Foundation for Alcohol Research & Education

Alcohol consumption during pregnancy:

Results from the 2010 National Drug Strategy Household Survey

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CENTRE FOR ALCOHOL POLICY RESEARCH

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About the Foundation for Alcohol Research and Education

The Foundation for Alcohol Research and Education (FARE) is an independent charitable organisation working to prevent the harmful use of alcohol in Australia. Our mission is to help Australia change the way it drinks by:

- helping communities to prevent and reduce alcohol-related harms;
- building the case for alcohol policy reform; and
- engaging Australians in conversations about our drinking culture.

Over the last ten years FARE has have invested more than $115 million, helped 750 organisations and funded over 1,400 projects addressing the harms caused by alcohol misuse.

FARE is guided by the World Health Organisation's *Global Strategy to Reduce the Harmful Use of Alcohol*[i] for addressing alcohol-related harms through population-based strategies, problem-directed policies, and direct interventions.

About the Centre for Alcohol Policy Research

FARE provides core funding to the Centre for Alcohol Policy Research, a world-class alcohol policy research institute. Led by Professor Robin Room, the Centre examines alcohol-related harms and the effectiveness of alcohol-related policies. Housed within Turning Point Drug and Alcohol Centre in Melbourne, the Centre is a joint undertaking of the Victorian Government, the University of Melbourne and FARE.

The Centre not only contributes to policy discussions in Australia but also contributes to international studies of significance for the World Health Organisation. An example of its international work is the GENACIS project, which examines gender alcohol and culture internationally.

The Centre has also undertaken a pioneering study, The Range and Magnitude of Alcohol's Harm to Others, that is the cost of alcohol related harms on people other than the drinker, otherwise referred to as third party harms. Results from the study were also included in the World Health Organisation's Global Status Report on Alcohol and Health, 2011, and WHO is using the study as a model for such studies globally.

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[i] World Health Organisation (2010). *Global strategy to reduce the harmful use of alcohol.* Geneva: World Health Organization.

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Executive Summary

The primary purpose of this report was to examine the rate of, and develop predictors for, alcohol consumption during pregnancy. In order to do this, data from the 2010 National Drug Strategy Household Survey was used. Of the respondents, 819 women had been pregnant in the twelve months prior to completing the survey. Within this sample, 47.3 per cent consumed alcohol while pregnant, before knowledge of their pregnancy and 19.5 per cent consumed alcohol while pregnant, after knowledge of their pregnancy. No information was collected on how much was being consumed by those who were drinking.

While no steady relationship between socioeconomic factors and drinking before knowledge of pregnancy was found, women who were older and with a higher household income were more likely to continue to drink after learning of their pregnancy. Age is a particularly important predictor of who chose to stop drinking once they became aware of their pregnancy. While 90 per cent of drinkers under 25 stopped drinking once they learned of their pregnancy, only half of those already drinking who were aged 36 or older did the same.

It is important to keep in mind when interpreting these results that many studies have found that the majority of women who consume alcohol during pregnancy do so at low levels (e.g., Powers, et al., 2010). Therefore more research is needed on how much women are drinking during pregnancy and the outcomes of different levels of consumption.

More focus is needed on raising awareness for women who are planning on getting pregnant. This is because much of the alcohol consumption during pregnancy is occurring before the woman is aware of the pregnancy.

Introduction

Drinking during pregnancy has been linked to Fetal Alcohol Spectrum Disorders (FASD) (Khalil & O'Brien, 2010), preterm birth (O'Leary, Nassar, Kurinczuk, & Bower, 2009), low birth weight (Meyer-Leu, Lemola, Daeppen, Deriaz, & Gerber, 2011) and increased risk for sudden infant death syndrome (Athanasakis, Karavasiliadou, & Styliadis, 2011). However, research on the relationship between these risks and the amount of alcohol consumed suggests that low to moderate drinking does not result in the same outcomes as heavy drinking. For instance, although drinking during pregnancy is linked to child behavioural issues (Sood et al., 2001), no significant link between low to moderate consumption and behavioural development was found in a prospective cohort study (Robinson et al., 2010).

The advice on drinking while pregnant in the National Health and Medical Research Council (NHMRC) Australian Alcohol Guidelines has changed back and forth over time. While the 1992 guidelines recommended abstinence (National Health and Medical Research Council, 1992), the 2001 guidelines recommended drinking less than seven standard drinks in a week, and no more than two on any one day (National Health and Medical Research Council, 2001). The 2009 Guidelines reverted to recommending no alcohol consumption during pregnancy (NHMRC, 2009). Despite this, 23.7 per cent of surveyed women in an Australian phone based study said they intended to drink when they were pregnant (Peadon et al., 2011).

One study comparing cohorts of pregnant women before and after the guideline change in 2001 found a non-significant drop in abstention in pregnant women, but on the other hand a significant drop in moderate to heavy consumption from before the guideline change to after (Powers et al., 2010). Another study found that 27.6 per cent of women who had children in 1999-2000 had drunk while pregnant (when the guidelines suggested no consumption) as compared to 37.6 per cent in 2003-2004 (when the guidelines suggested low consumption) (Australian Institute of Family Studies, 2011). Whether or not this rise in alcohol consumption in pregnancy could be attributed to the change in guidelines is unclear. As these studies indicate, it is clear that a substantial proportion of Australian women do at least some drinking during pregnancy. A survey on the habits of pregnant Australian women found over 20 per cent had consumed alcohol in the week prior to the survey (Lain, Ford, Hadfield, & Roberts, 2010).

A recent systematic review of international research on predictors of drinking while pregnant provides a useful snapshot of correlates of drinking while pregnant (Skagerstrom, Chang, & Nilsen, 2011). While the European studies in the review often found a positive relationship between drinking during pregnancy and age, previous Australian studies have not found this to be the case. Furthermore, many but not all studies investigating drinking while pregnant found that higher income is also a predictor of drinking while pregnant. The findings on the relationship between drinking during pregnancy and education were less clear, with two studies reporting lower education as a positive predictor and one study reporting higher education as a positive predictor.

