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NoLo drinks and pregnancy: women's harm perceptions, labeling ambiguity, and guidance needs

Abigail K. Rose^a, Hannah Marriott^a and Sam Burton^{a,b}

^aSchool of Psychology, Liverpool John Moores University, Liverpool, UK; ^bDepartment of Women's and Children's Health, School of Life Course and Population Sciences, King's College London, London, UK

ABSTRACT

Background: No- and low-alcohol (NoLo) products are promoted as harm-reduction alternatives to standard alcohol, but their role in pregnancy is unclear. We examined pregnant and recently pregnant women's perceptions of NoLo-related harm, how perceptions relate to drinking, and women's information preferences.

Methods: A cross-sectional mixed-methods online survey, completed by 515 UK women, who were currently/recently pregnant. Participants rated harm of standard-strength alcohol, NoLo (0.0–1.2% ABV), and alcohol-free ($\leq 0.05\%$) drinks, reported drinking during pregnancy, and provided open-text responses about NoLos.

Results: Standard-strength alcohol was perceived as most harmful, followed by NoLo and alcohol-free drinks ($p < .001$). Women aware of abstinence guidelines and who did not drink during pregnancy rated all alcohol-containing drinks as more harmful. Greater perceived harm of standard (OR = 0.98, 95% CI = 0.97–0.99) and NoLo (OR = 0.97, 95% CI = 0.96–0.99) drinks was associated with lower odds of pregnancy drinking. Sensitivity analyses indicated these associations were product-specific. Qualitative findings revealed widespread confusion around NoLos, concerns about labeling, and strong preferences for clear, clinician-led guidance.

Conclusions: NoLo products occupy a psychologically ambiguous space in prenatal alcohol decision-making. Women make distinct risk assessments for different beverage types during pregnancy, yet remain uncertain about NoLo products. Clearer regulation, labeling, and evidence-based pregnancy-specific guidance are needed for informed decision-making.

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NoLo; Harm perception; pregnancy; alcohol; risk; public health

Introduction

In 2016, the UK's Chief Medical Officer revised alcohol guidelines for pregnancy, shifting from permitting 1–2 units once or twice a week (i.e. up to 4 units/32g alcohol), to avoiding any alcohol if pregnant or trying to conceive. This precautionary approach reflects the teratogenic nature of alcohol and the absence of a known safe threshold for prenatal consumption. Despite abstinence guidelines, the UK continues to have one of the highest levels of antenatal drinking, with up to 79% of women reporting some alcohol use when pregnant (McQuire et al., 2019) and 28.5% reporting drinking after pregnancy recognition (Mårdby et al., 2017).

Antenatal drinking can impact the pregnant person's health, for example by increasing the risk of nutritional deficiencies (Oei, 2020; Sebastiani et al., 2018), and

alcohol is one of the leading, preventable causes of birth defects and intellectual disabilities (Williams et al., 2015). Low levels of alcohol use, i.e. under 4 units p/week, may increase the risk of preterm delivery and low birth weight (Mamluk et al., 2017). As drinking increases, so does the risk of fetal alcohol spectrum disorder (FASD) – a lifelong neurodevelopmental disorder affecting an estimated 1.8–3.6% of births in the UK (McCarthy et al., 2021), although one study found that 17% of children screened positive for FASD, warranting further investigation (McQuire et al., 2019). FASD contributes to substantial social and economic costs, estimated at £2 billion annually for the UK (Schölin et al., 2021). Additionally, high levels of alcohol use may increase risk of miscarriage, stillbirth, and sudden infant death syndrome (Bailey & Sokol, 2011; Sundermann et al., 2021).

CONTACT Abigail K Rose ✉ A.K.Rose@ljmu.ac.uk School of Psychology, Liverpool John Moores University, 2.20 Tom Reilly Building, Byrom Street campus, Liverpool, L3 3AF, UK

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Motives to drink during pregnancy include a desire to feel 'normal', enjoy social occasions, and manage negative states such as stress (Christiansen et al., 2024; Fleming et al., 2025). Motives for not drinking often center around wanting to avoid harm to the baby (Fleming et al., 2025; Jones et al., 2025), and can involve multiple feelings such as fear, anxiety, guilt, and a sense of 'maternal responsibility' (Hammer & Rapp, 2022). Decisions on whether to drink are shaped by individual beliefs about risk and harm, which can be understood through the Health Belief Model (Green et al., 2020). This theory suggests that behaviors are influenced by perceived susceptibility to harm, severity of consequences, benefits of action, and barriers to change, as well as self-efficacy and cues to action (i.e. internal or external stimuli that trigger decision making) (Alamer, 2024). The model has been applied to various behaviors and treatment adherence, including alcohol and substance use (Muslim et al., 2025).

Evidence supports the theory that perceptions of harm are central to antenatal alcohol use, and that effective risk communication when educating people about drinking during pregnancy is essential (Elek et al., 2013; Erng et al., 2024). Drink strength or potency is a key factor that influences harm perception (Erng et al., 2023; Meurk et al., 2014; Popova et al., 2022). This may be particularly relevant in the context of NoLo beverages, defined as containing between 0.0–1.2% ABV, comprising alcohol-free ($\leq 0.05\%$ ABV), de-alcoholised ($\leq 0.5\%$ ABV) and low alcohol ($\leq 1.2\%$ ABV) beverages. The NoLo market is expanding (Holmes et al., 2024) and the potential for NoLos to enable moderation was reflected by the UK Government identifying these products as an effective alcohol harm reduction strategy (HM Government, 2019).

Although low-moderate consumption and harm reduction approaches may be effective for the general population, they may not be appropriate for all groups, including pregnant people. It is important to identify potential unintended negative consequences of products and policy, to minimize harm to vulnerable and/or marginalized groups. One key aspect to this is understanding how NoLos are perceived during pregnancy. According to Risk Perception theory (Ferrer & Klein 2015; Slovic et al., 2004), individual's cognitive beliefs as well as emotional and contextual factors determine perceived harm – encompassing those factors highlighted by the Health Belief Model (susceptibility to harm, severity of consequences, benefits of action, barriers to change, self-efficacy, cues to action).

