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# Identifying the motives for and against drinking during pregnancy and motherhood, and factors associated with increased maternal alcohol use

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## Abstract

**Aim** Maternal drinking (alcohol use during pregnancy/motherhood) is a hidden public health concern which can have significant negative effects on the woman and child. This pilot survey explored several domains that might influence maternal drinking.

**Subject and methods** Two cross-sectional, online surveys recruited (1) women who were pregnant and (2) mothers who were not pregnant. Surveys captured data on alcohol use and harmful drinking, attitudes on and motives for drinking/not drinking, and perceived barriers to drinking less. Content analysis of free text responses complemented quantitative data.

**Results** In this convenience sample of 836 pregnant women and 589 mothers, 91% of pregnant women and 28% of mothers reported abstinence. Of those reporting alcohol use, median consumption was 2.3 units/week in pregnant women, and 6.9 units/week in non-pregnant mothers. Of mothers currently drinking, 25.1% reported hazardous or harmful levels. Heavier drinking was associated with numerous motives, including using alcohol as a coping strategy. Child welfare was a key motivating factor for not drinking, as were practical issues of motherhood. The stresses of motherhood were a perceived barrier to reducing drinking, and mothers reported more barriers than pregnant women.

**Conclusion** Stress reduction motives may be a risk factor for heavier maternal drinking, while motives for not drinking seem to be focused on child welfare and maternal well-being. Stress and a lack of knowledge about how to reduce drinking appear to be barriers for mothers to change their drinking behaviour. These findings can inform the development of effective public health interventions to reduce maternal drinking.

**Keywords** Maternal alcohol use · Drinking motives · Stress reduction · Mother · Pregnancy

## Introduction

Alcohol use is a major public health problem, and there are unique harms associated with drinking during specific life stages. This includes maternal drinking which covers the

periods of pregnancy and motherhood. Alcohol-exposed pregnancy is the greatest preventable cause of childhood disability in the Western world (BMA 2016). Globally, the UK has one of the highest prevalence rates of drinking during pregnancy (41.3%), despite official recommendations to abstain (Dept. of Health 2016), which results in one of the highest rates (~3.2%) of fetal alcohol spectrum disorder (FASD) (McCarthy et al. 2021; Popova et al. 2018). FASD is a group of neurodevelopmental conditions caused by alcohol-exposed pregnancy, and is associated with increased adverse health conditions (physical and mental), underachievement at school, poor employment prospects, and, frequently, exploitation (Scholin et al. 2021).

Drinking during motherhood can also have a host of negative effects on the child. For instance, maternal drinking is associated with increased risk of sudden infant death syndrome (Blair et al. 2009), long-bone fracture

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and hospitalisation, medicinal poisoning (McGovern et al. 2018; Rossow et al. 2016), childhood depression and anxiety (Malone et al. 2010), and behavioural and cognitive problems (Chatterji and Markowitz 2001; Finan et al. 2015; Ohannessian 2012; Torvik et al. 2011). Within the UK, estimates suggest that up to 18% of mothers are drinking at harmful levels (15–35 units/week) (Syed et al. 2018); 12.9% of women living with children scored 8–15 on the Alcohol Use Disorder Identification Test (AUDIT), which indicates hazardous drinking, and 1.9% scored  $\geq 16$ , suggesting harmful alcohol use (McManus et al. 2014). Furthermore, at least 1 in 17 children live with a mother who has a primary care record of alcohol misuse within the 5 years pre-/post-birth (Syed et al. 2018).

Despite this obvious public health issue, drinking during motherhood has received relatively little attention, perhaps because becoming a mother has traditionally been associated with reduced alcohol use (Laborde and Mair 2012). Yet any reduction associated with pregnancy and having a child may be short-lived, with drinking increasing in the first year postpartum and returning to pre-pregnancy drinking levels within 5 years (Borschmann et al. 2019). Additionally, some research has found that 40% of mothers who were drinking at hazardous levels before pregnancy returned to pre-pregnancy consumption levels within 3 months postpartum (Jagodzinski and Fleming 2007). These findings are important; although most alcohol research focuses on men's drinking behaviour, alcohol-related health risks are often greater in women than men, and occur at lower drinking levels (Epstein et al. 2007; Erol and Karpyak 2015).

Given that maternal alcohol use has the potential to cause significant direct and indirect harm (to the mother and child), understanding the mechanisms underlying maternal drinking is a key step in developing appropriate interventions. The reasons for drinking during motherhood are likely to be complex and involve changing cultural norms—for instance, increased financial independence and access to drinking spaces for women (Atkinson et al. 2019), increased purchasing of alcohol for home consumption (PHE 2017), and cultural narratives that mums need and deserve alcohol (Harding et al. 2021; Leung et al. 2020). In addition, some evidence suggests that women, relative to men, are more likely to use alcohol to cope with mental health issues (Berenz et al. 2017; Najavits et al. 1997). This fits within the self-medication hypothesis, and research has shown links between low mood in motherhood—e.g. depression, stress—and alcohol use (Chandola et al. 2019; Harding et al. 2021). When developing public health alcohol interventions, it is important to understand not only the motives for drinking, but also the reasons why a particular group may not drink (e.g., to protect the child), and any perceived barriers against

reducing alcohol use (e.g., stress). Together this information can help to address recent calls for effective, female-specific health interventions (Dept. of Health and Social Care 2022), which better address the specific needs of maternal populations (WHO 2016).