Although drinking during pregnancy is positively related to Socio-Economic Status (SES), rates of FASD are higher in low SES settings (May & Gossage, 2011). This may be due to differences in amount and pattern of drinking between high and low SES women who drink during pregnancy. Alternatively, biases in reporting and diagnoses may explain the socioeconomic disparities in FASD rates. Recent research suggests that heavy consumption is relatively rare among the women who drink while pregnant. Powers and colleagues (2010) found that 99 per cent of those who drank during pregnancy drank low to moderate amounts, and a similar Canadian study found that 95.8 per cent did (Walker, Al-Sahab, Islam, & Tamim, 2011).

This study will use the National Drug Strategy Household Survey (NDSHS) to ascertain rates of drinking during pregnancy in light of the 2009 change in the guidelines for pregnancy. The NDSHS is Australia's largest population based survey on drug and alcohol use and issues. Due to changes in the questions on pregnancy and drinking introduced in the 2010 survey, it is now possible to differentiate between drinking before and after knowledge of pregnancy. This is valuable because drinking after knowledge of pregnancy is more likely to be influenced by guidelines than drinking before knowledge of pregnancy. The demographic information provided as part of the survey will also be used to identify the SES variables that predict drinking during pregnancy. Unfortunately, as the questions surrounding alcohol consumption during pregnancy have changed from 2007 to 2010, a valid comparison reported drinking between the two dates cannot be made (please seen Appendix A for information on this).

Method

Survey and sample

Fieldwork for the NDSHS 2010 survey was carried out across Australia between April and September 2010. For more information on the survey, please refer to the 2010 NDSHS report (NDSHS, 2010). Surveys were collected using the drop-and-collect method in selected households. In total, 26,645 respondents were asked a wide range of questions on tobacco, alcohol and illicit drug use. Only females aged fourteen or over (n=14,445) were asked the questions on pregnancy and breastfeeding. One of these items addressed whether the respondent was pregnant, breastfeeding and/or both pregnant and breastfeeding at any time in the past twelve months. Altogether, 911 women answered positively to either the question on pregnancy or to the questions on pregnancy and on breastfeeding. However, 92 were deemed to have answered incorrectly; the rationale for this decision is outlined in Appendix B. Therefore, 819 women make up the target sample of women who were pregnant in the last 12 months. The 5836 females aged between 14 and 45 who were not pregnant, breastfeeding or unclear in their answers to this section were used as a not-pregnant comparison group. Weights were applied to the data to better represent the Australian general population by taking into account the probability of being interviewed. All percentages and models reported are weighted; all reported sample sizes are not.

Measures

Demographic information including age, annual household income and educational attainment was collected from all respondents, and residential socio-economic advantage was coded from their reported postcode. Respondents were also asked to outline their alcohol consumption, both in the past 12 months and the day before completing the survey, in detail. They were also asked whether they approved or disapproved of the use of a range of drugs including alcohol by an adult. Of particular interest, female respondents were asked multiple questions about pregnancy and breastfeeding and corresponding tobacco, alcohol or illicit drug consumption. Specifically, they were asked if they were pregnant, breastfeeding or both at any time in the past 12 months, and if they consumed any drugs during this time. It is important to note that there were no questions addressing the number of drinks consumed while pregnant, just whether or not any alcohol was consumed.

Results

Overview

- **47.3 per cent of women drank while pregnant, before knowledge of their pregnancy.**
- **19.5 per cent of women drank while pregnant, after knowledge of their pregnancy.**
- **Drinking before knowledge of pregnancy does not vary unilinearly as a function of age or socioeconomic variables.**
- **The rate of drinking after knowledge of pregnancy increases with age and a range of socioeconomic variables.**
- **Age is thought to be the driving force in this trend. Over 90 per cent of those aged 25 or under who were drinking before their knowledge of pregnancy stopped drinking when they became aware of their pregnancy, while only approximately half of those aged 36 or over did.**

Pregnancy and alcohol consumption

Of the women who stated they were pregnant in the past 12 months, 32.0 per cent were pregnant at the time of filling out the survey. Of these 262 women, 219 of them answered the question on how many drinks they had the day before filling out the survey. Only nine of these had drunk at all yesterday, while 95.9 per cent had not. Due to low numbers, this line of analysis was not further explored, and the focus instead is on whether or not they drank before and/or after knowledge of their pregnancy[1].

In order to explore the differences in those who drank before and after knowledge of pregnancy, the women who reported pregnancy within the last year were divided into the following five groups that will be used throughout the report:

1. Women who abstained regardless of pregnancy, that is, who reported they had not drunk at all for two or more years (n=92)
2. Women who did not drink while pregnant, both before or after knowledge of pregnancy (excluding abstainers) (n=264)
3. Women who drank during pregnancy before they found out they were pregnant but stopped when they became aware of it (n=297)
4. Women who did not drink during pregnancy before they found out they were pregnant but did drink after they became aware of it (n=59)
5. Women who drank during pregnancy both before and after knowledge of their pregnancy (n=107)

[1] Please note that there were some coding issues with this item, so statistics cited below may be different to those reported elsewhere from the same data set. Please see Appendix C for more information on this.

Pregnant women were also asked the same questions on frequency and amount of alcohol consumed over the past 12 months that all respondents were asked. Although there is no way of knowing how women responded in terms of what drinking occurred when pregnant or not pregnant, the general drinking habits over the previous twelve months of the women who choose to give up or continue drinking during pregnancy can be examined. Therefore it is possible to define the women who identified as pregnant in the 12 months prior to completing the questionnaire into groups based on their drinking over the past year. The groups are based on risky drinking, defined as five or more drinks in a session. The sample was split into groups of those who did not drink, never drank more than five drinks in a sitting, drank five or more drinks less than 12 times a year, or drank five or more drinks 12 or more times in the past year. These are shown as a function of pregnancy and drinking before or after pregnancy in Table 1.

The percentage of women in each of these groups that were in each of the risky drinking defined groups is shown. Those who drank before, but not after, knowledge of pregnancy were most likely to participate in risky drinking, while those who drank throughout their pregnancy were the most likely to drink less than five standard drinks in a night. The rate of heavy drinking for those who reported drinking after knowledge of pregnancy did not differ significantly from those who did not, However those who dranK before knowledge of pregnancy were substantially more likely to report heavy drinking throughout the year.