This study aims to deliver novel insights to inform alcohol policy, public health interventions, and health-care practice. It investigates women's attitudes toward

NoLo use during pregnancy, examining how these are shaped by prior prenatal alcohol use and awareness of guidelines and alcohol-related risks. Open-ended questions explore women's understanding of NoLo products, alongside their preferences for information and guidance on NoLo use during pregnancy. Drawing on relevant theory and evidence, we hypothesize that:

1. Accurate knowledge of pregnancy alcohol guidelines will be associated with standard- and NoLo-labeled drinks being perceived as more harmful than those unaware of guidelines.
2. Participants who report not drinking alcohol during pregnancy will rate standard- and NoLo-labeled drinks as more harmful than participants who report drinking during pregnancy.
3. Lower harm perceptions of standard and NoLo alcohol drinks will be associated with personal use of alcohol during pregnancy

Methods

Design

A cross-sectional, mixed method survey, delivered online.

Participants

A total of 562 participants were recruited from Prolific through purposive self-selecting sampling. Due to incomplete data entries, 47 participants were excluded from the final analysis, leaving a total of 515 completed surveys. Inclusion criteria for the participants were: aged 18 or over, living in the UK, and currently pregnant or having given birth in the last twelve months. To ensure we captured data from participants who were pregnant, as this may potentially affect alcohol-related attitudes, we purposively over-recruited women currently pregnant ($n=208$, 40.39%).

Materials

Demographics: The following demographics were collected: age, ethnicity, sexuality, household income (before tax), employment status, marital status, number of children, and whether currently pregnant or months since pregnancy.

Alcohol Use Disorders Identification Test (AUDIT) (Barbor et al., 1992): A 10-item screening tool to identify potential hazardous/harmful drinking or those at risk for alcohol use disorder, with questions related to quantity and frequency of use and alcohol-related problems. It is

scored from 0 to 40. The AUDIT's psychometric properties are well established, and demonstrated good internal consistency in this sample ($\omega = .80$).

NoLos: knowledge, use and harm perceptions

1. Due to evidence suggesting the public may be unaware of what NoLos are, we assessed this by asking participants to select the correct definition of NoLos from 6 options (including: Alcohol beverage between 0.0-1.2% ABV). Binary outcome (correct/incorrect).
2. Participants' NoLo use was assessed by a single question: 'Did/Do you consume any alcohol products during your pregnancy?' Options: standard alcohol only, standard and NoLos, NoLos only (0.0-1.2%), Alcohol-free only (0.0-0.05%), No, Unsure. We categorized people into 'abstainers' (followed guidelines: No and Alcohol-free only) and 'drinkers' (did not follow guidelines, consumed alcohol $\geq 0.5\%$ ABV).
3. Harm perceptions of different drink types (standard strength, NoLos 0.0-1.2%, Alcohol-free alcohol drinks 0.0-0.05%) were measured by asking 'How harmful do you believe consumption of [drink type] can be during pregnancy?' Rated on a 0 (not harmful at all) to 100 (extremely harmful) scale.

Knowledge and perceptions of abstinence guidelines and NoLos

1. Knowledge of potential risks of prenatal drinking was assessed by asking participants to select multiple possible outcomes (risks) from 6 options (FASD, low birth weight, brown eyes, premature birth, none, other [which allowed a free text response]). To avoid causing undue distress, pre-specified options did not include some of the rarer and most serious risks (e.g. miscarriage, still birth).
2. Awareness of current UK guidelines (i.e., avoid any alcohol use during pregnancy) was assessed by asking participants to select the correct response from 7 possible answers (including 'other', which allowed a free text response). Binary outcome (correct/incorrect).

Attitudes and experiences regarding alcohol awareness during pregnancy

Attitudes around guidelines and experiences were assessed with the following questions: 1) How

important do you think it is for pregnant individuals to receive clear guidance on alcohol consumption during pregnancy?, 2) How important do you think it is for healthcare professionals to discuss alcohol use with pregnant individuals?, 3) How clear do you find the current guidance on alcohol consumption during pregnancy?, 4) How easy is it for you to access information about alcohol use during pregnancy?, 5) Where have you received information about alcohol use during pregnancy? (Select all that apply from 5 pre-specified and one 'other' option), 6) Has the guidance about alcohol use during pregnancy influenced your decisions about drinking during pregnancy? Questions were rated on a 5-point Likert scale. Data not analyzed. All stimuli and data are available at www.osf.io/2qf3s.

Attitudes toward and understanding of NoLos, and requested information

Two optional open-text questions were included to capture nuances in participants' views that may not be elicited through quantitative items. 1) Do you think the definitions of NoLo drinks are accessible, clear and helpful? (please explain), 2) What information should be available to pregnant women about the potential harms and/or benefits of NoLo consumption during pregnancy? Open-ended survey questions can provide valuable qualitative insights that complement quantitative findings, particularly for emerging topics (Braun et al., 2021). Responses were analyzed to enrich the interpretation of the survey findings.

Drink labeling stimuli

Participants were presented with 9 stimuli 3 were standard strength alcohol, 3 were nolo and 3 were alcohol free, and asked to categorize these as an additional understanding check. Data not analyzed. All stimuli and data are available at www.osf.io/2qf3s.

Procedure

Participants responded to the study advert on Prolific, which gave access to the Participant Information Sheet. After providing informed consent, participants completed study assessments/measures in the order listed above. A single attention check was included during the study (What planet do you live on?) A debrief at the end of the study included current UK alcohol guidelines (standard and pregnancy-related), definitions of NoLos, signposting to further support and/or information on alcohol and wellbeing.

Analysis

Analysis was performed in R studio using the dplyr packages. Baseline differences between participants who were currently pregnant and those who had children were assessed using independent-samples *t*-tests for continuous variables (age, number of children, AUDIT score, and household income) and chi-square tests of independence for categorical variables (ethnicity, relationship status, employment status, sexuality, and alcohol consumption during pregnancy). Between subject's ANOVAs were applied using the aov function in R. For hypothesis 1 and 2 analysis independent variables were knowledge of pregnancy alcohol guidance (2 levels: yes or no) or consumed alcohol during pregnancy (2 levels: yes or no), pregnancy (2 levels: pregnant or have children) and label (3 levels: standard alcohol strength, nolo, alcohol free). Dependent variable was harm perception rated from 0 to 100 using a visual analogue scale. For hypothesis 3 the outcome was consumed alcohol (regular strength or NoLo) in pregnancy (2 levels: yes or no), the independent variables were harm perception of standard strength alcohol and harm perception of nolo products. In a sensitivity analysis, the outcome was also treated as consuming only regular strength alcohol or only NoLo products, respectively. Within the model the following variables were adjusted for: age, pregnancy status, ethnicity, income and AUDIT score. The assumption of linearity in the logit was assessed for continuous harm perception variables using restricted cubic spline models. A comparison of linear and spline specifications indicated that the inclusion of non-linear terms did not significantly improve model fit ($\chi^2(4) = 6.68, p = .154$). Consequently, harm perception variables were retained as continuous linear predictors in the final model. Analysis for hypothesis 2 was conducted with individuals who had only report consumption of at least one instance of standard alcohol as sensitivity analysis presented in [supplementary file 2](#).