We conducted an online survey to collect initial data on alcohol use during pregnancy and motherhood. The aims of the survey were to measure alcohol use during these life stages, explore attitudes around maternal drinking, and identify key motives for drinking and for not drinking, and perceived barriers to reducing alcohol use. In line with the self-medication hypothesis, we predicted that alcohol use would be positively associated with coping-related motives. A secondary aim was to look at structural aspects of the survey to inform future work in this area.

## Method

### Participants

Two surveys were released online via social media (e.g., Facebook, Twitter), one recruiting pregnant women and the other recruiting mothers living with at least one dependent child (defined as  $\leq 18$  years of age) and who were not currently known to be pregnant. Inclusion criteria were age  $\geq 18$  years (18 is the minimum legal age to drink alcohol in the UK) and English language fluency.

### Measures

There are very few alcohol-related measures that have been designed specifically for use with maternal populations. In preparation for this exploratory study, we conducted public engagement activities, asking pregnant women and mothers for their opinions on the topics this study investigated (e.g., motives and attitudes around maternal drinking) and different methods used in surveys. The feedback from these activities guided the outcome measures and items included and the delivery of the survey (outlined below).

### Participant characteristics

Participants provided details on age, ethnicity, relationship status, highest level of education, current occupation, household income, country of residence, religious views, and sexuality. Information was also requested on number/age of children and previous treatment for alcohol use (before/since

becoming pregnant/a mother). In the pregnancy survey only, participants were asked at what point they found out they were pregnant (e.g., less than 1 week, 1–2 weeks...26–40 weeks).

### Alcohol-related outcomes

**Pre-pregnancy drinking behaviour** Surveys asked whether respondents consumed alcohol before they knew they were pregnant (or before trying to conceive if they had reduced alcohol use during this time). If ‘yes’, respondents were asked to self-report the number of alcohol drinks consumed per week. Drink options were given [e.g., standard glass (175 ml)/large glass (250 ml) wine, half a pint/bottle/ beer/ cider, shot of spirit]. Using UK alcohol unit information (1 unit = 8 g alcohol), researchers converted numbers of drinks to indicate weekly unit consumption.

**Pre-pregnancy and current drinking contexts** When respondents answered ‘yes’ to drinking alcohol, they were asked where they typically drank (alone, at home with others, outside with others, other) before being pregnant and currently.

**Current alcohol use** The first item of the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al. 1993) screened for subsequent alcohol questions: ‘How often do you have a drink containing alcohol?’ In the pregnancy survey, this was reworded to ‘Since knowing you were pregnant, how often...?’ If the participant responded ‘never’, they did not receive further alcohol questions on current drinking, the AUDIT, or drinking motives. If the respondent indicated that they did consume alcohol, additional alcohol measures were administered, listed below. This method was based on public engagement activities, where advisors requested surveys use screening measures to ensure only applicable questions were shown to respondents.

**Current drinking behaviour** Respondents were asked to self-report drinks per week, using the same options as the ‘pre-pregnancy drinking behaviour’ measure.

**Alcohol Use Disorders Identification Test** AUDIT (Saunders et al. 1993) is a 10-item clinical screening tool used to identify drinking risk. Female-specific scores, as recommended by the World Health Organization (WHO), were used to calculate low-risk drinking (score 0–6), medium risk/hazardous (score 7–15), high risk/harmful (16–19), probable dependence (>20) (Babor et al. 2001).

**Drinking motives** Fifteen items assessed drinking motives since becoming pregnant/a mother which were scored on a Likert scale (never, sometimes, almost always). These items

were based on the DMQ-R (Drinking Motives Questionnaire-Revised, designed to assess drinking motives in young adults). Because the current study focused on pregnant women and mothers, some items were changed/removed based on public engagement feedback. For instance, ‘to get high’ was considered irrelevant, but ‘to feel like my old self’ was considered relevant (see Table 2 for full item list). For the purposes of analysis, sometimes and always were grouped together.

The following four measures were applicable to all respondents, regardless of current alcohol use, and so were displayed to all participants.

**Motives to reduce/stop drinking** Based on current evidence and public engagement activities, 10 items assessed reasons for reducing or stopping their drinking. Respondents selected as many reasons as applicable to them (see Table 3 for full item list). Respondents could also list other reasons via the free text option.