Faced with a question about drinking "in the last 12 months" it is not clear how a respondent who abstained for part of the year and drank heavily in another part should respond. The pattern of responses in Table 1 suggests a combination of some answering in terms of social acceptability (it's more acceptable for a heavy drinker to acknowledge drinking before knowledge of pregnancy than after) and a real difference in drinking over the year, particularly between those who were pregnant and the others.

TABLE: 1 – DRINKING HABITS OF WOMEN PREGNANT IN THE LAST 12 MONTHS, BEFORE AND AFTER KNOWLEDGE OF PREGNANCY

Percentage	Non-drinker	Never 5+	5+ less than 12 times	5+ more than 12 times	Number
Not Pregnant	18.4	37.1	18.0	26.5	5836
Pregnant, total	19.9	46.2	17.6	16.3	819
Abstainers	100.0	0.0	0.0	0.0	92
No drinking while pregnant	17.4	54.7	17.7	10.3	264
Drank before knowledge but not after knowledge	0.0	56.6	20.2	23.2	297
Drank though pregnancy	0.0	66.0	17.3	16.7	107

Unfortunately, no questions were asked about how many drinks women consumed while pregnant, rather whether or not any alcohol was consumed. However, respondents were asked if they drank more or less after learning of their pregnancy. Of those who answered this question, 46.2 per cent of the pregnant women stated that they did not drink alcohol. Of the remainder who did drink (n=460), 96.3 per cent stated that they had drunk less alcohol after learning of their pregnancy, 3.0 per cent stated that they drank the same amount, and three participants (0.7per cent) stated that they had drunk more after learning of their pregnancy.

Women were also asked if they had employed any strategies to reduce their alcohol intake in the past year, and what the main reason was for this. Of the 819 pregnant women, 681 answered this question, and 72.8 per cent of those who answered said the main reason that they employed these techniques because of their pregnancy. Within this group, 59.3 per cent stated that they had reduced the amount they drank, 55.3 per cent that they reduced the number of times they drank, 4.6 per cent switched to drinking more low-alcohol drinks, and 49.5 per cent stopped drinking alcohol all together. The percentage of women who used these tactics in each drinking group is shown in Table 2.

Drinking before knowledge of pregnancy

Of the 819 women who stated that they were pregnant at some stage in the past 12 months, 51.7 per cent had their pregnancy confirmed within one to five weeks of conception, with the remainder having their pregnancy confirmed six or more weeks after conception. All women who were pregnant in the past 12 months were asked if they had drunk any alcohol while they were pregnant, but before knowledge of the pregnancy; 47.3 per cent stated that they had. No information is available on how much these women drank while pregnant. The percentage of pregnant women drinking before knowledge of pregnancy as a function of both household income and age is shown in Tables 3 and 4. There is no consistent pattern in the percentage of women drinking before knowledge of their pregnancy by either household income or age.

TABLE: 2 – PERCENTAGE OF WOMEN IN EACH ANNUAL-CONSUMPTION RISKY DRINKING GROUP WHO USED EACH STRATEGY[2] TO REDUCE ALCOHOL CONSUMPTION

Percentage	Reduced the amount of alcohol you drink	Reduced the amount of times you drink	Switched to low alcohol	Stopped drinking	Number
Never 5+	43.9	41.5	2.5	38.7	398
5+ less than 12 times	57.1	54.7	6.6	43.1	139
5+ more than 12 times	53.1	50.6	3.4	20.8	131

[2] Please note that respondents could select more than one option so the total will add to more than 100 per cent

TABLE: 3 – PERCENTAGE OF WOMEN REPORTING DRINKING BEFORE KNOWLEDGE OF PREGNANCY BY HOUSEHOLD INCOME AND NUMBER OF WEEKS PREGNANT WHEN THE PREGNANCY IS CONFIRMED

Percentage	$41,599 or less	$41,600 - $67,599	$67,600 - $103,999	$104,000 or more	Prefer not to say	Number
1-5 weeks	43.3	59.0	47.2	56.5	43.5	365
6+ weeks	51.7	51.6	53.1	55.2	42.0	337
Overall	48.3	55.3	49.2	53.2	42.0	702
Total	88	123	173	236	82	702

All percentages are the percentage of people responding yes to a question on drinking during the requested time period. Please note that the total N is dependent on the number of respondents who answered all three items in the represented table.

The only discernible pattern is that the rate of drinking before learning of pregnancy increases with age in those women whose pregnancy was confirmed six weeks or more after conception. Of particular concern is that the rates of drinking before knowledge of pregnancy are high even when the pregnancy is confirmed late, indicating that there may be more drinking occasions in the first trimester in this group.

Drinking after knowledge of pregnancy

The women who reported a pregnancy in the past 12 months (regardless of drinking habits before pregnancy) were asked if they had drunk any alcohol while they were pregnant after they knew they were pregnant; 19.5 per cent had. Once again it is important to note that the number of drinks that were consumed is not known. The percentage of women who said they did drink after learning of their pregnancy is shown in Tables 5 and 6 as a function of how pregnant they were when their pregnancy was confirmed and household income and age.

TABLE: 4 – PERCENTAGE OF WOMEN REPORTING DRINKING BEFORE KNOWLEDGE OF PREGNANCY BY AGE GROUP AND NUMBER OF WEEKS WHEN THE PREGNANCY WAS CONFIRMED

Percentage	25 or younger	26 to 30	31 to 35	36 or older	Number
1-5 weeks	61.9	45.7	51.5	55.6	396
6+ weeks	51.2	49.7	48.9	43.5	370
Overall	56.1	47.5	50.2	49.7	766
Total	119	223	240	176	766

All percentages are the percentage of people responding yes to a question on drinking during the requested time period. Please note that the total N is dependent on the number of respondents who answered all three items in the represented table.