Where significant main effects or interactions were identified outside of pre-specified hypotheses, follow-up pairwise comparisons were conducted to aid interpretation, this was exploratory analysis. Pairwise comparisons were adjusted for multiple testing using the Bonferroni correction. Effect sizes were reported as partial eta-squared and Cohen's *d*.

For the open-ended, qualitative data, a semantic-level thematic analysis was conducted (Braun & Clarke, 2006; Madill et al., 2000). Analysis assumed that participants' responses reflected their experiences of NoLo products within broader social contexts (e.g., exposure to public health or alcohol industry messaging, family/peer

alcohol norms). Given the brevity of responses, analysis focused on the explicit content of participants' responses to identify patterns of understanding and information preferences, rather than latent meanings. This approach was considered appropriate given the short responses and the potential application of this evidence to policy and public health. Themes were generated inductively following Braun and Clarke's six-phase process (2006, 2021). Given the relatively small volume of text, responses were coded and analyzed manually by the research team without the use of qualitative data management software.

Results and findings

Participants

The sample consisted of 515 participants, of whom 208 were currently pregnant and 307 had children. The average age of the sample was 32.21 years ($SD = 4.64$). Pregnant participants were significantly younger than those with children ($M = 31.56, SD = 4.17$ vs. $M = 32.66, SD = 4.89, p = .017$). As expected, participants with children reported a significantly greater number of children than pregnant participants ($M = 1.84, SD = 0.93$ vs. $M = 0.86, SD = 1.02, p < .001$).

Alcohol consumption, measured using the AUDIT, was slightly higher among pregnant participants ($M = 3.24, SD = 4.49$) than participants with children ($M = 2.96, SD = 3.26$), although this difference was not statistically significant ($p = .442$). The majority of participants were classified as low-risk drinkers (89.1%), with 8.7% meeting criteria for increasing-risk drinking, 1.6% for higher-risk drinking, and 0.6% for possible alcohol dependence. Hazardous drinking was reported by 8.2% of pregnant participants and 9.1% of participants with children, while harmful drinking was less common (1.9% vs. 1.3%, respectively).

The sample was predominantly White British (72.4%), followed by Black Other (6.4%) and White Other (6.4%). Ethnic composition did not differ significantly between pregnant participants and those with children ($p = .453$). Most participants were either married or cohabiting (60.4%) or in a relationship without cohabitation (31.7%), with no significant differences in relationship status between groups ($p = .777$). Employment status differed significantly between groups ($p < .001$); most pregnant participants were employed (84.6%), whereas participants with children were more likely to be on maternity leave (32.6%) or employed (50.8%). The mean household income was £65,380 ($SD = £36,650$), with no significant difference between groups ($p = .441$).

Most participants identified as heterosexual (89.5%), with 8.5% identifying as LGBTQ+ and a small number preferring not to disclose their sexuality. Sexual orientation did not differ significantly between groups ($p = .656$). Participants with children were more likely to report consuming alcohol during pregnancy than pregnant participants (36.5% vs. 32.2%, $p = .035$). Overall, aside from expected differences in age, number of children, employment status, and reported alcohol consumption during pregnancy, the two groups were broadly comparable across demographic characteristics. See Table 1 for a full breakdown of participant characteristics.

Effects of drink labelling and knowledge of guidelines on drink perceptions

A between subjects ANOVA was conducted to investigate the effects of drink labeling (standard, NoLo, free), knowledge of pregnancy alcohol guidance (yes vs. no), and participant group (pregnant women vs. those with children) on participant ratings. Analysis revealed a statistically significant main effect of drink label on harm perception, $F(1.947, 916.99) = 262.33$, $p < .001$, $\eta^2 = .358$. Post hoc comparisons showed that perceptions of the standard label were significantly more harmful than the NoLo, $t(471) = 14.32$, $p < .001$, $d = 1.34$, and Free, $t(471) = 21.21$, $p < .001$, $d = 2.11$, labels. Additionally, participants rated the NoLo drink significantly more harmful than the Free drinks, $t(471) = 8.91$, $p < .001$, $d = 0.77$.

The main effect of knowledge of guidelines was not statistically significant, $F(1, 471) = 3.13$, $p = .078$. There was no main effect of participant group, $F(1, 471) = 0.96$, $p = .328$, nor were there significant two-way interactions between drink and group or a three-way interaction among drink, group, and guidance knowledge, whereby the effect of a given variable was dependent upon other variables ($ps > .81$).

A significant interaction between drink type and knowledge of guidance was observed, $F(1.947, 916.99) = 5.68$, $p = .004$, $\eta^2 = .012$. Post hoc comparisons revealed that participants who were aware of the pregnancy alcohol guidelines rated the Standard (largest difference) and NoLo drinks as more harmful than those not aware, whereas ratings for the alcohol-free drink did not increase with guideline knowledge thus, supporting hypothesis 1 (Figure 1 and Table 2).

Perceived harm by drink label and pregnancy drinking history

A second between subjects ANOVA examined perceived harm for drink labels (Standard, NoLo, Free) as

a function of prior alcohol consumption during pregnancy (yes/no) and participant group (pregnant vs. children). A significant main effect of label type was observed, $F(1.94, 911.48) = 405.68$, $p < 0.001$, $\eta^2 = .46$. Post hoc tests showed that Standard labels were rated significantly more harmful than NoLo, $t(471) = 19.06$, $p < .001$, and Free labels, $t(471) = 25.96$, $p < 0.001$. NoLo were also rated significantly more harmful than alcohol free drinks, $t(471) = 9.38$, $p < 0.001$.

