

# Written information and health professionals are the information sources about alcohol use in pregnancy most often used by pregnant women

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## Abstract

**Introduction:** Alcohol use in pregnancy remains common in Australia, despite national guidelines recommending that pregnant women abstain. The aims of this study were to investigate where pregnant women obtain information about alcohol use in pregnancy and the relationship between the information source used and women's demographic characteristics and alcohol use.

**Methods:** In this cross-sectional survey of pregnant women attending public maternity services in the Hunter New England region (New South Wales), women were asked, 'Where did you get information to help you make decisions about alcohol use during pregnancy?'. The number and types of information sources were analysed using descriptive statistics. Associations between women's information sources, and their demographic characteristics and alcohol use in pregnancy were assessed using chi-square tests and logistic regression.

**Results:** Of 4511 pregnant women surveyed, 80.1% used at least one type of information source (range 0–5). Written/electronic information (45.4%), health providers (37.6%) and family/friends (19.5%) were the sources most reported. Higher use of written/electronic information, antenatal health providers and family/friends was associated with first pregnancy, younger age and higher education. The type of information source used was associated with alcohol use in pregnancy. Women who reported alcohol use were more likely to receive information from written/electronic sources. Almost 20% of women (older, multiparous [ $>1$  pregnancy] and more highly educated) obtained no information regarding alcohol use in pregnancy.

**Discussion and Conclusions:** Antenatal providers should routinely provide information on alcohol use in pregnancy, including for women least likely to access available information.

## KEYWORDS

alcohol consumption, antenatal care, consumer, health information, pregnancy

Belinda Tully: Gomeroi Nation.

## 1 | INTRODUCTION

Prenatal alcohol exposure (PAE) can result in adverse outcomes for the pregnancy and child, including miscarriage, stillbirth, prematurity and neurodevelopmental and behavioural disorders such as foetal alcohol spectrum disorder (FASD) [1, 2]. In Australia and internationally, guidelines to prevent foetal harm from PAE recommend that women do not consume alcohol during or when planning pregnancy [3]. Worldwide, approximately 10% of pregnant women use alcohol, rates differing by country and socio-economic status [2]. In Australia PAE rates of 35% to 82% are reported [4–7]. Women who are older and who regularly consume alcohol at medium to high-risk levels (including binge drinking) before pregnancy are more likely to consume alcohol during pregnancy [4, 8–10].

Reportedly, one reason that women consume alcohol during pregnancy is lack of awareness of harms or misinformation/misconceptions about alcohol use in pregnancy [11, 12]. In our previous study, we found that 78.1% of pregnant women who were aware of national guidelines on alcohol use during pregnancy knew that abstaining from alcohol in pregnancy was safest [10]. However, few studies to date have reported the source(s) of information used by women to obtain information about alcohol consumption in pregnancy. Identifying where women obtain information on health risk behaviours during pregnancy can assist in determining if information is obtained from authoritative sources (e.g., government guidelines, health-care professionals) and whether there is opportunity to reinforce guideline recommendations in information sources commonly used by women.

Two international studies have explored the sources of information on alcohol use in pregnancy used by pregnant women. In a Danish study of 439 pregnant women, only 16.2% reported receiving information about alcohol use in pregnancy from their health professional (general practitioner, midwives and obstetricians) [13]. More women reported receiving information from mass media (65%) and relatives (40%) [13]. In an Israeli study ( $N = 802$ ) 60.5% of pregnant women reported that they received education about alcohol use in pregnancy from a public or private physician (37.4%), nurse (17.2%) or social media (5.9%) [14]. Neither study reported associations between the use of different types of information sources and women's characteristics, including their alcohol consumption during pregnancy.

No studies have reported on the information sources used by Australian pregnant women regarding alcohol consumption. Two studies, however, have reported on where non-pregnant women obtain such information. In the first, a study of 1103 non-pregnant women of

childbearing age, it was found that although women preferred to receive information about alcohol use in pregnancy from their health professional, women mainly obtained information from brochures (16%) and media programs/articles (13%) [15].

In the second, a retrospective study involving 317 pregnant women in Victoria, Australia, 55.8% of women reported receiving preconception health information from their health professional, although women aged <25 years or with an unplanned pregnancy were less likely to access such information [16]. The preconception information received included advice on drug and alcohol cessation [16], but neither the proportion of women receiving information specific to alcohol use nor their use of other information sources was reported.