TABLE: 5 – PERCENTAGE OF WOMEN DRINKING DURING PREGNANCY, AFTER KNOWLEDGE OF PREGNANCY BY INCOME AND NUMBER OF WEEKS PREGNANT WHEN PREGNANCY WAS CONFIRMED

Percentage	$41,599 or less	$41,600 - $67,599	$67,600 - $103,999	$104,000 or more	Prefer not to say	Number
1-5 weeks	11.7	18.9	21.8	33.3	14.1	365
6+ weeks	13.3	16.7	19.5	32.8	4.98	337
Overall	12.8	17.8	20.7	33.1	9.5	702
Total	88	123	173	236	82	702

All percentages are the percentage of people responding yes to a question on drinking during the requested time period. Please note that the total N is dependent on the number of respondents who answered all three items in the represented table.

Unlike the rate of drinking before knowledge of pregnancy, the rate of drinking after knowledge of pregnancy appears to have a positive relationship with both age and household income. Particularly interesting is that although the rates of drinking before knowledge of pregnancy are fairly consistent, women who are younger or with lower household incomes are more likely to stop drinking once they learn of their pregnancy. Alternatively the percentage of older pregnant women who report drinking alcohol does not decrease as much after the pregnancy is confirmed.

Attitudes towards alcohol and drinking during pregnancy

Respondents were also asked if they approved of regular alcohol consumption by adults as part of the survey. This particular item was not presented with the other pregnancy information and as such is a reflection of their approval or disapproval of the drinking of adults in general, not specific to pregnancy. The percentage of respondents selecting each response who drank before or after knowledge of pregnancy is shown in Table 7. While the percentage who disapprove is higher in abstainers the pattern of approval is similar for those who did not drink during pregnancy and those who did, suggesting that views on pregnancy and drinking are not strongly influenced by general attitudes on regular adult consumption.

TABLE: 6 – PERCENTAGE OF WOMEN DRINKING DURING PREGNANCY, AFTER THE KNOWLEDGE OF PREGNANCY, BY AGE AND NUMBER OF WEEKS WHEN THE PREGNANCY WAS CONFIRMED

Percentage	25 or younger	26 to 30	31 to 35	36 or older	Number
1-5 weeks	11.7	13.9	30.3	36.8	396
6+ weeks	8.3	14.7	19.6	31.2	370
Overall	9.9	14.3	25.0	34.1	766
Total	119	223	240	176	766

All percentages are the percentage of people responding yes to a question on drinking during the requested time period. Please note that the total N is dependent on the number of respondents who answered all three items in the represented table.

TABLE: 7 – ATTITUDES TOWARDS REGULAR ALCOHOL CONSUMPTION AS A FUNCTION OF DRINKING WHILE PREGNANT

Percentage	Abstainers	No drinking while pregnant	Drank before but not after knowledge	Drank after but not before knowledge	Drank through pregnancy
Approve	21.4	44.8	54.0	49.8	61.3
Neither	21.5	38.9	32.2	38.0	30.4
Disapprove	57.2	16.3	13.8	12.2	8.3
Total	86	256	295	57	104

Please note that the total N is dependent on the number of respondents who answered all three items represented in this table.

Alcohol consumption in pregnant women who were not abstainers

In order to avoid the confoundER of women who would not be drinking, regardless of pregnancy, analyses of the SES variables related to drinking while pregnant were conducted only on the women who did not identify as abstainers in the survey. Therefore anyone who had not had a drink in the previous two years was removed from the pregnant and comparison samples. This meant that 11.2 per cent of the pregnant respondents were removed from the sample for the analyses in this section.

Of the remaining women who were pregnant in the previous 12 months, 53.2 per cent drank before knowledge of their pregnancy; this was reduced to 22.6 per cent after knowledge of pregnancy. The percentages of women responding yes to the questions on drinking before and after knowledge of pregnancy were compared to SES indicators. A positive relationship between drinking while pregnant after knowledge of pregnancy and household income can be seen in Table 8.

TABLE: 8 – PERCENTAGE OF WOMEN DRINKING WHILE PREGNANT (BEFORE OR AFTER KNOWLEDGE OF PREGNANCY) BY HOUSEHOLD INCOME

Income	Drank before knowledge of pregnancy (per cent yes)	Drank after knowledge of pregnancy (per cent yes)	Number
$41,599 or less	53.3	14.1	84
$41,600 - $67,599	62.4	20.1	107
$67,600 - $103,999	50.9	21.5	170
$104,000 or more	55.0	34.0	231
Prefer not to say	52.2	11.9	70

Please note that the total N is dependent on the number of respondents who answered all three items represented in this table.

TABLE: 9 – PERCENTAGE OF PREGNANT RESPONDENTS DRINKING BEFORE AND AFTER DISCOVERING PREGNANCY, BY EDUCATION

Highest qualification	Drank before knowledge of pregnancy (per cent yes)	Drank after knowledge of pregnancy (per cent yes)	Number
Trade Certificate	60.3	15.2	83
Non-trade Certificate	58.9	19.6	65
Diploma	54.2	22.5	73
Bachelors	54.1	27.2	180
Postgraduate	53.9	39.8	90

Please note that the total N is dependent on the number of respondents who answered all three items represented in this table.

This positive relationship between household income and drinking after knowledge of pregnancy is supported by a similar finding on highest qualification, as shown in Table 9. Women with higher qualifications are less likely to drink while pregnant, before knowledge of pregnancy, but more likely to drink after learning of their pregnancy. The rates of drinking by both highest qualification and by Socio-Economic Index for Areas (SEIFA), a SES indicator of the respondent's postcode, shown in Table 10 indicates that there may be a pattern in which living in lower socio-economic areas would predict higher rates of drinking before knowledge of pregnancy, but lower after this knowledge. This seems to indicate that those in lower SES groups are more likely to adjust their behaviour after gaining knowledge of their pregnancy.