A significant main effect of pregnancy drinking history was found, $F(1, 471) = 38.38$, $p < .001$, $\eta^2 = 0.08$, participants who drank during pregnancy rated all labels as less harmful, supporting hypothesis 2. There was no main effect of participant group, $F(1, 471) = 0.58$, $p = 0.447$. A significant interaction between label type and pregnancy drinking history was also observed, $F(1.94, 911.48) = 6.99$, $p < .001$, $\eta^2 = .01$. Participants who had not consumed alcohol during pregnancy rated drinks as more harmful in comparison to those who had. The largest difference was between standard and alcohol-free drinks, between those who had and had not consumed alcohol during pregnancy (mean difference = 72.62, $p < .001$, $d = 2.87$) (Figure 2).

Associations with drinking during pregnancy

A binary logistic regression examined whether perceived harm of differently labeled drinks was associated with alcohol consumption during pregnancy. The model explained 25% of the variance in pregnancy drinking behavior. Greater perceived harm of both NoLo-labeled drinks (OR = 0.97, 95% CI = 0.96–0.99, $p < .001$) and standard-labeled drinks (OR = 0.98, 95% CI = 0.97–0.99, $p = .003$) was associated with lower odds of drinking during pregnancy. These findings support Hypothesis 3, indicating that higher perceived harm of both regular and NoLo-labeled drinks was associated with a lower likelihood of alcohol consumption during pregnancy.

As a sensitivity analysis, we examined whether perceived harm was associated with different types of alcohol product consumption during pregnancy. Greater perceived harm of regular-labeled alcoholic drinks was associated with lower odds of consuming regular alcohol during pregnancy (OR = 0.95, 95% CI = 0.91–0.99, $p < .05$). In contrast, perceived harm of NoLo-labeled drinks was not associated with consumption of regular alcohol during pregnancy (OR = 1.00, 95% CI = 0.95–1.03, $p = .833$).

Perceived harm of regular-labeled drinks was not significantly associated with consumption of NoLo-labeled drinks during pregnancy (OR = 1.01, 95% CI = 0.99–1.03, $p = .065$). However, greater perceived harm

Table 1. Participant characteristics by pregnancy status and total.

	Pregnant (<i>n</i> = 208)	Have children (<i>n</i> = 307)	Total (<i>n</i> = 515)
Age			
Mean (SD)	31.56 (4.17)	32.66 (4.89)	32.21 (4.64)
Median (IQR)	32.00 (5.00)	32.00 (5.00)	32.00 (6.00)
Number of Children			
Mean (SD)	.86 (1.02)	1.84 (.93)	1.44 (1.08)
Median (IQR)	1.00 (1.00)	2.00 (1.00)	1.00 (1.00)
AUDIT			
Mean (SD)	3.24 (4.49)	2.96 (3.26)	3.07 (3.81)
Median (IQR)	2.00 (4.00)	2.00 (3.00)	2.00 (4.00)
N low risk (%) (0-7)	184 (88.5%)	274 (89.3%)	459 (89.1%)
N increasing risk (%) (8-15)	17 (8.2%)	28 (9.1%)	45 (8.7%)
N higher risk (%) (16-19)	4 (1.9%)	4 (1.3%)	8 (1.6%)
N possible dependence (%) (20+)	3 (1.4%)	0	3 (0.6%)
Missing	0	1 (0.3%)	1 (0.2%)
AUDIT-C (current drinking)			
Positive Screen >5	9 (4.3%)	8 (2.6%)	17 (3.3%)
Positive Screen >3 (Gender sensitive)	30 (14.4%)	56 (18.2%)	86 (16.7%)
Ethnicity			
Any Other	0 (0.0%)	1 (0.3%)	1 (0.2%)
Asian - British	13 (6.3%)	11 (3.6%)	24 (4.7%)
Asian - Other	2 (1.0%)	4 (1.3%)	6 (1.2%)
Black - British	12 (5.8%)	9 (2.9%)	21 (4.1%)
Black - Other	11 (5.3%)	22 (7.2%)	33 (6.4%)
Mixed - Any	9 (4.3%)	10 (3.3%)	19 (3.7%)
White - Other	12 (5.8%)	21 (6.8%)	33 (6.4%)
White British	149 (71.6%)	224 (73.0%)	373 (72.4%)
Missing	0 (0.0%)	5 (1.6%)	5 (1.0%)
Relationship Status			
Divorced or separated	0 (0.0%)	1 (0.3%)	1 (0.2%)
I prefer not to answer this question	1 (0.5%)	0 (0.0%)	1 (0.2%)
In a relationship (not co-habiting)	68 (32.7%)	95 (30.9%)	163 (31.7%)
Married or co-habiting	123 (59.1%)	188 (61.2%)	311 (60.4%)
Single	11 (5.3%)	14 (4.6%)	25 (4.9%)
Missing	5 (2.4%)	7 (2.3%)	12 (2.3%)
Employment			
Employed	176 (84.6%)	156 (50.0%)	332 (64.5%)
Self-employed	7 (3.4%)	8 (2.6%)	15 (2.9%)
Maternity leave	11 (5.3%)	100 (32.6%)	111 (21.6%)
Stay at home mum/homemaker	11 (5.3%)	37 (12.1%)	48 (9.3%)
Unemployed	3 (1.4%)	3 (1.0%)	6 (1.2%)
Prefer not to answer	0 (0.0%)	1 (0.3%)	1 (0.2%)
Missing	0 (0.0%)	2 (0.7%)	2 (0.4%)
Household Income (GBP)			
Mean (SD)	64,750 (37,760)	66,340 (34,950)	65,380 (36,650)
Median (IQR)	60,000 (38,500)	64,000 (45,630)	60,000 (42,250)
Sexuality			
Heterosexual	186 (89.4%)	275 (89.6%)	461 (89.5%)
LGBT	20 (9.6%)	20 (6.5%)	40 (7.8%)
Prefer not to say	1 (0.5%)	3 (1.0%)	4 (0.8%)
Missing	1 (0.5%)	5 (1.6%)	6 (1.2%)
Consumed alcohol during pregnancy (standard or NoLo alcohol products)			
Yes	67 (32.2%)	112 (36.5%)	179 (34.8%)
No	131 (63.0%)	184 (59.9%)	315 (61.2%)
Missing	10 (4.8%)	11 (3.6%)	21 (4.1%)
Number of people who consumed specific drinks during pregnancy			
Standard alcohol drinks only	1 (0.5%)	11 (3.6%)	12 (2.3%)
No Lo only (0-1.2%)	12 (5.8%)	20 (6.5%)	32 (6.2%)
Standard and No Lo drinks	6 (2.9%)	18 (5.9%)	24 (4.7%)
Alcohol free only (0-.05)	48 (23.1%)	63 (20.5%)	111 (21.6%)
No	131 (63.0%)	184 (59.9%)	315 (61.2%)
Missing	10 (4.8%)	11 (3.6%)	21 (4.1%)

of NoLo-labeled drinks was associated with lower odds of consuming NoLo-labeled drinks during pregnancy (OR = 0.97, 95% CI = 0.96–0.98, $p < .001$). This suggests

that risk perceptions may be product-specific rather than reflecting general attitudes toward alcohol use in pregnancy (Table 4).