**Have your reasons for drinking changed since becoming pregnant/a mother?** Given that a primary aim of this paper was to explore motives around maternal drinking, respondents were asked whether they felt their reasons for drinking had changed since pregnancy/becoming a mother (yes, no, unsure). Participants could provide free text responses.

**Drinking attitudes and behaviour** Fifteen items measured beliefs around personal drinking habits and attitudes. Statements were developed for this study, with responses of ‘agree’, ‘disagree’, and ‘not applicable’ (see Supplementary Table 2 for item list).

**Barriers to reduce drinking** Eight items measured potential perceived barriers to reducing drinking. Items were developed for this study based on existing evidence and public engagement work. Responses were ‘agree’, ‘disagree’, and ‘neither’, and respondents could list other barriers via free text (see Table 4 for item list).

### Procedure

Research adverts, including details of inclusion/exclusion criteria and a link to the survey, were posted on various social media platforms (e.g., Twitter, Facebook). Separate adverts publicised the pregnancy survey and the motherhood survey. Clicking on the link took participants to a Participant Information Sheet. The survey was launched after participants confirmed they met inclusion criteria and provided informed consent. Participants could take part in the survey at their own pace, completing over multiple sessions. Based on ethical requirements and public

engagement feedback, the survey did not use a forced-choice design (i.e., where people must provide a response to a question). At the end of the survey, an online debrief was provided. Ethical approval was provided by the ethics committee at the host institution.

## Statistical analysis

Frequencies for demographic characteristics were tabulated for women in each survey. Because of the skewed distribution, alcohol consumption was reported as median units, having converted standard drink sizes to unit measurements. Associations between attitudes and motives towards drinking or mental health markers and categorical drinking status were examined using chi-square tests. Owing to a lack of demographic data, we did not adjust for any further variables, and thus report univariable results only. For these analyses, drinking status was categorised as no drinking, 1–14 units per week (low risk), and 15 or more units per week, as few women reported drinking 35 units or more per week (hazardous/harmful drinking). Data are presented from all participants, but when reporting includes demographic characteristics, only the sample of respondents who provided these data are included. Free text options were coded and analysed using qualitative content analysis (Braun and Clarke 2006).

## Results

### Participant characteristics

A total of 1425 women consented to participate: 836 in the pregnancy group and 589 in the motherhood group. A large proportion of pregnant participants did not provide demographic data. Of those who did (43%,  $n = 363$ ), most were under 30 years of age (64.4%), White British or White Other ethnicity (97.8%), and with a household income of over £30k (54.3%). In the motherhood survey (where most respondents provided demographics), respondents were predominantly over 30 years of age (78.8%), of White British or White Other ethnicity (96.5%), educated to degree level or beyond (65.9%), and with a household income of over £30k (66.2%). See Supplementary Table 1 for full demographic characteristics and information on UK representative data.

### Drinking behaviour

Most women reported drinking before becoming pregnant (or before trying to conceive if they reduced their consumption at that time) or becoming a mother (Table 1).

Respondents in the pregnancy survey, who reported pre-pregnancy alcohol use, reported weekly alcohol

**Table 1** Drinking behaviour of women in motherhood and pregnancy survey: weekly units, situational drinking, and AUDIT score†

	Pregnancy survey <i>N</i> = 836		Motherhood survey <i>N</i> = 589	
	Pre-pregnancy	Current	Pre-motherhood	Current
No reported drinking*	216 (25.8)	760 (90.9)	59 (10.0)	165 (28.0)
Weekly units (of those drinking)	[ <i>N</i> = 620]	[ <i>N</i> = 76]	[ <i>N</i> = 530]	[ <i>N</i> = 424]
Median [IQR]	8.8 [4.6, 17.2]	2.3 [2.3, 4.0]	13.7 [6.4, 23.2]	6.9 [2.8, 15.2]
(range)	(1.1–96)	(1.1–44.8)	(1.1–176)	(1.1–112)
1–14	438 (70.6)	73 (96.1)	284 (53.6)	315 (74.3)
15–34	141 (22.7)	3 (3.9)	179 (33.8)	109 (25.7)
35+	41 (6.6)	0	67 (12.6)	0
Situational drinking**				
Alone	60 (9.7)	3 (3.9)	79 (14.9)	95 (22.4)
Out with others	596 (96.1)	62 (81.6)	516 (97.4)	347 (81.8)
At home with others	374 (60.3)	33 (43.4)	353 (66.6)	349 (82.3)
Other	24 (3.9)	37 (48.7)	17 (3.2)	25 (5.9)
AUDIT score				
0–6 (low risk)		59 (7.1)		320 (54.3)
7–15 (medium risk)		2 (0.2)		143 (24.3)
16–19 (high risk)		2 (0.2)		14 (2.4)
20+ (probable dependence)		0		14 (2.4)
Missing***		773 (92.5)		98 (16.6)

†Data are  $n$  (% of non-null values) unless otherwise stated

\*Includes respondents who reported not drinking and those who chose not to answer these questions

\*\*Responses are not mutually exclusive

\*\*\*Includes counts from participants who indicated that they ‘never’ drank alcohol in the AUDIT screening question and so were not asked these questions



consumption of 8.8 [IQR: 4.6–17.2] units (prior to pregnancy). Seventy-six pregnant women reported consuming alcohol since knowing they were pregnant, with median consumption of 2.3 weekly units. Two pregnant women scored highly enough on the AUDIT to be considered at high risk.