TABLE: 10 – PERCENTAGE OF PREGNANT RESPONDENTS DRINKING BEFORE AND AFTER DISCOVERING PREGNANCY, BY SOCIO-ECONMIC INDEX FOR AREAS (SEIFA)

SEIFA Quintile	Drank before knowledge of pregnancy (per cent yes)	Drank after knowledge of pregnancy (per cent yes)	Number
Quintile 1 (lowest)	46.3	15.2	114
Quintile 2	50.1	18.5	137
Quintile 3	65.0	18.2	127
Quintile 4	54.2	25.0	192
Quintile 5 (highest)	54.9	31.5	157

Overall, there is no steady relationship between SES and drinking before knowledge of pregnancy. However after knowledge of pregnancy there is a stronger relationship in which women with higher SES indicators are more likely to drink. It is possible that it is actually age which is the driving factor behind these differences by income and other status indicators - that older women are less likely to stop drinking once they are aware of their pregnancy. Shown in Table 11 is a summary of the rates of drinking while pregnant by age group. As can be seen, before knowledge of pregnancy there is little difference between the age groups, but the increase in drinking after knowledge of pregnancy as age increases is steady.

Logistic regression models predicting the likelihood of drinking before and after knowledge of pregnancy were developed in order to ascertain if any of these variables are predictive of the likelihood to drink while pregnant. Each model was run twice, once with the demographic predictors only and once with the views on alcohol added in. Please note that women who had not drunk alcohol in the two years prior to the survey were not included in this analysis. The two models predicting drinking during pregnancy, before knowledge of pregnancy, are shown in Table 12.

SEIFA, as a measure of socio-economic residential advantage, was the only significant predictor of drinking before knowledge of pregnancy in model 1, with respondents from more advantaged areas more likely to drink. The addition of approval of regular consumption did not make a difference to the significance of the other variables. As would be expected from the well-established general relationship between attitudes to drinking and drinking behaviour, those that approved of consumption were more likely to drink before knowledge of pregnancy than those who disapproved or did not approve or disapprove.

TABLE: 11 – PERCENTAGE OF PREGNANT RESPONDENTS DRINKING BEFORE AND AFTER DISCOVERING PREGNANCY, BY AGE

Age	Drank before knowledge of pregnancy (per cent yes)	Drank after knowledge of pregnancy (per cent yes)	Number
25 or younger	53.8	9.4	124
26 to 30	52.2	15.5	224
31 to 35	55.4	27.5	219
36 or older	55.3	37.9	160

TABLE: 12 – REGRESSION COEFFICIENTS FOR PREDUCTION OF DRINKING BEFORE KNOWLEDGE OF PREGNANCY

		Model 1	Model 2
Age		1.02 (0.97-1.06)	1.02 (0.97-1.06)
Household Income	< $41,599	1 (Ref)	1 (Ref)
	$41,600-67,599	1.68 (0.67-4.18)	1.66 (0.72-3.83)
	$67,600-103,999	0.63 (0.27-1.50)	0.86 (0.39-1.89)
	$104,000+	0.90 (0.39-2.12)	1.12 (0.51-2.47)
	prefer not to say	0.92 (0.35-2.41)	0.82 (0.34-2.02)
SEIFA	1 (least advantaged)	1 (Ref)	1 (Ref)
	2	1.78 (0.82-3.85)	1.27 (0.61-2.67)
	3	3.97 (1.79-8.84)**	3.04 (1.40-6.60)**
	4	2.07 (1.00-4.31)	1.88 (0.93-3.84)
	5 (most advantaged)	2.34 (1.11-4.95)*	2.38 (1.12-5.08)*
Highest Qualification	Trade Certificate	1 (Ref)	1 (Ref)
	Non-Trade Certificate	0.82 (0.37-1.80)	0.89 (0.40-1.99)
	Diploma	0.79 (0.36-1.73)	0.65 (0.31-1.35)
	Bachelors	0.61 (0.31-1.18)	0.50 (0.27-0.96)*
	Postgraduate	0.58 (0.27-1.26)	0.59 (0.28-1.24)
Regular Consumption	Approve		1 (Ref)
	Neither		0.57 (0.36-0.89)*
	Disapprove		0.34 (0.20-0.58)***

*P <.05; ** P < .01; *** P < .001

The same two sets of predictors were used to develop models predicting drinking after knowledge of pregnancy. These two models are shown in Table 13. In Model 1, age was the only significant predictor of drinking after knowledge of pregnancy, with older women more likely to drink. The addition of attitudes towards regular consumption in the second model made no difference to the significance of the demographic variables in the first model. But, as expected, those that disapproved of regular consumption were significantly less likely to drink after knowledge of pregnancy than those who approved.

TABLE: 13 – REGRESSION COEFFICIENTS FOR PREDUCTION OF DRINKING AFTER KNOWLEDGE OF PREGNANCY

		Before	After
Age		1.13 (1.07-1.19)***	1.13 (1.08-1.19)***
Household Income	< $41,599	1 (Ref)	1 (Ref)
	$41,600-67,599	1.42 (0.39-5.26)	1.32 (0.37-4.71)
	$67,600-103,999	1.89 (0.58-6.15)	1.83 (0.58-5.72)
	$104,000+	2.58 (0.82-8.15)	2.35 (0.76-7.23)
	Prefer not to say	1.20 (0.31-4.47)	0.89 (0.23-3.41)
SEIFA	1 (least advantaged)	1 (Ref)	1 (Ref)
	2	1.52 (0.51-4.53)	1.33 (0.47-3.78)
	3	0.98 (0.34-2.87)	1.00 (0.35-2.88)
	4	1.39 (0.53-3.63)	1.27 (0.48-3.34)
	5 (most advantaged)	1.38 (0.53-3.58)	1.45 (0.56-3.75)
Highest Qualification	Trade Certificate	1 (Ref)	1 (Ref)
	Non-Trade Certificate	1.71 (0.55-5.34)	1.76 (0.55-5.63)
	Diploma	1.33 (0.47-3.73)	1.26 (0.45-3.57)
	Bachelors	1.53 (0.59-3.96)	1.36 (0.51-3.61)
	Postgraduate	2.28 (0.83-6.26)	2.34 (0.85-6.44)
Policy	Approve		1 (Ref)
	Neither		0.73 (0.43-1.22)
	Disapprove		0.43 (0.21-0.91)*

*P <.05; ** P < .01; *** P < .001

In the two models predicting drinking after knowledge of pregnancy, age is the important factor; the findings on relationship between drinking while pregnant and other socio-economic variables seem to be, at least to a certain extent, a reflection of the differences in the variables by age. Furthermore variables that play a part in drinking before knowledge of pregnancy, such as SEIFA, do not predict drinking after knowledge of pregnancy. It may be that education and awareness programs on the dangers of drinking while pregnant or breastfeeding are having an effect on the younger, but not older, mothers. However, this awareness only impacts behaviour after knowledge of pregnancy.