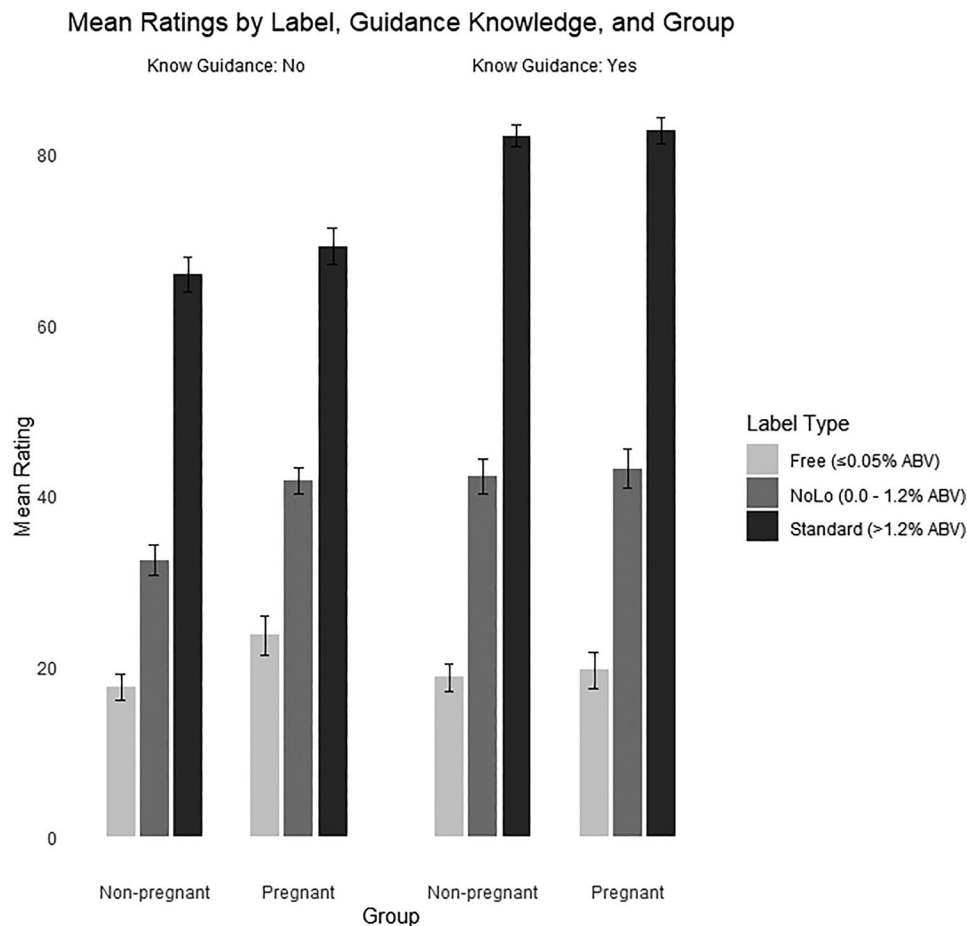


Figure 1. Mean harm-perception ratings for three drink label types—free ($\leq 0.05\%$ ABV), NoLo ($0 - 1.2\%$ ABV), and standard ($> 1.2\%$ ABV)—plotted by awareness of official pregnancy alcohol guidelines (knowledge: Yes vs. No) and participant group (pregnant vs. Non-pregnant). Error bars represent ± 1 standard error of the mean

Table 2. Means and standard deviations for perceived harm by drink type, guidance knowledge, and group.

Drink	Know Guidance	Group	Mean	SD
Standard	No	Non-pregnant	65.90	31.03
Standard	No	Pregnant	69.25	26.87
Standard	Yes	Non-pregnant	82.18	20.74
Standard	Yes	Pregnant	82.82	20.61
NoLo	No	Non-pregnant	32.45	27.28
NoLo	No	Pregnant	41.81	20.39
NoLo	Yes	Non-pregnant	42.29	30.85
NoLo	Yes	Pregnant	43.14	30.16
Free	No	Non-pregnant	17.55	23.71
Free	No	Pregnant	23.63	31.03
Free	Yes	Non-pregnant	18.71	25.19
Free	Yes	Pregnant	19.53	27.04

Qualitative data

Do you think the definitions of NoLo drinks are accessible, clear and helpful?

Of the 483 respondents to this question, most participants found definitions unclear, confusing, or inconsistent. Quite a lot of participants stated they were still confused by what was meant by NoLos having completed the study, while others pointed out that they

only understood the definitions (or realized their previous belief that all NoLos were alcohol-free was incorrect) due to taking part. Just under one-third reported that definitions were clear and accessible, while around 11% expressed mixed or uncertain views. Three themes were identified.

Confusing, misleading, and a lack of clarity. The majority of participants indicated finding the term NoLo confusing, “I was so confused if i could drink these during pregnancy as some say Alcohol free to which they should be 0.0% but then you find out they are like 0.2%. Which is not alcohol free.” This was often associated with a sense that the current label and descriptions could be misleading, partly due to the NoLo label covering too broad a category of drinks, “No as too many variations” “Not really. Are they 0.2 or 0.5 or 0?”. A fairly common belief was that a ‘no alcohol’ label should mean 0.0 ABV %, “No, sometimes 0.5% products are advertised as ‘alcohol-free’ which to me is incorrect and misleading advertising.” “Needs to be clearer whether 0% or low”, “I think they should just say lo if there is any alcohol in them!”

