use across the continuum of care in a community healthcare centre. *Drugs: Education, Prevention and Policy*, 18:1, 60-68, DOI: 10.3109/09687630903501757
- Kuntsche E., Cooper M.L. (2010) Drinking to have fun and to get drunk: Motives as predictors of weekend drinking over and above usual drinking habits. *Drug and Alcohol Dependence*, 110. (2010) 259–262
- Leppo A., Hecksher D., Tryggvesson K. (2014) ‘Why take chances?’ Advice on alcohol intake to pregnant and non-pregnant women in four Nordic countries. *Health, Risk & Society*, 16: (6): 512–529, doi: 10.1080/13698575.2014.957659
- Lovatt M., Eadie D., Meier PS., Li J., Bauld L., Hastings G., Holmes J. (2015) Lay epidemiology and the interpretation of low-risk drinking guidelines by adults in the United Kingdom. *Addiction*, doi:10.1111/add.13072 [Epub ahead of print]
- Lovibond S.H., Lovibond P.F. (1995) *Manual for the Depression Anxiety Stress Scales*. Sydney
- Magnusson A., Goransson C., Heilig M. (2005) Unexpectedly high prevalence of alcohol use among pregnant women: Failed detection by antenatal care and simple tools that improve detection. *Journal of Studies on Alcohol*, 66. (2): 157-164.
<http://dx.doi.org/10.15288/jsa.2005.66.157>

- Mallard S.R., Connor J.L., Houghton L.A. (2013) Maternal factors associated with heavy periconceptional alcohol intake and drinking following pregnancy recognition: a post-partum survey of New Zealand women. *Drug and Alcohol Review*, 32(4): 389-97. doi: 10.1111/dar.12024
- Mather M., Wiles K., O'Brien P. (2015) Should women abstain from alcohol throughout pregnancy? *BMJ*, 351: h5232. doi: 10.1136/bmj.h5232
- Measham F., Østergaard J. (2009) The public face of binge drinking: British and Danish young women, recent trends in alcohol consumption and the European binge drinking debate. *Probation Journal*, 56. (4): 415–434
- Meyer K.A., Werler M.M., Hayes C., Mitchell A.A. (2010) Low maternal alcohol consumption during pregnancy and oral clefts in offspring: the Slone Birth Defects Study. *Birth Defects Research, Part A*, 67. (7): 509–514
- Muggli E., Cook B., O'Leary C., Forster D., Halliday J. (2015) Increasing accurate self-report in surveys of pregnancy alcohol use, *Midwifery*, 31. (3): 23-28.
- Naimi T.S., Lipscomb L.E., Brewer R.D., Gilbert B.C. (2003) Binge Drinking in the Preconception Period and the Risk of Unintended Pregnancy: Implications for Women and Their Children. *Pediatrics*, 111: 1136-1141
- Neighbors C., Walters S.T., Lee C.M., Vader A.M., Vehige T., Szigethy T., DeJong W. (2007) Event-specific prevention: addressing college student drinking during known windows of risk. *Addictive Behaviors*, 32: 2667–2680
- Nevin A.C., Parshuram C., Nulman I., Koren G., Einarson A. (2002) A Survey of Physicians' Knowledge Regarding Awareness of Maternal Alcohol Use and the Diagnosis of FAS. *Family Practice*, 3. (1): 2

NHS Choices (2014) *Binge Drinking.*

<http://www.nhs.uk/Livewell/alcohol/Pages/Bingedrinking.aspx>

NHS HS [National Health Service Health Scotland] (2010) *Alcohol Brief Interventions: antenatal professional pack.* Edinburgh, NHS HS

NICE [National Institute for Health and Care Excellence] (2010) Alcohol-use disorders: prevention. PH24. Available at: nice.org.uk/guidance/ph24

NICE (2014) *Antenatal care: NICE clinical guideline 62.* London, NICE

Ornoy A., Ergaz Z. (2010) Alcohol Abuse in Pregnant Women: Effects on the Fetus and Newborn, Mode of Action and Maternal Treatment. *International Journal of Environmental Research and Public Health*, 7(2): 364-379; doi:10.3390/ijerph7020364

Palma S., Pardo-Crespo R., Mariscal M., Perez-Iglesias R., Llorca J., Delgado-Rodríguez M. (2007) Weekday but not weekend alcohol consumption before pregnancy influences alcohol cessation during pregnancy. *European Journal of Public Health*, 17(4): 394-9

Parackal S.M., Parackal M.K., Harraway J.A. (2013) Prevalence and Correlates of Drinking in Early Pregnancy Among Women who Stopped Drinking on Pregnancy Recognition. *Maternal and Child Health Journal*, 17: 520–529

Payne J.M., Watkins R.E., Jones H.M., Reibel T., Mutch R., Wilkins A., Whitlock J., Bower C. (2014) Midwives' knowledge, attitudes and practice about alcohol exposure and the risk of fetal alcohol spectrum disorder. *BMC Pregnancy Childbirth*, 14: 377