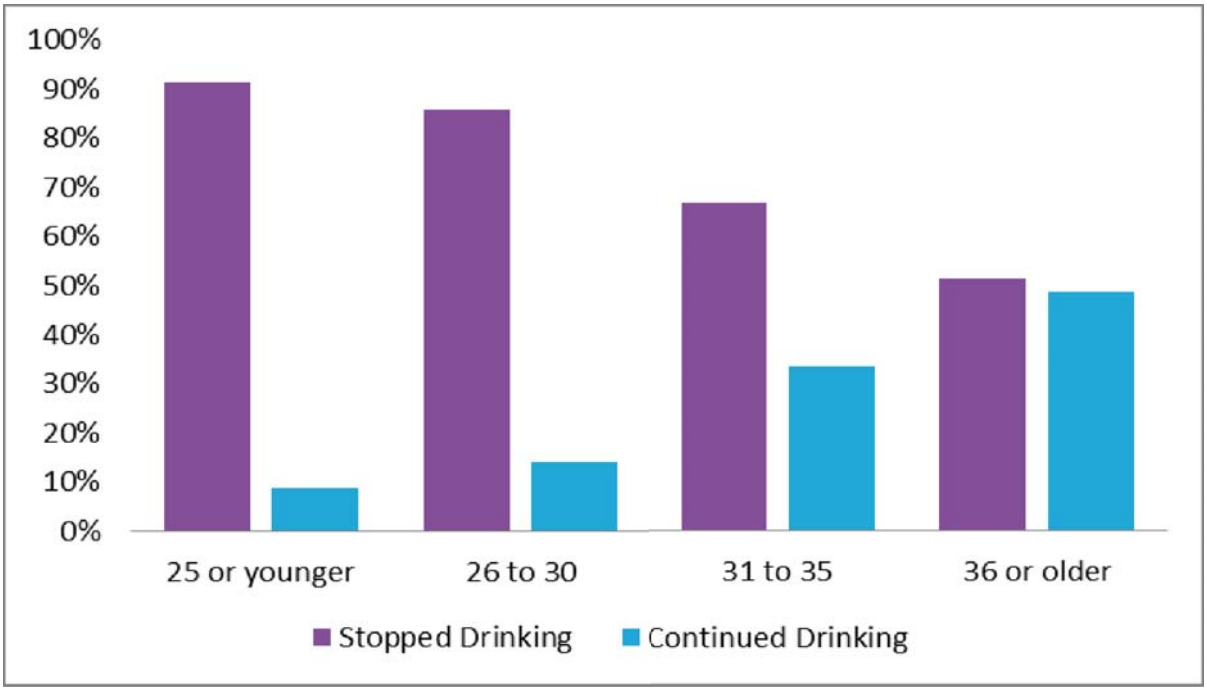
The percentages of pregnant women in each of these groups who did not drink, stopped drinking or continued drinking are shown in Table 14. Once again the results suggest that age is an important predictor; the percentage of women choosing to cease drinking once aware of their pregnancy steadily decreases through each age group.

TABLE: 14 – PERCENTAGE OF WOMEN DRINKING BEFORE AND/OR AFTER PREGNANCY BY AGE

Percentage	Abstainers	No drinking while pregnant	Drank before but not after knowledge	Drank after by not before knowledge	Drank through pregnancy	Number
25 or younger (per cent)	7.0	38.6	45.7	4.4	4.3	134
26-30 (per cent)	14.3	34.1	38.4	6.9	6.4	251
31-35 (per cent)	13.6	30.8	31.9	7.8	16.0	253
36 or older (per cent)	12.3	29.6	24.9	9.6	23.6	181

The most interesting point here is the percentage of women who gave up drinking once they found out about their pregnancy. While the youngest age group had the lowest proportion of abstainers, they also had the highest proportion not drinking during pregnancy or giving up alcohol once they became aware of it. It could be argued that this is to a certain extent a reflection of the drinking rates before pregnancy, as they were less likely to be abstainers when not pregnant. Therefore a separate analysis, based only on those who drank before knowledge of their pregnancy was also calculated. The percentage of women who were drinking before knowledge of their pregnancy who quit or continued drinking after finding out about their pregnancy is shown in Figure 1. Of the 14 to 25 year olds who drank before knowledge of pregnancy, 91.3 per cent gave up drinking after discovery, with a steady decrease to 51.3 per cent of those who were 36 or older giving up drinking.

FIGURE: 1 – PERCENTAGE OF WOMEN WHO STOPPED OR CONTINUED DRINKING AFTER DISCOVERING THEIR PREGNANGY BY AGE GROUP (n=355)



Summary

Overall these results suggest that, while there is a higher level of drinking after knowledge of pregnancy in those women with higher SES indicators, much of this finding can be explained by age: younger women are more likely to stop drinking once they become aware of their pregnancy. This is similar to what was found for European samples in the systematic review of pregnancy and drinking (Skagerstrom, et al., 2011), with the positive relationship between age and drinking now also being found in an Australian sample. The rate of women who drank after knowledge of pregnancy in this study (19.5 per cent) is similar to the 23.7 per cent of women who intended to drink during pregnancy in a sample of non-pregnant Australian women aged 18-45 (Peadon, et al., 2011), suggesting that this is a premeditated decision.

Of those who were drinking before they knew they were pregnant, younger women were much more likely than their older counterparts to stop drinking once they learned of their pregnancy. The addition of the differentiation between drinking before and after knowledge of the pregnancy makes direct comparisons with these results to previous research difficult. However, the change in questions in the NDSHS does seem to be a valuable addition that encourages more disclosure of drinking during pregnancy, thus gaining a more accurate snapshot of drinking during pregnancy.