Neither of these studies reported on the information sources used by women once they were pregnant and neither sought to determine associations between the types of information sources used and the characteristics of women, including their demographics and their alcohol use. Such information is required to inform public health strategies to improve adherence to national recommendations and reduce rates of PAE and its consequences.

Thus, the aims of the current study were to identify the:

1. number and type of information sources that pregnant Australian women used to obtain information and advice about alcohol use in pregnancy;
2. associations between characteristics (clinical, demographic) of pregnant women and the number and types of information sources used regarding alcohol use in pregnancy; and
3. associations between number and type of information sources used and women's alcohol use during pregnancy.

## 2 | METHODS

### 2.1 | Design

Cross-sectional survey (July 2017 to November 2019) with pregnant women attending public maternity services in three sectors (covering metropolitan, regional and rural areas) of the Hunter New England Local Health District in New South Wales.

### 2.2 | Inclusion/exclusion criteria

All women who attended public antenatal services in the participating sectors of the Hunter New England Local Health District were eligible to participate if they were at

least 18-years-old, pregnant at 12 to <38 weeks gestation and able to complete the survey in English [17]. Women were excluded if they were receiving antenatal care through a private provider, had already given birth or had a negative pregnancy outcome [17].

### 2.3 | Recruitment

Eligible women were identified using electronic medical records and antenatal appointment data [10, 17]. Every week between 17 July 2017 and 25 November 2019, a sample of 105 women was selected using a computerised, random number generator and mailed a participant information statement. Aboriginal women were contacted by text message 4 days after the letter was sent and invited to participate in the survey via computer assisted telephone interview (CATI) or online. Non-Aboriginal women were contacted by telephone 7 days after the letter was sent and invited to complete the survey via telephone or if the telephone interview was declined, online [17]. Up to 10 attempts to contact women were made over a 2-week period.

### 2.4 | Data collection and measures

Data from CATI and online surveys were collected using REDCap [18, 19]. CATI surveys were undertaken by trained, experienced female interviewers [17]. Survey questions were based on previous Australian surveys [5, 7, 20] and were co-developed, piloted and reviewed for cultural appropriateness by the study's Cultural Review Group, led by Aboriginal and Torres Strait Islander women.

Women reported their demographic and clinical details, including age, level of education, Aboriginal or Torres Strait Islander origin, and parity. Women's residential postcodes were obtained from electronic medical records to determine area index of disadvantage based on the Socio-Economic Indexes for Areas [21] and remoteness, based on the accessibility/remoteness index of Australia [22].

Women reported their alcohol consumption during the 12 months before pregnancy and since pregnancy recognition using the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) tool [23]. Special occasion drinking during pregnancy was assessed by asking women, 'Were there any special occasions (e.g., a wedding, anniversary, birthday) since you found out you were pregnant where you consumed any alcohol?'

Regarding sources of information on alcohol use in pregnancy, women were asked the open-ended question:

'Where do you get information from to help you make decisions about alcohol use during pregnancy?'

### 2.5 | Analysis

Condensed response categories were created for the following demographics of pregnant women: Aboriginal and Torres Strait Islander origin (yes/no), education level (high school or less/technical certificate or diploma/university or college degree or higher), first pregnancy (yes/no), index of disadvantage (most/mid/least disadvantaged), remoteness (regional or remote/major city) and age ( $\leq 24$  years/ $\geq 25$  years). For alcohol use measures, total AUDIT-C score was classified as no risk (score = 0), low-medium risk (score = 1–4) or high risk (score  $\geq 5$ ) [24], and special occasion drinking as yes/no.

For Aim 1, the information sources used by pregnant women to obtain information about alcohol use in pregnancy were classified using thematic analysis [25]. The data collected from the CATIs were reviewed and initial codes generated by the study team. If multiple information sources were reported by a participant, each information source was classified separately. Initial codes were then reviewed and collated if appropriate (by Tracey W. Tsang, Melanie Kingsland, Emma Doherty, reviewed by all co-authors), resulting in the 12 classifications listed below.