Pedersen E.R., Grow J., Duncan S., Neighbors C., Larimer M.E. (2012) Concurrent Validity of an Online Version of the Timeline Followback Assessment. *Psychology of Addictive Behaviors*, 26. (3): 672-677

- Phillips D., Thomas K., Cox H., Ricciardelli L.A., Ogle J. (2007) Factors that influence women's disclosures of substance use during pregnancy: A qualitative study of ten midwives and ten pregnant women, *Journal of Drug Issues*, 37. (2): 357-376,
- Popova S., Rehm J., Patra J., Zatonski W. (2007) Comparing alcohol consumption in central and eastern Europe to other European countries. *Alcohol and Alcoholism*, 42. (5): 465-73
- RCM [Royal College of Midwives] (2015) Avoid alcohol in pregnancy says RCM on new guidelines (10 February 2015). <https://www.rcm.org.uk/news-views-and-analysis/news/avoid-alcohol-in-pregnancy-says-rcm-on-new-guidelines> [accessed 7 December 2015)
- Royal College of Obstetricians and Gynaecologists (2015) *Alcohol and You – Information for you*. London: RCOG
- Russell M. (1994) New assessment tools for drinking in pregnancy: T-ACE, TWEAK and others. *Alcohol Health and Research World*, 18(1): 55-61
- Savage C.L., Wray J.N., Ritchey P.N., Fulmer M. (2002) Measurement of maternal alcohol consumption in a pregnant population. *Substance Abuse*, 23 94): 211-214
- Savage C.L., Wray J.N., Ritchey P.N., Sommers M., Dyehouse J., Fulmer M. (2003) Current screening instruments related to alcohol consumption in pregnancy and a proposed alternative method. *Journal of obstetric, Neonatal and Gynecologic Nursing*, 32. (4) 437 – 446. doi: 10.1177/0884217503255086
- Scottish Government (2012) *Changing Scotland's relationship with alcohol: a framework for action – progress report*. Edinburgh, Scottish Government
- Scottish Government (2015a) *The Scottish Health Survey – 2014*. Edinburgh: Scottish Government

- Scottish Government (2015b) *Local Delivery Plan Standard: Alcohol Brief Interventions – National Guidance*. Edinburgh, Scottish Government
- Sedgh G., Singh S., Hussain R. (2014) Intended and unintended pregnancies worldwide in 2012 and recent trends. *Studies in Family Planning*, 45(3): 301-314
- Shakeshaft A.P., Bowman J.A., Sanson-Fisher R.W. (1999) A comparison of two retrospective measures of weekly alcohol consumption: diary and quantity/frequency index. *Alcohol and Alcoholism*, 34, 636-645
- Shipton D., Whyte B., Walsh D. (2013) Alcohol-related mortality in deprived UK cities: worrying trends in young women challenge recent national downward trends. *Journal of Epidemiology and Community Health*, 67. (10): 805-12. doi:10.1136/jech-2013-202574
- Skagerström J., Chang G., Nilssen P. (2011) Predictors of Drinking During Pregnancy: A Systematic Review. *Journal of Women's Health*, 20. (6): 901-913
- Smith L, Foxcroft D. (2009) *Drinking in the UK: an exploration of trends*. Joseph Rowntree Foundation
- Smith L., O’Sullivan B., Abbott H. (in submission) Assessment of health behaviour during pregnancy by UK midwives
- Sobell L.C., Sobell M.B. (1995) *Alcohol Timeline Followback Users’ Manual*. Toronto, Canada: Addiction Research Foundation
- Stockwell T., Zhao J., Chikritzhs T., Greenfield T.K. (2008) What did you drink yesterday? Public health relevance of a recent recall method used in the 2004 Australian National Drug Strategy Household Survey. *Addiction*, 103: 919-28. doi:10.1111/j.1360-0443.2008.02219.x

- Terplan M., Cheng D., Chisolm MS. (2014) The relationship between pregnancy intention and alcohol use behavior: An analysis of PRAMS data. *Journal of Substance Abuse Treatment*, 46: 506-510
- Tough S., Tofflemire K., Clarke M., Newburn-Cook C. (2006) Do women change their drinking behaviors while trying to conceive? An opportunity for preconception counseling. *Clinical Medicine & Research*, 4(2): 97-105.
- Werch, C.E. (1989) Quantity-Frequency and Diary Measures of Alcohol Consumption for Elderly Drinkers. *International Journal of the Addictions*, 24 (9): 859-865. doi: 10.3109/10826088909047316
- Whitty J.E., Sokol R.J. (1996) Alcohol teratogenicity in humans: critical period, thresholds, specificity and vulnerability. In: Alcohol, pregnancy and the developing child. (Spohr HL & Steinhausen H-C, eds.) Cambridge, Cambridge University Press, pp. 3-14
- WHO (2003) *Management of Substance Dependence: Screening and Brief Interventions*. Geneva, WHO
- Winstone A.M., Verity C. (2015) Antenatal alcohol exposure: An East Anglian study of midwives' knowledge and practice. *British Journal of Midwifery*, 23. (3): 180-186