It is important to note that the amount that women drink during pregnancy was not assessed. Therefore it may well be that the relationship between moderate or higher alcohol consumption during pregnancy and these demographic predictors is different from the relation with abstention. Powers and colleagues (2010) found that while 83 per cent of women surveyed in 2003 and 2006 consumed alcohol, only one per cent consumed more than fourteen standard drinks in a week, and the majority of the entire sample (63 per cent) did not drink more than two standard drinks a day and not more than seven in a week. Therefore it may be that while the rates of women drinking during pregnancy are still high, they are not drinking at the levels that research has more confidently linked to adverse alcohol exposure related effects (O'Leary, et al., 2010; Robinson, et al., 2010). Given that the rate of FASD is higher among lower SES mothers (May & Gossage, 2011) and heavy drinking is more common in younger pregnant women than older pregnant women (Mullally, Cleary, Barry, Fahey, & Murphy, 2011), it will be worthwhile to investigate the interaction between age, SES and the amount of alcohol consumed while pregnant in future research.

Future surveys should include information on the amount of alcohol consumption while pregnant as well as amendments to fix the problems outlined in Appendices B and C. That said the addition of the differentiation between drinking before and after pregnancy has provided valuable information on the difference in predictors of these two types.

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Appendix A

In the 2007 NDSHS, instead of asking about drinking before and after knowledge of pregnancy, participants were instead asked about drinking while pregnant, breastfeeding or both. This makes comparison between the two surveys problematic. In the 2007 survey, 24 per cent of those who were pregnant in the preceding year reported drinking while pregnant (as compared to 47.3 per cent before and 19.5 per cent after knowledge of pregnancy in 2010). However the question on drinking more or less alcohol since becoming pregnant was the same from 2007 to 2010, allowing some comparison. The responses to this item in 2007 and 2010 are shown in Table 15.

TABLE: 15 – CHANGE IN ALCOHOL CONSUMPTION DUE TO PREGNANCY IN 2007 AND 2010

	2007	2010
Drank More	0.1	0.4
Drank Less	57.6	49.3
Drank the Same Amount	2.9	1.7
Don't Drink Alcohol	39.4	48.6

While the rate of drinking more or the same after becoming pregnant was fairly similar, there were more women not drinking during pregnancy in 2010 than there were in 2007. As can be seen in Table 16, the relationship between drinking while pregnant and socio-economic indicators was similar to that found in the 2010 data. SEIFA neighbourhood status and highest qualification was positively linked with an increased likelihood of alcohol consumption during pregnancy, as was increasing age. However the relationship between household income and drinking during pregnancy was not as clear as it was for drinking after knowledge of pregnancy in the 2010 survey. This may be in part a result of this differentiation not being made in 2007.

There are two plausible interpretations of these results, both of which may be in effect. The first is that the option to differentiate between drinking before and after knowledge of pregnancy resulted in higher response rates. Respondents in 2007 may not have thought that drinking before knowledge of pregnancy "counted". The second interpretation is that rates of drinking while pregnant have genuinely dropped. Ultimately, what can be taken from this is that a comparison of drinking rates during pregnancy in 2007 and 2010 is not tenable if using the NDSHS survey results.

TABLE: 16 – PERCENTAGE OF PREGNANT RESPONDENTS DRINKING DURING PREGNANCY BY HOUSEHOLD INCOME, HIGHEST QUALIFICATION, SEIFA AND AGE

Category	Percentage of respondents drinking during pregnancy	Number
Household Income		
< $41,599	21.4	98
$41,600-67,599	31.3	112
$67,600-103,999	23.5	149
$104,000 or more	31.4	169
prefer not to say	13.8	80
Highest Qualification		
Trade Certificate	13.4	67
Non-Trade Certificate	23.7	59
Diploma	35.5	62
Bachelors	27.3	143
Postgraduate	27.5	91
SEIFA		
1 (least advantaged)	17.2	122
2	21.6	116
3	23.3	116
4	17.4	164
5 (most advantaged)	31.5	143
Age		
25 or younger	16.7	126
26 to 30	25.8	159
31 to 35	25.0	236
36 or older	30.0	140

Appendix B

The number of pregnant respondents in this report may be lower than those reported elsewhere, as we have adjusted for a perceived error in coding in question z5. The number of women who stated that they were both pregnant and breastfeeding at the same time was unusually high in this survey, and the age range in particular within this group suggested that many women who gave this response were in fact neither pregnant nor breastfeeding in the previous 12 months. In Figure 1 the raw numbers of women who reported pregnancy, breastfeeding or both at the same time in the NDSHSs from 2004 to 2010 are shown.

As can be seen in Figure 2, there was a large rise in women reporting being both pregnant and breastfeeding at the same time in 2010. Furthermore the age range of these women (up to age 86) indicated that it was unlikely all of them answered the question accurately. This problem seems to have been consistent at least throughout the last three surveys. This can be seen in Table 16, where the proportions of women reporting that they are pregnant, breastfeeding or both who are over 55 are reported. While the proportion of women reporting that they are both pregnant and breastfeeding who are over 55 is lower than it was in previous years, the sheer number of women reporting this is much higher, indicating that there may be a problem with participants answering this question.