1. Antenatal health provider: any antenatal health provider or health service/clinic, antenatal and parenting courses, community health service, Aboriginal Maternal and Infant Health Services, Aboriginal Community Control Health Organisation, hospital doctor, nurse, fertility specialist.
2. Other health provider: naturopath, psychologist, Mothersafe, counsellor, psychiatrist, pharmacist, Australian Breastfeeding Association.
3. Family and friends.
4. Colleagues: workplace colleagues, support groups, work-related knowledge.
5. Written information—Health: health service websites and materials, research studies, hospital posters, guidelines, textbooks.
6. Written information—Alcohol industry: labels on alcohol products.
7. Written information—Undefined: internet, books, brochures/pamphlets.
8. Media: traditional and social media, apps.
9. Self-knowledge/education: studies (university/school/course), common sense, culture/religion, community, family/personal experience, non-drinker.
10. Other sources: cannot be classified in above categories (e.g., 'course', 'classes', 'community centre').

11. Unknown: information was obtained but respondent could not recall the source.
12. None: No information was sought.

Descriptive statistics were used to describe the number and proportion of information sources used. Any information source type from the list of 12 above which was used by  $\geq 20\%$  women was considered among the most frequently used source types and explored in the subsequent analyses (Aims 2 and 3).

For Aim 2, the relationships between types of information sources used and demographic/clinical characteristics of pregnant women were assessed using a two-step process. First, bivariate analyses (Pearson's chi-square tests, Pearson's chi-square test, Mann-Whitney *U* tests on medians, Kruskal-Wallis tests with Dunn's pairwise post-hoc tests or Kendall rank correlation) were used. Subsequently, multivariate analysis using individual variables found in the above analyses to be related to each information source at  $p < 0.20$ , were included as predictor variables in forced-entry binary logistic regression models, with the information source type as the dependent (predicted) variable.

For Aim 3, bivariate analyses were used to test for associations between the type/number of information sources used and alcohol use during pregnancy (AUDIT-C and special occasion drinking). Chi-square or Fishers exact tests were used for categorical variables (source type), and Mann-Whitney *U* and Kruskal-Wallis tests for continuous variables (number of information sources). Results were considered statistically significant at  $p < 0.05$ . Analyses were conducted using IBM SPSS Statistics for Windows, Version 25.0 (IBM Corp., Armonk, NY, USA).

### 3 | RESULTS

#### 3.1 | Participant characteristics

A total of 8078 pregnant women were randomly selected to participate in the survey. On the day of attempted contact, 7481 (92.6%) remained eligible to participate based on medical record data indicating they had not given birth or had a negative pregnancy outcome. Of the 5747 (76.8%) women who could be contacted, 5590 (97.3%) were deemed eligible. Of these women, 4637 (83.0%) consented and 4511 (80.7%) completed the survey by CATI (4438) or online (73).

Demographic characteristics of participants are presented in Table 1. Of the 4511 women who participated in the survey, most were aged 26 to 33 years, resided in a major city (70.4%), were employed full- or part-time (70.5%), had completed tertiary education (70.6%), were

**TABLE 1** Respondent demographics ( $N = 4511$ )

Characteristic	Total cohort ( $N = 4511$ )
Age, years	
Mean $\pm$ SD	29.6 $\pm$ 5.2
Median (range)	30 (18–51)
Interquartile range	26–33
Aboriginal or Torres Strait Island background, $N$ (%)	( $N = 4508$ ) 276 (6.1)
First pregnancy, $N$ (%)	( $N = 4510$ ) 1771 (39.3)
Education level completed, $N$ (%)	( $N = 4508$ )
High school or less	1326 (29.4)
Technical cert or diploma	1601 (35.5)
Uni/college degree or higher	1581 (35.1)
Index of disadvantage (NSW 2016), $N$ (%)	( $N = 4509$ )
Most disadvantaged	2075 (46.0)
Mid disadvantaged	1409 (31.2)
Least disadvantaged	1025 (22.7)
Marital status, $N$ (%)	( $N = 4506$ )
Never married	454 (10.1)
Married/living together	3938 (87.4)
Separated/divorced	111 (2.5)
Widowed	3 (0.1)
Remoteness, $N$ (%)	( $N = 4509$ )
Major city	3174 (70.4)
Inner/outer regional	1327 (29.4)
Remote/very remote	8 (0.2)
AUDIT-C score pre-pregnancy <sup>a</sup> , $N$ (%)	( $N = 4481$ )
No risk	858 (19.1)
Low-medium risk	2694 (60.1)
High risk	929 (20.7)
AUDIT-C score during pregnancy <sup>a</sup> , $N$ (%)	( $N = 4508$ )
No risk	4059 (90.0)
Low-medium risk	447 (9.9)
High risk	2 (0)
Special occasion drinking during pregnancy, $N$ (%)	( $N = 4158$ ) 394 (9.5)

Abbreviations: AUDIT-C, Alcohol Use Disorders Identification Test-Consumption; NSW, New South Wales.