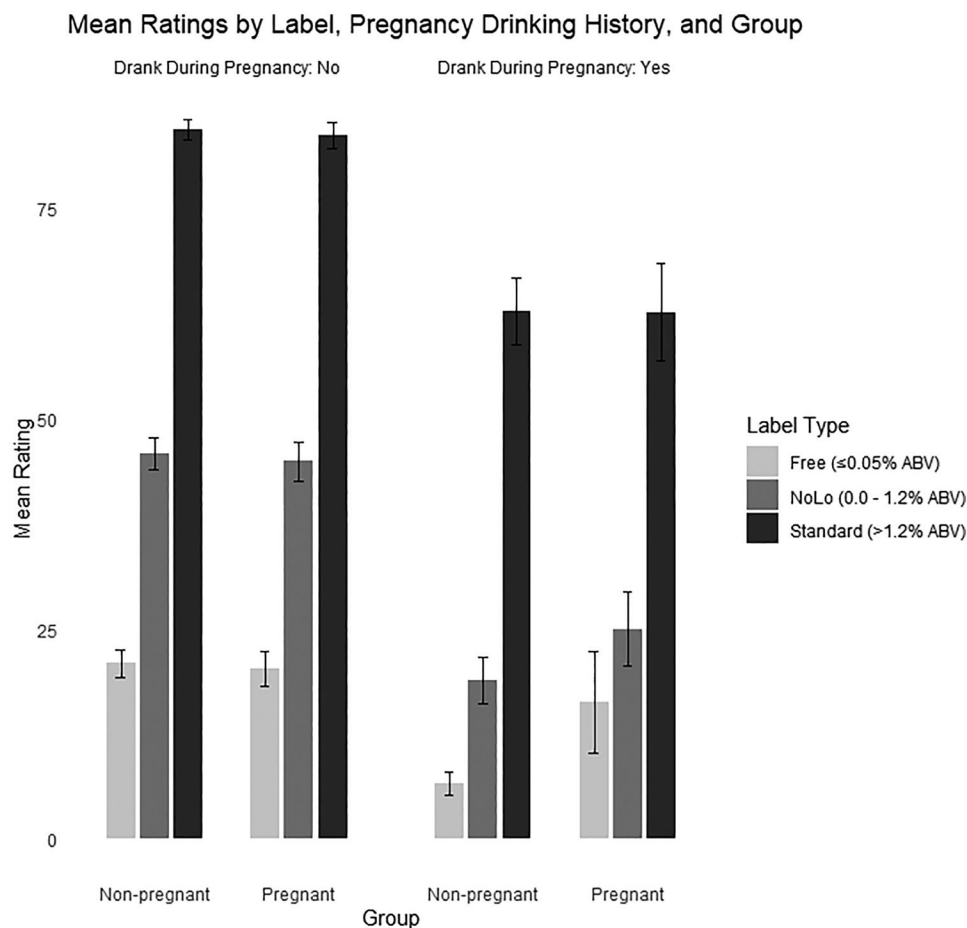


Figure 2. Mean harm-perception ratings for three drink label types—free ($\leq 0.05\%$ ABV), NoLo ($0 - 1.2\%$ ABV), and standard ($> 1.2\%$ ABV)—plotted by pregnancy drinking history (drank during pregnancy: Yes vs. No) and participant group (pregnant vs. Non-pregnant). Error bars represent ± 1 standard error of the mean (Table 3).

Table 3. Perceived harm by label, pregnancy drinking, and group.

Label	Drank During Pregnancy	Group	Mean	SD
Standard	No	Non-pregnant	84.45	19.25
Standard	No	Pregnant	83.66	20.19
Standard	Yes	Non-pregnant	62.82	26.30
Standard	Yes	Pregnant	62.67	24.39
NoLo	No	Non-pregnant	45.86	30.66
NoLo	No	Pregnant	44.92	29.75
NoLo	Yes	Non-pregnant	18.91	18.52
NoLo	Yes	Pregnant	25.00	18.51
Free	No	Non-pregnant	20.89	26.43
Free	No	Pregnant	20.26	26.43
Free	Yes	Non-pregnant	6.60	8.90
Free	Yes	Pregnant	16.28	25.82

Table 4. Logistic regression predicting pregnancy drinking.

Predictor	OR	95% CI OR	p
Intercept	0.15	[0.97, 4.25]	.001
Harm Standard	0.98	[0.97, 0.99]	.003
Harm NoLo	0.97	[0.96, 0.99]	<.001

The qualitative question in pink "Do you think the definitions of NoLo drinks are accessible, clear and helpful?" Should have quotation marks added, to match the second qualitative question

The perceived ambiguity was also seen as a way to intentionally mislead people "There is still too much of a grey area that could lead to misleading marketing

campaigns". Even within the respondents who said yes to this question, some went on to explain that more clarity was needed, especially around naming drinks alcohol-free when they contained alcohol, albeit low levels. 'Yes if you don't take things at face value and actually read the small print'. The range of ABVs covered by the NoLo label was consistently seen as lacking in clarity with many not knowing that 1.2% ABV was the upper limit. Some respondents were surprised it was this high "...some consumers might be confused with the alcohol level up to 1.2%" while others thought NoLo meant any lower strength alcohol "I didn't realise they were such a low alcohol content, the name doesn't fully explain this - it could definitely be clearer. I assumed it was just low alcohol".

Some respondents had an issue with the term 'NoLo', "I think they picked a name they thought was cool, but I don't think it is very clear what it means". This is illustrated by several opinions that it meant alcohol-free only. "'lo' does not imply alcohol and 'no' implies none, and as a word together it looks to me like it means no 'lo', not no-to-low alcohol content", "...assumed it would be

something which was an alcohol free version of an alcoholic drink just from the word NoLo."

It's important to point out this confusion was also reported by participants with professional health backgrounds, suggesting that uncertainty may extend beyond the general public, "No, I'm a healthcare professional and I didn't know the threshold for "no/lo" abv".

Accessibility and completeness. Almost a third of respondents said yes, that the definition was accessible, with some elaborating that "I think a simple google search will probably give me an answer". Yet within this group many prefaced this with the definition still feeling incomplete in some way, "Yes once explained, but I don't think the name NoLo is clear and obvious - you need to look into it more." While some reasoned that the % on packaging made it clear, others felt that packaging need to be clearer – again reflecting the belief that there is a real difference between 0.0% and 0.5% "It needs to be made clear on the packaging if there is no alcohol or up to 0.5%". Overall, responses indicated that accessibility was surface level, which did not translate into genuine understanding.