Respondents to the motherhood survey reported median weekly alcohol consumption of 13.7 [IQR: 6.4–23.2] units before becoming a mother, and a current median weekly consumption of 6.9 [IQR: 2.8–15.2] units. Of the respondents who reported alcohol use, 25.7% reported currently drinking over 14 units per week (i.e., hazardous drinkers, consuming over the recommended maximum weekly consumption guidelines), with 28 women (~1 in 20 overall) scoring 16 or more on the AUDIT representing high risk ( $N = 14$ ) or probable dependence ( $N = 14$ ).

According to free text responses regarding drinking situation, before pregnancy, pregnant women and non-pregnant mothers reported drinking mostly as a social activity with friends, family, or work colleagues either at home or at a social gathering, such as a night out. Since becoming aware of pregnancy, most women had stopped drinking, with some reporting low levels of consumption at special occasions ( $n = 28$ ) such as weddings, holidays, or Christmas. Occasions and social gatherings remained the main situation for drinking after becoming a mother ( $n = 21$ ), with some mothers reporting drinking in the home ( $n = 9$ ; *‘When the kids have gone to bed and I finally get some me time’*) and some reporting reducing or stopping drinking ( $n = 22$ ).

### Motives for drinking

Between 108 and 116 women in the pregnancy survey gave valid responses to individual items on drinking motives (as respondents could choose not to answer items). Of these women, most reported drinking to celebrate (63%) or to enjoy a social occasion (71%) and for the taste (49%) (Table 2, note: responses were not mutually exclusive).

Respondents to the motherhood survey mostly reported drinking to enjoy a social occasion (93%), to celebrate (94%), to have fun (86%), and to feel less stressed (64%).

Statistically significant associations ( $p < 0.05$ ) were seen in the direction of women more likely to report sometimes or always with *higher* level of drinking, with the exception of ‘to cheer yourself up’ in the pregnancy survey. During pregnancy, drinking motives to have fun ( $\chi^2 = 9.33$ ,  $p = 0.009$ ), to relax ( $\chi^2 = 12.9$ ,  $p = 0.002$ ) and feel less stressed ( $p = \chi^2 = 12.9$ ,  $0.002$ ), and out of habit ( $\chi^2 = 12.8$ ,  $p = 0.002$ ) were statistically significantly associated with higher alcohol use. For mothers, all motives were associated higher alcohol use ( $\chi^2 \geq 8.71$ ,  $p \leq 0.01$ ) with the exception of feeling pressured by others (see Table 2).

Around half of women stated that the reason they drank currently was different from the reasons before becoming

pregnant/a mother. Analysis of free text reasons showed that the majority of change was from drinking to socialise or to get drunk, to drinking to relax or as a reward. *‘Before to socialise, now to relax, forget problems, feel less stressed, to cheer myself up, as a reward, etc.’* Mothers also reported the use of alcohol to cope with stress, negative emotions, and the symptoms of anxiety and depression ( $n = 14$ ). *‘Before I became a mother I drank to socialise, and occasionally to cope with strong emotion. After I became a mother I started to drink to escape from stress and demands.’*

### Motives for not drinking

From the pregnancy survey, most women who reported reducing or stopping drinking gave no specific reason (Table 3). When free text responses were provided, the majority stated that motivation to stop or reduce drinking was to avoid harm to their baby ( $n = 34$ ).

Respondents to the motherhood survey reported multiple reasons for not drinking, most commonly ‘I’m too tired’ (30.6%), ‘I want to be healthy’ (28.0%), and ‘I am breastfeeding’ (22.6%), and out of concern for their child or wanting to manage weight (21.4% each) (note: responses were not mutually exclusive). Close to one third of mothers provided an additional (free text) reason for reducing or stopping their drinking. These were coded, and other reasons with greater than 10 responses were hangover or tiredness (*‘I don’t want a hangover with small children’*;  $n = 63$ ), parental responsibility/staying in control/child safety (e.g., co-sleeping; *‘I need to care for child’*, if care is required in an emergency;  $n = 117$ ), providing a good example for the child ( $n = 13$ ), loss of interest/changed priorities ( $n = 32$ ), less opportunity to socialise ( $n = 71$ ), high cost ( $n = 13$ ), and having a drinking problem or fear of having a drinking problem ( $n = 16$ ).

Women were less likely to agree with statements if they were previously or currently a heavy drinker.