<sup>a</sup>AUDIT-C scores were categorised as follows: no risk (0), low-medium risk (1–4), high risk ( $\geq 5$ ).

multiparous (i.e., had given birth more than once; 60.7%) and were in the most (46.0%) or mid-disadvantaged (31.2%) group for socio-economic status. Aboriginal

**TABLE 2** Sources of information on alcohol use in pregnancy

Information source	Total cohort ( <i>N</i> = 4511)
<i>N</i> information sources reported	( <i>N</i> = 4509)
Mean ± SD	1.2 ± 0.9
Median (range)	1 (0–5)
Interquartile range	1–2
Written/electronic information, <i>N</i> (%)	( <i>N</i> = 4509)
Health	61 (1.4)
Alcohol industry	12 (0.3)
Undefined	1970 (43.7)
Health provider, <i>N</i> (%)	
Antenatal ( <i>N</i> = 4509)	1687 (37.4)
Other	9 (0.2)
Family/friends, <i>N</i> (%)	878 (19.5)
Traditional/social media, <i>N</i> (%) ( <i>N</i> = 4509)	419 (9.3)
Self-knowledge/education, <i>N</i> (%)	( <i>N</i> = 4509)
	243 (5.4)
Colleagues, <i>N</i> (%)	( <i>N</i> = 4509)
	73 (1.6)
Unknown source, <i>N</i> (%)	( <i>N</i> = 4509)
	36 (0.8)
Other source, <i>N</i> (%)	( <i>N</i> = 4509)
	3 (0.1)
No information sought, <i>N</i> (%)	( <i>N</i> = 4509)
	898 (19.9)

Note: NB. Several women used multiple sources of information so % does not add up to 100%.

women comprised 6.1% of participants. In the 12 months before pregnancy, 80.8% of women consumed alcohol, 20.7% of whom reported high-risk drinking (Table 1). The proportion of women who did not consume alcohol increased from 19.1% (in the 12-months before pregnancy) to 90.0% during pregnancy. When the AUDIT-C was used, 10.0% (449/4508) reported using alcohol during pregnancy. An additional 185 women were identified as consuming alcohol only at special occasions. These 185 women were classified as ‘No risk’ using the AUDIT-C and constituted 4.9% of the ‘AUDIT-C: No risk’ group.

### 3.2 | Number and type of information sources on alcohol use in pregnancy

Most (80.1%) women used at least one information source and the majority (72.5%) used 1–2 different sources to

obtain information on alcohol use in pregnancy (range 0–5) (Table 2). Written/electronic information (45.4%) and information from health providers (37.6%) and family/friends (19.5%) were the most frequently reported information sources. The remaining information sources were used by <20%. Approximately one-fifth (19.9%) of women did not recall any information sources on alcohol use in pregnancy.

### 3.3 | Association between pregnant women’s characteristics and use of information sources on alcohol use in pregnancy

Results of the logistic regression analyses are presented in Table 3.

#### 3.3.1 | Written/electronic information

First pregnancy (odds ratio [OR] 1.21; 95% confidence interval [CI] 1.07 to 1.37;  $p = 0.003$ ) and higher education level (high school or less: OR 0.59 [95% CI 0.51 to 0.70];  $p < 0.001$ ) were statistically significant predictors of use of written/electronic information on alcohol use in pregnancy.

#### 3.3.2 | Antenatal health provider

Women in their first pregnancy (OR 1.21 [95% CI 1.06 to 1.37];  $p = 0.004$ ), of younger age (OR: 0.75 [95% CI 0.63 to 0.89];  $p = 0.001$ ), and with socioeconomic disadvantage ( $p = 0.020$ , Table 3) were more likely to identify an antenatal care provider as a source of information on alcohol use in pregnancy.