FIGURE: 2 – RATE OF REPORTED PREGNANCY, BREASTFEEDING OR BOTH IN THE NDSHS SURVEYS 2004 – 2010 (PERCENTAGE OF ALL FEMALE RESPONDENTS)

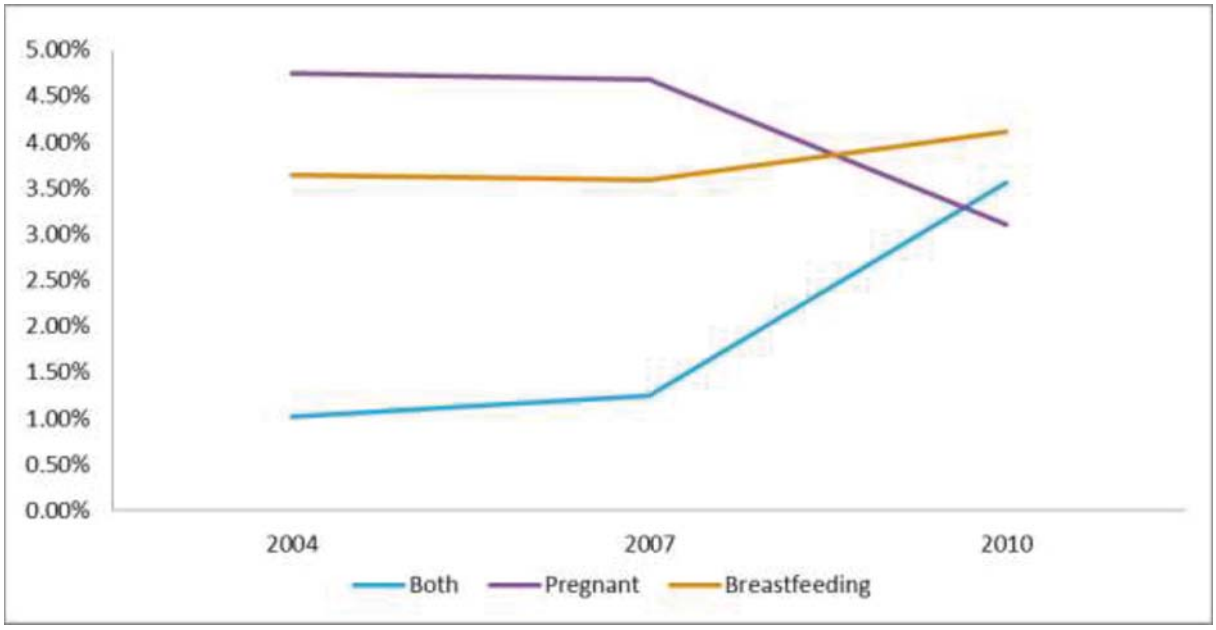

TABLE: 17 – NUMBER OF WOMEN SELF REPORTING PREGNANCY BREASTFEEDING OR BOTH IN THE PAST 12 MONTHS AND THE PERCENTAGE OF THESE WOMEN OVER THE AGE OF 55

Percentage	2010	2007	2004
Both	524 (4.4)	164 (11.9)	170 (10.6)
Pregnant	457 (0.5)	614 (0.2)	789 (0.0)
Breastfeeding	604 (0.0)	471 (0.0)	605 (0.2)

Therefore for the 2010 survey participants were no longer considered pregnant AND breastfeeding if:

- They stated that they were both pregnant and breastfeeding but then went on to state that they were not pregnant in question z9 or that they were not breastfeeding in z10
- They stated that they were pregnant AND breastfeeding within the past 12 months BUT were not just pregnant or just breastfeeding in the same time frame.
- Responded 'not applicable' to the question on how many weeks they were pregnant when a pregnancy was confirmed (with the exception of women who did this but did tick pregnant only or breastfeeding only in question z5)
- Any women who fit the above criteria BUT went on to state that pregnancy was a reason for amending drinking habits in another section of the survey were placed back in the pregnancy category.

Although it is feasible that some of these women were in fact pregnant and/or breastfeeding, it is unlikely, and given the problems with this particular item it was decided that this method of identification would be more accurate than taking the question at face value.

It is possible that this confusion could be avoided if the question simply asked if there was any time in the past 12 months if they were pregnant, or if there was any time in the last 12 months that the participant was breastfeeding. No information would be lost through this method if the rest of the questionnaire remains as it is. This is because all questions about drinking only ask about drinking while pregnant OR breastfeeding, with no specific question addressing the habits of those who were both at the same time.

Appendix C

Aside from a difference in the number of pregnancies, some results may also be different to those reported elsewhere due to our interpretation of question z8 which is shown in Figure 3.

FIGURE: 3 – QUESTION Z8 OF THE 2010 NDSHS

Z8. At any time in the last 12 months when you were pregnant or breastfeeding, did you use any of the following. . .?
(Select each that applies to you during the last 12 months from the top row, and moving down the list of substances, mark all that apply)

	Before you knew you were pregnant	After you knew you were pregnant	When breast-feeding
Alcohol	☐	☐	☐
Tobacco	☐	☐	☐
Tranquillisers, Sleeping pills for non-medical use	☐	☐	☐
Prescription Pain-killers/Analgesics for non-medical use	☐	☐	☐
Over-the-counter Pain-killers/ Analgesics for non-medical use	☐	☐	☐
Steroids for non-medical use	☐	☐	☐
Sniffing Petrol/Glue/ Aerosols/Solvents	☐	☐	☐
Marijuana/Cannabis	☐	☐	☐
Hallucinogens/LSD/Magic Mushrooms	☐	☐	☐
Methadone/Buprenorphine for non-medical use	☐	☐	☐
Meth/amphetamine for non-medical use	☐	☐	☐
Heroin	☐	☐	☐
Other Opioids/Opiates (e.g. Morphine, Pethidine) for non-medical use	☐	☐	☐
Cocaine/Crack	☐	☐	☐
Ecstasy	☐	☐	☐
GHB	☐	☐	☐
Ketamine	☐	☐	☐
Kava	☐	☐	☐
Other	☐	☐	☐
None of these substances	☐	☐	☐
Not applicable in the last 12 months	☐	☐	☐

The figures in this report may be different to other published reports (using the same dataset) because of our interpretation of the missing values in the questions on drinking before and after knowledge of pregnancy. Because of the way the question is worded, it is very reasonable for someone who has not consumed alcohol, tobacco or any illicit substances during their pregnancy to skip to the next question, rather than ticking the 20th box in a list of 21, which is the "None of these substances" option. These

respondents were coded as missing data, having apparently skipped the question. In order to more accurately capture the rates of drinking in pregnant women, if they have stated that they were pregnant, and this has been deemed correct as per the guidelines outlined in Appendix B, we have re-coded this missing data to indicate that they did not consume alcohol.

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