### Attitudes around drinking

Except for statements regarding current drinking levels (due to the low level of reported drinking in the pregnancy survey), the level of agreement with the ‘drinking attitude and behaviour’ statements was broadly similar across the pregnancy and motherhood surveys. Most women agreed that they enjoyed drinking alcohol (mothers: 80%, pregnant women: 78%), that drinking is bad for their health (mothers: 69%, pregnant women: 72%), and that they try to drink within recommended guidelines (mothers: 73%, pregnant women: 83%).

Pregnant women were more likely to agree with statements such as ‘I drink more than I should’ ( $\chi^2 = 10.8$ ,  $p = 0.004$ ), ‘I feel guilty’ ( $\chi^2 = 21.2$ ,  $p < 0.001$ ) and concerned

**Table 2** Numbers and proportions of women who reported ‘sometimes or always’ to the question ‘Since becoming pregnant/ being a mother, how often have you drunk alcohol...’ and associations with categorical drinking status (0, 1–14, 15+ units a week). (*N* represents number of non-missing responses for individual questions)

How often have you drunk alcohol...	Pregnant women <i>n</i> (%)	Association with current drinking*	Mothers <i>n</i> (%)	Current drinking*
...to have fun	37 (34.3) <i>N</i> = 108	$\chi^2 = 9.33$ ( $p = 0.009$ )	444 (86.4) <i>N</i> = 514	$\chi^2 = 25.7$ ( $p < 0.001$ )
...out of habit	13 (11.8) <i>N</i> = 110	$\chi^2 = 12.8$ ( $p = 0.002$ )	197 (39.1) <i>N</i> = 504	$\chi^2 = 132$ ( $p < 0.001$ )
...to relax	36 (32.4) <i>N</i> = 111	$\chi^2 = 12.9$ ( $p = 0.002$ )	400 (77.5) <i>N</i> = 516	$\chi^2 = 98.8$ ( $p < 0.001$ )
...to help you sleep	7 (6.4) <i>N</i> = 110	$\chi^2 = 4.89$ ( $p = 0.087$ )	104 (20.8) <i>N</i> = 501	$\chi^2 = 46.4$ ( $p < 0.001$ )
...to feel less stressed	29 (26.9) <i>N</i> = 108	$\chi^2 = 12.9$ ( $p = 0.002$ )	326 (63.8) <i>N</i> = 511	$\chi^2 = 107$ ( $p < 0.001$ )
...for the taste	57 (49.1) <i>N</i> = 116	$\chi^2 = 3.80$ ( $p = 0.150$ )	394 (77.3) <i>N</i> = 510	$\chi^2 = 52.8$ ( $p < 0.001$ )
...because you felt pressured by family/ friends/partner	10 (9.1) <i>N</i> = 110	$\chi^2 = 1.91$ ( $p = 0.384$ )	74 (14.7) <i>N</i> = 502	$\chi^2 = 5.43$ ( $p = 0.066$ )
...to enjoy a social occasion	80 (71.4) <i>N</i> = 112	$\chi^2 = 4.88$ ( $p = 0.087$ )	485 (93.3) <i>N</i> = 520	$\chi^2 = 15.0$ ( $p < 0.001$ )
...because you felt left out	24 (21.6) <i>N</i> = 111	$\chi^2 = 5.17$ ( $p = 0.075$ )	79 (15.7) <i>N</i> = 502	$\chi^2 = 8.71$ ( $p = 0.013$ )
...to cheer yourself up	19 (17.4) <i>N</i> = 109	$\chi^2 = 0.80$ ( $p = 0.671$ )	232 (45.7) <i>N</i> = 508	$\chi^2 = 80.4$ ( $p < 0.001$ )
...to reward yourself	11 (1.00) <i>N</i> = 110	$\chi^2 = 3.34$ ( $p = 0.188$ )	287 (56.2) <i>N</i> = 511	$\chi^2 = 81.1$ ( $p < 0.001$ )
...to feel like the ‘old you’	19 (17.3) <i>N</i> = 110	$\chi^2 = 4.76$ ( $p = 0.093$ )	180 (35.7) <i>N</i> = 504	$\chi^2 = 9.50$ ( $p = 0.009$ )
...to forget problems	9 (8.2) <i>N</i> = 110	$\chi^2 = 4.84$ ( $p = 0.089$ )	140 (27.8) <i>N</i> = 504	$\chi^2 = 67.5$ ( $p < 0.001$ )
...because you like the feeling	11 (10.0) <i>N</i> = 110	$\chi^2 = 0.99$ ( $p = 0.609$ )	265 (52.5) <i>N</i> = 505	$\chi^2 = 64.0$ ( $p < 0.001$ )
...to celebrate	71 (62.83) <i>N</i> = 113	$\chi^2 = 5.94$ ( $p = 0.051$ )	479 (93.9) <i>N</i> = 510	$\chi^2 = 12.5$ ( $p = 0.002$ )

\*Statistically significant associations ( $p < 0.05$ ) were seen in the direction of more likely to report sometimes or always with *higher* level of drinking, with the exception of ‘to cheer yourself up’ in pregnancy survey

**Table 3** Motives for not drinking. Numbers (proportion) of women who responded to the question ‘Since becoming a mother/since getting pregnant, have you stopped or reduced your drinking?’