#### 3.3.3 | Family/friends

Advice on alcohol use in pregnancy was more often obtained from family/friends by women who were in their first pregnancy (OR 1.48 [95% CI 1.27 to 1.72];  $p < 0.001$ ), younger (OR 0.77 [95% CI 0.63 to 0.95];  $p = 0.014$ ) and had university level education (compared to high school or less: OR 0.71 [95% CI 0.58 to 0.87];  $p = 0.004$ ) (Table 3).

#### 3.3.4 | Did not seek any information

Women were significantly less likely to seek/recall information on alcohol use in pregnancy if they were multiparous (OR 0.75 [95% CI 0.64 to 0.88];  $p < 0.001$ ), attained

TABLE 3 Associations between women's characteristics and information sources on alcohol use in pregnancy

Predictor variables	Women reporting information source, %	OR (95% CI)	<i>p</i>
<b>Written/electronic information:</b> Model $R^2$ : 0.027, $p < 0.001^*$			
First pregnancy			0.003*
Yes	48.1	1.21 (1.07 to 1.37)	
No	43.4	-	
Index of disadvantage			0.183
Most disadvantaged	42.5	0.86 (0.73 to 1.01)	0.066
Mid disadvantaged	46.2	0.92 (0.78 to 1.08)	0.320
Least disadvantaged	49.7	-	
Education level completed			<0.001*
High school or less	36.5	0.59 (0.51 to 0.70)	<0.001*
Technical cert or diploma	46.3	0.87 (0.75 to 1.00)	0.052
Uni/college degree or higher	51.5	-	
Remoteness			0.092
Regional/remote	41.3	0.89 (0.77 to 1.02)	
Major city	46.9	-	
Aboriginal or Torres Strait Islander			0.679
Yes	40.0	0.95 (0.73 to 1.22)	
No	45.6	-	
Age			0.058
≥25 years	46.6	1.18 (0.99 to 1.41)	
≤24 years	38.9	-	
<b>Antenatal health provider:</b> Model $R^2$ : 0.014, $p < 0.001^*$			
First pregnancy			0.004*
Yes	40.6	1.21 (1.06 to 1.37)	
No	35.4	-	
Education level completed			0.287
High school or less	40.2	1.13 (0.96 to 1.33)	0.135
Technical cert or diploma	38.0	1.10 (0.95 to 1.28)	0.220
Uni/college degree or higher	34.5	-	
Aboriginal or Torres Strait Islander			0.149
Yes	44.0	1.20 (0.94 to 1.55)	
No	37.0	-	
Age			0.001*
≥25 years	35.6	0.75 (0.63 to 0.89)	
≤24 years	45.7	-	
Index of disadvantage			0.020*
Most disadvantaged	39.9	1.16 (0.99 to 1.36)	0.061
Mid disadvantaged	35.1	0.96 (0.81 to 1.14)	0.664
Least disadvantaged	35.4	-	
<b>Family/friends:</b> Model $R^2$ : 0.018, $p < 0.001^*$			
First pregnancy			<0.001*
Yes	23.7	1.48 (1.27 to 1.72)	
No	16.7	-	

(Continues)

TABLE 3 (Continued)

Predictor variables	Women reporting information source, %	OR (95% CI)	<i>p</i>
Education level completed			0.004*
High school or less	17.3	0.71 (0.58 to 0.87)	0.001*
Technical cert or diploma	19.6	0.88 (0.73 to 1.05)	0.151
Uni/college degree or higher	21.3	-	
Age			0.014*
≥25 years	18.7	0.77 (0.63 to 0.95)	
≤24 years	23.0	-	
Aboriginal or Torres Strait Islander			0.062
Yes	23.2	1.33 (0.99 to 1.79)	
No	19.2	-	
Remoteness			0.165
Regional/remote	17.8	0.89 (0.75 to 1.05)	
Major city	20.2	-	
<b>Did not seek any information:</b> Model R <sup>2</sup> : 0.016, <i>p</i> < 0.001*			
First pregnancy			<0.001*
Yes	16.6	0.75 (0.64 to 0.88)	
No	22.0	-	
Education level completed			<0.001*
High school or less	23.3	1.50 (1.24 to 1.81)	<0.001*
Technical cert or diploma	18.7	1.06 (0.89 to 1.28)	0.509
Uni/college degree or higher	18.2	-	
Index of disadvantage			0.189
Most disadvantaged	19.3	1.00 (0.82 to 1.21)	0.959
Mid disadvantaged	21.5	1.15 (0.94 to 1.41)	0.171
Least disadvantaged	18.8	-	
Age			0.004*
≥25 years	20.6	1.38 (1.11 to 1.71)	
≤24 years	16.6	-	

Abbreviations: CI, confidence interval; OR, odds ratio.