Risk perception and effects on the individual. Participants described how uncertainty surrounding NoLo products could shape women's risk perceptions and, in turn, their drinking decisions during pregnancy, "They might not be clear enough for a pregnant individual without prior knowledge. This could lead to a misunderstanding of the risks involved". While others said the uncertainty meant they avoided any type of NoLo when pregnant. "NoLo literally means no or low, so I'm not sure if they're only 0% or low under a certain % content. It's a bit confusing which is safe and which isn't. So I just assume they're all not safe." Others suggested a sense of panic and guilt around NoLos "Can pregnant women drink them? Is it safe? Guidance is so cloudy and scary. You feel you're allowed one but guilty if you do have one. Medical staff don't know the answer."

Although isolated, one respondent highlighted the harm reduction aspect of NoLos "yes i think they can be a great alternative for people who either have an alcohol addiction or cannot go without alcohol throughout pregnancy". Yet overall, there seemed to be a generally high level of risk perception which then influenced behavior "They can be ambiguous so i tended to look at alcohol %, for my pregnancy I only felt comfortable drinking the occasional 0.0% beer".

"What information do you believe should be available to pregnant women about the potential harms and/or benefits of NoLo consumption during pregnancy?"

Of the 475 respondents to this question, most requested better definitions for NoLo drinks, clearer

labeling, and more explicit information on the potential risks of NoLos during pregnancy. Around half of respondents requested official guidance, with some highlighting that more research was needed to achieve this.

Clear definitions, labeling, and guidance. Many participants requested clearer definitions, emphasizing the need for comparative clarity - that some NoLos still contained alcohol, and the differences between NoLo drinks and standard alcoholic beverages. A common request was for very clear labeling which prominently displayed ABV and 'Alcohol free' (which some felt should only be 0.0%) "Alcohol content transparency and clear distinction between no alcohol, low alcohol and alcohol free".

Most respondents wanted clear information on the possible risks of NoLo drinks, especially for the baby (e.g. FASD, low birth weight) but quite often also for the pregnant woman. "Pregnant women should be informed that NoLo drinks may still pose risks to fetal development and that it's safest to avoid them. Clear guidelines should emphasize that 0.0% ABV drinks are the safest option." "That these should not be consumed during pregnancy as there's harms and risks to the mum and baby".

Some also requested information on possible benefits of NoLo drinking, occasionally contextualizing this for women who were heavier drinkers and may have difficulty abstaining "Offer support to heavy drinkers". A predominant response was a desire to know what volume of NoLo consumption would be considered safe "If they're safe and how much would be safe to consume", while others highlighted that no level of NoLo consumption should be presented as safe. Some participants highlighted that alcohol should be treated as importantly as smoking during pregnancy "I think there needs to be more information provided around alcohol consumption (at any strength) and pregnancy. It needs to be as important and advertised in the same way smoking and pregnancy is".

Research-based evidence. Many respondents noted a lack of evidence on the effects of NoLo drinks in pregnancy, and reported a desire for evidence-based guidance which was trustworthy "The actual research reality not opinion". Some participants explicitly stated that this research should not be funded by the alcohol industry. This need was also reflected by some participants who either described confusion or mistrust regarding the possible safety of NoLos, partly due to the lack of current evidence.

Trusted and accessible sources. Respondents emphasized that trustworthiness was as important as accessibility, with healthcare professionals (especially

midwives during antenatal appointments and GPs) viewed as more credible sources of information than drinks companies, *"Information from midwives. As they are the most trusted during pregnancy"*. The most often suggested format was leaflets (in clinics and product aisles which can be taken home: *"A leaflet detailing exactly what percentage drinks are allowed"*) and adverts (especially on social media), with some suggesting *"An app where they can scan a barcode and see if it's safe"* in terms of ingredients and alcohol volume.

Although respondents differed on what they found most useful, e.g. images, infographics, text, all stressed the importance of clarity. This was occasionally contextualized by the need for plain information which avoids technical jargon, given regularly due to cognitive impairments during pregnancy. *"It should all be made available but needs to be clear and consise. My brain was addled and I needed simple things explaining to me twice!"*

Empowerment and informed choice. Several responses advocated for empowering pregnant people with transparent information *"Providing transparent labeling, clear advice, and realistic alternatives (0.0% ABV) would empower pregnant women to make informed and safe choices for their health and the health of their baby"*. Respondents wanted *"Clear information so they can make an informed decision"* around NoLo consumption.

Discussion

This study examined pregnant and recently pregnant women's perceptions of harm associated with NoLo products, how these perceptions relate to alcohol use during pregnancy, and what information women want to support decision-making. Consistent with our hypotheses, women who were aware of UK abstinence guidelines and those who did not drink during pregnancy rated all alcohol-containing drinks as more harmful. Importantly, variation in harm perception was observed more for NoLo products, than standard-strength alcohol, and lower perceived harm of NoLo drinks uniquely predicted drinking during pregnancy. Results suggest that NoLo products occupy a psychologically ambiguous space in antenatal alcohol decision-making, which has important implications for risk communication, policy, and practice.

Findings align with the Health Belief Model, which proposes that health behavior is shaped by perceived susceptibility and severity of harm, alongside cues to action and self-efficacy (Alamer, 2024). Perceived harm of standard alcoholic drinks was uniformly high across participants, perhaps reflecting the normalization of

abstinence guidance (implemented in the UK in 2016) and public health messaging around alcohol and pregnancy (Burton et al., 2025). In contrast, harm perceptions of NoLo products varied substantially, ranging from minimal to moderate perceived risk.

Consistent with the Health Belief Model, greater perceived harm of both standard alcoholic drinks and NoLo drinks was associated with lower odds of alcohol consumption during pregnancy. However, the wider variability in perceived harm ratings for NoLo products suggests that these perceptions may be particularly important in shaping decisions about their use during pregnancy, whereas perceptions of standard alcohol harm may be approaching a ceiling effect.

Sensitivity analyses further indicated that harm perceptions were product-specific. Women who perceived greater harm from standard alcoholic drinks were less likely to consume standard alcohol during pregnancy, while women who perceived greater harm from NoLo drinks were less likely to consume NoLo products. Cross-product associations were not significant, suggesting that risk perceptions did not generalize across beverage categories. Rather, pregnant women's decisions appeared to be guided by distinct evaluations of the perceived safety of each product type.