	Pregnant women <i>N</i> (%) <i>N</i> = 836	Mothers <i>N</i> (%) <i>N</i> = 589
No, I have not stopped or reduced my drinking	527 (63.0)	116 (19.7)
Yes, I’m too tired to drink alcohol	28 (3.3)	180 (30.6)
Yes, I am breastfeeding	23 (2.8)	133 (22.6)
Yes, I don’t want to risk harming my child	28 (3.3)	126 (21.4)
Yes, but not for any specific reason	242 (28.9)	70 (11.9)
Yes, I want to be healthy	25 (3.0)	165 (28.0)
Yes, to help manage my weight	8 (1.0)	126 (21.4)
Yes, another reason	44 (5.3)	189 (32.1)
Don’t know	36 (4.3)	8 (1.4)

responses were not mutually exclusive

( $\chi^2 = 23.6$ ,  $p < 0.001$ ) about my drinking', and the belief that alcohol was bad for their health ( $\chi^2 = 21.1$ ,  $p < 0.001$ ) and could negatively impact their children ( $\chi^2 = 10.4$ ,  $p = 0.005$ ) if they were currently drinking more alcohol.

Mothers who drank more were more likely to agree with statements implying awareness that they were drinking too much and the possible negative consequences of their alcohol use ( $\chi^2 \geq 24.3$ ,  $p < 0.001$ ), as well as drinking more when in positive ( $\chi^2 = 8.54$ ,  $p = 0.01$ ) and negative ( $\chi^2 = 67.3$ ,  $p < 0.001$ ) moods, and to feel better ( $\chi^2 = 72.6$ ,  $p < 0.001$ ) (full results, see Supplementary Table 2).

### Barriers to reducing drinking

Of respondents who answered questions on perceived barriers to reduce drinking, 47.8% of pregnant respondents reported that there were no barriers to reducing alcohol use. The most frequently reported barrier for pregnant women was the perception that health information around alcohol use was inconsistent and/or incorrect (23.5%). Over 40% of mothers said that the stress of motherhood, the pressure from others to engage in drinking, and a lack of knowledge regarding how to change their drinking behaviour were barriers (see Table 4).

### Discussion

This pilot study aimed to measure alcohol use during pregnancy and motherhood, attitudes around maternal drinking, identify key motives for drinking and for not drinking, and to determine perceived barriers to reducing alcohol use.

Given these aims, we specifically asked pregnant respondents about their drinking behaviour since knowing they were pregnant. Estimated UK prevalence rates of any alcohol use (41.3%) and binge drinking (18.6%) during pregnancy (Lange et al. 2017; Popova et al. 2017) are high, but some data show that this drops to around 12% once

the pregnancy is confirmed (Schölin et al. 2019). In our sample, around 9% of pregnant respondents reported alcohol use since knowing they were pregnant (with median consumption of 2.3 units a week). Although these rates are similar, it should be noted that retrospective reporting of pre-pregnancy drinking was 8.8 units for pregnant women (compared to 13.7 units for mothers). This may be an accurate reflection of our self-selecting population (discussed below) or it may suggest a reporting bias, with pregnant women more likely to underreport their alcohol use even when reporting pre-pregnancy drinking. This fits with previous studies reporting that women are likely to underreport their drinking behaviour during pregnancy, perhaps for fear of consequences and stigma (Phillips et al. 2007; Schuler et al. 2015). An alternative reason may be that retrospective recall of behaviour is influenced by current behaviour, with pregnant women using their current low levels of alcohol use to estimate historical drinking behaviour. There is evidence that mood can influence autobiographical memories through congruency effects, but it is unclear whether this applies to recall of historical health behaviour (Drace 2013).

Most of the non-pregnant mothers reported drinking alcohol (median 6.9 units/week), with approximately 25.7% drinking above recommended weekly guidelines (14+ units/week) and 1 in 20 mothers scoring 16 or more on the AUDIT, suggesting high risk or probable dependence. Even with potential underreporting of alcohol use, this rate is higher than that reported in the general population of women aged 25–44 years (15% drink above 14 units/week) (NHS Digital 2020). This suggests that mothers may be a specific population where targeted information around reducing alcohol use could be beneficial. Crucially, most maternal drinking research focuses on alcohol use in pregnancy due to the risk of FASD. However, maternal drinking by mothers who are not pregnant can also increase the risk of harm, to both the woman's and child's health and well-being (Blair et al. 2009; McGovern

**Table 4** Barriers to reducing drinking. Numbers (proportion) of women who responded to the question 'What do you think are the greatest barriers for mothers who want to reduce their drinking?'