\**p* < 0.05.

an education level of high school or less (OR 1.50 [95% CI 1.24 to 1.81]; *p* < 0.001) and older (OR 1.38 [95% CI 1.11 to 1.71]; *p* = 0.004) (Table 3).

### 3.3.5 | Number of different types of information sources accessed

Higher education (KWt (df): 47.8 (2); *p* < 0.0001) and first pregnancy (*U* = 2183046.0; *p* < 0.0001) were significantly associated with use of a larger number of information sources on alcohol use in pregnancy.

## 3.4 | Associations between information sources and alcohol use during pregnancy

### 3.4.1 | Alcohol use disorders identification test-consumption

Women who consumed alcohol during pregnancy at low-medium risk levels were more likely to have used written/electronic information (57.7%) than those in the no risk (43.9%) or high-risk groups (50.0%; *p* < 0.001; Table 4). However, the high-risk group had only two women. A Kruskal–Wallis *H* test showed a significant difference between groups in number of sources reported

**TABLE 4** Information sources about alcohol use in pregnancy used (%) and alcohol use after pregnancy recognition

Information source	No risk ( <i>N</i> = 4057)	Low-medium risk ( <i>N</i> = 447)	High risk ( <i>N</i> = 2)	<i>p</i>	Special occasions = yes ( <i>N</i> = 394)	Special occasions = no ( <i>N</i> = 3763)	<i>p</i>
	Antenatal health provider	37.5	36.2		50.0	0.816	
Written/electronic	43.9	57.7	50.0	<0.001*	54.3	44.3	<0.001*
Family/friends	19.2	21.7	50.0	0.154	19.0	19.6	0.805
No information sought	20.3	16.3	0	0.106	15.2	21.1	0.006*
N sources used	1 (0 to 5)	1 (1 to 4)	2 (1 to 3)	0.003*	1 (0 to 5)	1 (0 to 5)	0.017*

\**p* < 0.05.

( $X^2(2)$  11.42, *p* = 0.003). Post-hoc analysis showed the significant difference was between the low-medium risk and no risk groups (*p* = 0.004; Table 4), where low-medium risk drinkers referred to a larger number of sources.

### 3.4.2 | Special occasion drinkers

Women who reported special occasion drinking during pregnancy were more likely to seek information about alcohol use in pregnancy than those who reported no special occasion drinking (Table 4). Compared to women who did not drink at special occasions, those who did obtained information from written/electronic sources (54.3% vs. 44.3%; *p* < 0.001) more frequently and also used a larger number of sources (*U*: 961262.5, *p* = 0.017).

## 4 | DISCUSSION

This Australian study is the first to report on information sources used by pregnant women to obtain information on alcohol use in pregnancy. Pregnant women reported that written/electronic information, health providers and family/friends were the information sources most frequently used. Most women used 1–2 information sources, but some used up to five different types of information sources. Approximately one-fifth did not seek or use any information about alcohol use in pregnancy. The information sources used by women varied according to characteristics including, education, age and gravidity. First pregnancy, younger age and higher education were associated with more frequent receipt of information from written/electronic information, antenatal health providers and family/friends. Women who were older, had lower levels of education and had one or more previous pregnancies were less likely to obtain any information about alcohol use in pregnancy. Women who consumed alcohol during pregnancy versus abstainers were more likely

to obtain information on alcohol use from written/electronic sources, and to use a larger number of sources.

Our findings contrast with the Danish study in which higher proportions of pregnant women used information from mass media (TV, newspapers and/or weekly magazines; 65%) and relatives (40%) and only 16.2% reported receiving information on alcohol use from health professionals (general practitioners, midwives, obstetricians) [13]. This may be due to cultural, social or health system differences between Denmark and Australia, for example, Denmark was among the five countries with highest estimated prevalence of alcohol use during pregnancy [2]. It may also reflect changes over time in how information is accessed (the Danish study was conducted 23 years ago). Our study findings were more consistent with the Israeli study: health providers were recalled as an information source by 37.4% women in our study and 54.6% in the Israeli study [14]. Similarly, social media was recalled as a source of information on alcohol use in pregnancy by <10% women in both studies. The difference in the proportion that recalled health providers as information sources may also be due to differences in culture, health systems and survey methodologies, with response options being prompted in the Israeli study.