From a risk perception perspective, these results are consistent with evidence that individuals rely on heuristics and contextual cues when evaluating harm, particularly under conditions of uncertainty. Drink strength is a key driver of perceived alcohol harm (Meurk et al., 2014; Popova et al., 2022); the broad NoLo category (0.0–1.2% ABV) may blur distinctions for certain groups, including pregnancy. The qualitative findings reinforce this interpretation, with participants describing NoLo definitions as confusing, misleading, or insufficiently transparent. Participants frequently conflated "NoLo," "alcohol-free," and "low alcohol," and several were unaware that NoLo products can contain up to 1.2% ABV. Accounts highlight a mismatch between branding cues and biological reality, where products framed as "no" or "free," contain alcohol at levels that are salient in the context of pregnancy. This discrepancy may explain why NoLo products could attenuate perceived risk for some women, while increasing anxiety and avoidance for others, an effect that maps closely onto the Pregnancy Alcohol Use Risk Perception (PARP) model (Erng et al., 2024), which emphasizes the interaction between cognitive knowledge, affective responses, social norms, and contextual influences. NoLo products appear to disrupt this system by introducing a product category that is implicitly positioned as safer, yet lacking clear guidance on its relevance to pregnancy. In doing so, NoLos may weaken perceived

susceptibility and severity for some women, while simultaneously increasing uncertainty, guilt, or avoidance for others.

Prior drinking behavior during pregnancy further shaped harm perceptions. Women who reported drinking during pregnancy rated all drink types as less harmful than those who abstained, consistent with previous research showing lower perceived risk among antenatal drinkers (Burton et al., 2025; Lyall et al., 2021; Tsang et al., 2022). NoLo products may function as a particularly salient means of risk normalization, allowing women to reconcile abstinence norms with psychosocial or identity-related motives for drinking, such as wanting to feel “normal” or manage social situations.

A particularly important finding from the qualitative data was the emphasis placed on midwives and doctors as trusted sources of information. Participants consistently expressed a desire for guidance from healthcare professionals and described frustration or anxiety when clinicians were unable to provide clear advice about NoLo products. This suggests that clinical authority is an influencing factor in prenatal alcohol decision-making, consistent with the Health Belief Model. The absence of clear, pregnancy-specific guidance on NoLo products therefore represents a missed opportunity for effective risk communication within antenatal care. These findings align with previous work highlighting the central role of healthcare professionals in shaping women’s understanding of alcohol-related (including NoLo products) risks during pregnancy (Elek et al., 2013; Hammer & Rapp, 2022). Given recent research which found that pregnant women received inconsistent NoLo guidance from professionals (Burton et al., 2025), this underscores the need to equip clinicians with consistent, evidence-based information.

The results have important implications for alcohol policy and regulation. While NoLo products have been promoted as a harm reduction strategy for the general population, this framing may not translate appropriately to pregnancy. Ambiguous labeling that emphasizes “free” or “safe” characteristics risks undermining abstinence guidance for pregnant women. Stricter transparency standards, including restricting “alcohol-free” to 0.0% ABV, and explicit pregnancy warnings on all alcohol-containing products regardless of strength, may help align branding with potential biological risk. Participants preferred evidence-based guidance independent of the alcohol industry, highlighting the need for regulation that prioritizes public health over commercial interests. This is relevant for current consultation on UK policy proposing to increase the ‘alcohol-free’ threshold to ≤ 0.5 , from ≤ 0.05 (Office of Health Improvements & Disparities, 2023).

Several limitations should be acknowledged. The cross-sectional design precludes causal inference, and self-reported alcohol use may be subject to under-reporting due to stigma. While the inclusion of open-text survey responses provided additional context to the quantitative findings, the brevity of responses limited opportunities to explore women’s views and experiences in depth. Recent interview-based research has highlighted that pregnant people’s decision making around standard and NoLo alcohol should be understood within a broader sociocultural context, including gender norms and expectations (Burton et al., 2025). While NoLo products may help avoid unwanted questions about pregnancy, facilitate a sense of inclusion, and help manage alcohol cravings, - echoing the current findings - most participants also reported uncertainty and confusion around the potential harms of NoLos. The sample was predominantly White British and relatively socioeconomically advantaged (median household income of £65,380, compared with national mean of £55,600 (Office of National Statistics, 2025)), which may limit generalizability – although UK data suggest NoLo products are consumed more by those in more affluent socioeconomic groups (Wilson et al., 2025).

Future research should identify NoLo perceptions in more diverse populations and explore how structural factors shape access to information and risk communication. Additionally, future research should examine how women interpret and use NoLo products throughout the perinatal period, testing the impact of alternative labeling and warning formats on understanding and behavior, and generating independent evidence on alcohol exposure from typical NoLo consumption patterns in pregnancy. Longitudinal work could further clarify how harm perceptions evolve over time and interact with stress, social norms, and mental health. Research and public health responses must attend carefully to how risk is communicated, particularly in relation to uncertainty. While there is no established safe threshold for alcohol exposure during pregnancy, and ‘abstinence’ offers clear precautionary guidance, this does not mean that all low-level exposures confer equivalent risk, nor that harm occurs in a simple, linear manner across pregnant populations (Dejong et al., 2019). Overly alarmist or ambiguous messaging may inadvertently increase fear, guilt, or disengagement (France et al., 2014), particularly among women who have already consumed alcohol before pregnancy recognition or who find abstinence challenging (which represents a substantial number of women) (Frennesson et al., 2025). Consistent with ethical approaches to pregnancy health promotion (and reflected by our qualitative data), there is a need to balance harm

prevention with respect for women's autonomy, recognizing pregnant women as capable decision-makers (Binder et al., 2024; Raymond et al., 2009). Clear communication about what is known, what remains uncertain (Brown & Trickey, 2017), and why precautionary guidance exists may better support informed choice, while allowing NoLo products to be discussed within a nuanced harm-reduction framework for women who struggle to abstain, without presenting any level of alcohol consumption as "safe" (Anderson et al., 2014).

This study demonstrates that perceptions of NoLo products can play a distinct and influential role in prenatal alcohol decision-making. In a rapidly expanding NoLo market, clearer regulation, transparent labeling, and pregnancy-specific guidance are needed to ensure that harm reduction strategies designed for the general population do not inadvertently increase risk, uncertainty, guilt of fear for pregnant women.

Ethical statement

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 2000. Ethical approval was obtained prior to any data collection by PSYREC Ethics Committee (Liverpool John Moores University, UK): PsyREC-285-2425-M.

Patient consent

All participants provided informed consent before undertaking the survey.

Author contributions

CRedit: **Abigail K. Rose**: Conceptualization, Methodology, Supervision, Writing – original draft; **Hannah Marriott**: Investigation, Writing – review & editing; **Sam Burton**: Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing.

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