Barriers to reducing drinking	Pregnant women		Mothers			
	Agree	Disagree	Neither	Agree	Disagree	Neither
No barriers	243 (47.8)	155 (30.5)	110 (21.7)	204 (35.4)	236 (40.9)	137 (23.7)
Health information is inconsistent and/or incorrect	122 (23.5)	335 (64.6)	62 (11.9)	181 (31.3)	303 (52.3)	95 (16.4)
Health information is difficult to get	73 (14.1)	401 (77.6)	43 (8.3)	112 (19.4)	396 (68.5)	70 (12.1)
Motherhood/pregnancy is stressful	70 (13.5)	398 (77.0)	49 (9.35)	287 (49.5)	230 (39.7)	63 (10.9)
Pressure to drink (e.g., from family/friends)	97 (18.7)	396 (76.3)	26 (5.0)	278 (48.0)	253 (43.7)	48 (8.3)
No time to change behaviour	30 (5.8)	452 (87.4)	35 (6.8)	216 (37.2)	306 (52.8)	58 (10.0)
No realistic alternatives	84 (16.2)	403 (77.7)	32 (6.2)	202 (35.0)	326 (56.5)	49 (8.5)
Don't know how to change behaviour	101 (19.5)	366 (70.7)	51 (9.9)	246 (42.5)	254 (43.9)	79 (13.6)



et al. 2018; Rossow et al. 2016; IAS 2017). This finding highlights a need for more work that focuses on maternal alcohol research beyond pregnancy.

In terms of drinking motives, given that very few of the pregnant respondents reported any alcohol use, we cannot derive much from reported motives in this population. However, among pregnant responders, 71% reported drinking to enjoy social occasions. This fits with existing research which demonstrates the role alcohol continues to have in some women's social lives during pregnancy (Meurk et al. 2014). Additionally, studies have found that specific questions on special-occasion drinking were more effective in identifying alcohol use during pregnancy than the use of more traditional measures (e.g., the AUDIT-C) (Muggli et al. 2016; Tsang et al. 2022). Although tentative due to the numbers, motives that may be a risk for greater alcohol use during pregnancy were to have fun (which is likely related to enjoying special/social occasions), to reduce stress and to relax, and drinking out of habit.

Interestingly, some pregnant respondents chose not to answer the question about whether they drank since knowing they were pregnant, perhaps indicating that they did not wish to admit this behaviour. However, because they did not answer the screening question, subsequent questions concerning alcohol use were shown to them (in addition to the 76 pregnant women who said they had consumed alcohol since knowing they were pregnant). This led to approximately 40 more pregnant women providing data on their motives for drinking since knowing they were pregnant. This would result in a prevalence rate of around 13–14% of drinking after pregnancy recognition, slightly higher than the previously reported rate (Schölin et al. 2019). Therefore, including questions around alcohol use which do not directly ask about quantity of consumption may be a way to gain more accurate information on prevalence rates of drinking during pregnancy.

Motives for drinking in mothers were wide-ranging, with approximately half of the sample stating that their motives for drinking had changed since becoming a mother. Reflecting existing evidence (Johnson et al. 2022), qualitative responses highlighted alcohol as a coping strategy for stress and symptoms of mental health issues, and as a reward and a way for mothers to cheer themselves up. In line with our prediction, higher drinking levels were associated with women who reported drinking when in a negative mood and who used alcohol to feel better. This is important, as evidence shows that drinking for negative reinforcement (e.g., coping-based) motives may be associated with increased risk of experiencing alcohol-related harm and developing an alcohol use disorder (Cooper et al. 2015; Thomas et al. 2014) and greater harm to children (Bryant et al. 2019). However, it is important to note that with the exception of 'feeling pressured to

drink', all motives were associated with higher alcohol use in mothers.

For motives not to drink, many of the pregnant women reported that they had not reduced their alcohol use since knowing they were pregnant. This may suggest that most respondents were planning their pregnancy and so had reduced their drinking as part of this preparation, which is in line with UK Chief Medical Officer (CMO) guidance for women trying to conceive (Dept. of Health 2016). This may also help explain the lower reported levels of pre-pregnancy alcohol use in our pregnant sample.

In mothers, the most frequently chosen response was being too tired to drink, followed by motives related to mother's and child's health and well-being. The optional free text responses echoed these findings. Both pregnant women and mothers reported a clear motive to reduce drinking as child welfare (e.g., avoid harm, breastfeeding), which fits existing literature (Martinelli et al. 2019). In addition, mothers reported other motives focused on their own health and well-being, as well as practical and social issues more unique to motherhood (e.g., too tired to drink, avoiding a hangover when looking after children, no opportunity to go out and socialise).