The most recalled information source, used by 45.4% pregnant women, was written/electronic information. This shows this is an important information source, particularly for women in their first pregnancy, with higher levels of education, and who consume alcohol during pregnancy. For women who consume alcohol during pregnancy, it is imperative that the information they receive is correct. We require more information about the sources of the written/electronic information (e.g., a government, other similar authority or other source), and whether the information contained is consistent with guideline recommendations.

Health-care providers were the second-most used information source, recalled by 37.6% pregnant women. This rate was lower among women who were not having

their first pregnancy,  $\geq 25$  years of age and least disadvantaged. As the second-most used information source, after written/electronic information, health-care providers have a crucial opportunity both to provide advice and to refer pregnant women to reliable and professional written sources of information consistent with guidelines. Health-care providers should be supported to routinely provide advice to all pregnant women. This idea is consistent with guidelines [26], is supported by pregnant women and women of childbearing age generally [13, 15, 27, 28] and has been shown can be embedded into routine care through clinical practise change interventions [29]. In our study, 20% of women did not receive any information. They were more likely to be multiparous and have lower education attainment. The risk of such women missing out on information could be addressed if its provision was embedded into routine care.

The Australian Government recently committed funding for Australia's first national campaign to raise awareness of alcohol harms in pregnancy (launched in November 2021; <https://fare.org.au/fare-welcomes-federal-government-commitment-to-fetal-alcohol-spectrum-disorder/>). Our study findings suggest that one focus of the campaign should be to ensure that reputable websites (e.g., the FASD Hub and government health department sites) have high search engine optimisation rankings for information about alcohol use in pregnancy. Also, the message that women who are pregnant or planning a pregnancy should not drink alcohol must be highly visible to the general public (e.g., through warning labels on all alcohol products as mandated from 2023; and through television, radio and other media; billboards/posters as proposed in the national campaign) and include specific awareness raising for those people who support pregnant women, including their partners and friends. Initiatives including the Pregnant Pause campaign (<https://www.pregnantpause.com.au/>) could potentially play an important role in ensuring family and friends provide an environment that supports pregnant women not to drink and receive the correct information about alcohol use in pregnancy.

#### 4.1 | Study limitations and strengths

Strengths of this study include its large, representative sample from three geographical areas (metropolitan, rural, remote); high survey response rate; and use of open-ended questions rather than restricted or cued responses about information sources used. Limitations included the fact that in many responses 'written information' was poorly defined, so it is possible use of 'written information—Health' (from reputable sources, e.g., health service websites and materials, research studies, hospital posters,

guidelines, textbooks) was underestimated. Our use of open-ended questions could also be considered a limitation, because it meant that participants did not need to be precise in their answers and resulted in some important details being omitted. Also, we did not explore the accuracy of the advice attributed to each source type, or how the information was obtained, that is if the information was actively sought by women or received (offered) passively. Additionally, although we had a good response rate, we cannot rule out the possibility of non-response bias and do not know if drinkers versus non-drinkers were more likely to respond to the survey.

## 5 | CONCLUSIONS

In this large, random, representative sample of pregnant women recruited from public maternity services, the most frequent sources of information women used about alcohol use in pregnancy were written/electronic information, antenatal health providers and family/friends. Women who were older, had lower levels of education and had one or more previous pregnancies were less likely to obtain any information about alcohol use in pregnancy. These findings could inform approaches to targeted and tailored education campaigns and materials. They highlight the importance of antenatal health providers initiating conversations about alcohol use in pregnancy with all women so that opportunities for brief advice, support and referral are not missed.

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## CONFLICT OF INTEREST

None to declare.

## ETHICS STATEMENT

The study received ethics approval from the Hunter New England Human Research Ethics Committee (16/11/16/4.07), Aboriginal Health and Medical Research Council (1236/16) and the University of Newcastle Human Research Ethics Committee (H-2017-0032).

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