Attitudes around drinking suggest ambivalence to some extent, with both pregnant women and mothers saying they enjoy alcohol, while also believing that alcohol was bad for their health. Although most respondents reported trying to drink within recommended levels, higher alcohol use was associated with women who reported some level of awareness that they were drinking more 'than they should' and that there was potential risk of harms associated with their drinking. In addition, heavier drinking in mothers was associated with respondents who said they drank more when in a positive mood and that they enjoyed drinking (perhaps associated with socialising/celebrating), in a negative mood, and to feel better. Again, this suggests some mothers are using alcohol coping-based strategies, and so more work is needed to support mothers in adopting more adaptive coping methods.

In terms of perceived barriers to reducing alcohol use, mothers were more likely to report any barriers than pregnant women. This may reflect a public health focus of alcohol behaviour during pregnancy due to the potential harm to the foetus (e.g., FASD). During antenatal appointments, pregnant women are asked about their drinking and given basic information on the potential harm alcohol can have on the foetus. Once the baby is born, mothers may be given some information on alcohol harm, but this tends to be focused on specific behaviours that may not be relevant to all women (e.g., co-sleeping and breastfeeding). In particular, mothers reported that stress, pressure from others, and a lack of knowledge around how to reduce drinking were barriers to reducing alcohol use. These factors could therefore be a

target in tailored interventions aimed at supporting mothers in keeping drinking at low risk levels.

There are several limitations to this study. Firstly, the data are not representative of the pregnant or non-pregnant population of the UK. Although respondents were fairly representative regarding maternal age, our sample was more likely to be white, have a higher level of education and household income (see supplementary material for representative data). This necessarily means that findings should be interpreted with caution. However, these findings, along with the existing literature around drinking during pregnancy, and the growing narrative around mothers needing to drink shows that this is an area that needs focused, systematic work. Although women (including mothers; Johnson 2021) are heavy social media users irrespective of socioeconomic status (Deloitte 2020; Lupton and Maslen 2019), our recruitment methods focused on a restricted number of online platforms (e.g. Twitter, Facebook) and so will have limited our population. It will be important for future research to actively engage with more diverse populations to ensure representation and enable an investigation of how demographics, including intersectional characteristics, may affect the motives and impact of maternal drinking.

Secondly, given the lack of research investigating the mechanisms underlying maternal drinking, there are no validated scales designed to measure relevant issues tailored to pregnant women and mothers. We therefore adapted existing scales, based on feedback with maternal public advisors, and created items based on existing evidence. This pilot work highlights a need for development and validation of maternal alcohol use scales. Also, given that this is a cross-sectional survey, it is impossible to make any comments on cause and effect of alcohol use behaviour in this population.

Lastly, given the stigmatising issues covered in this study (Vicario et al. 2021), concerns around maternal populations underreporting alcohol use (Morrello et al. 2022), and increased dropout rates as people move through surveys (Hoerger 2010), we conducted public engagement activities to ask women about the design of the survey. As a result, key outcome measures (e.g., alcohol use) were placed at the start of the survey, with demographic questions at the end. Additionally, where possible, display logic was used to tailor the survey more to the individual participant, and participants could choose not to answer a question they did not want to. However, this likely contributed to a large proportion of respondents not providing demographic information, and less data on some topics (e.g., alcohol use and drinking motives of pregnant respondents who initially said they had not been drinking since knowing they were pregnant). Although it is important to work with the population of interest and to keep observational research as concise as

possible, there is a balance to be had in order to obtain the most useful data.

Maternal drinking is associated with a range of harms to the mothers and child. These initial findings provide a more nuanced understanding of why pregnant women and mothers drink and do not drink. Understanding the motives for drinking is important, and pregnant women and mothers who use alcohol as a coping mechanism may be at risk of drinking more, leading to a greater risk of experiencing alcohol-related harm. Additionally, there appear to be unique reasons for maternal populations to reduce their drinking. It is likely that a focus on how women can reduce stress in more adaptive ways, while emphasising the positive impact reduced drinking can have on them and their children, will result in more effective public health interventions. Prospective longitudinal studies are now needed to understand the causal risks of increased drinking and harm in maternal populations, while reducing issues around retrospective self-reported drinking behaviour, which may be particularly biased in maternal populations.

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**Availability of data and material** Data will be deposited on the Open Science Framework once the paper is accepted.

**Code availability** Analysis conducted on SPSS

**Authors' contributions** Rose: concept, lead on PPI sessions, lead author, data collection, supervision; Fleming: lead analysis, lead author results, paper review/editing; Ujhelyi Gomez: data collection, paper review/editing; Goodwin: paper/analysis review editing.

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## Declarations

**Ethics approval** This research received ethical approval from the University of Liverpool ethics committee.

**Consent to participate** All participants provided online informed consent prior to participation.

**Consent for publication** Data are published in aggregate form within the manuscript. Informed consent was provided.

**Ethical statement** Ethical approval was obtained prior to data collection, and all participants provided informed consent.

**Conflicts of interest/Competing interests** The authors declare that they have no conflicts of interest.

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