

Psychology

**Determinants of Alcohol Use Intentions in Pregnancy: Implications
for Health Promotion**

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**This thesis is presented for the Degree of
Doctor of Philosophy
of
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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university.

Ethics Approval

The research presented and reported in this thesis was conducted in accordance with the National Health and Medical Research Council National Statement on Ethical Conduct in Human Research (2007) – updated March 2014. The proposed research study received human research ethics approval from the Curtin University Human Research Ethics Committee (EC00262), Approval Number HRE2019-0339.

Tess Marjorie Dartnall Fletcher

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Abstract

As there is no known safe level of prenatal alcohol exposure, health agencies take a precautionary approach by recommending no alcohol use during pregnancy. However, women report that they are unsure about the guidelines and often receive mixed messages, therefore clear and consistent messaging is needed. To develop messages that are effective in creating behaviour change, it is necessary to explore the determinants of alcohol use in pregnancy. Specifically, taking a theory-based approach toward conceptualising the modifiable determinants of health behaviours can contribute to the design and evaluation of effective behaviour change interventions. Prior research into determinants has largely focused on heavy alcohol use, with little evidence for determinants of low to moderate alcohol use in pregnancy. Furthermore, perceptions of different levels of alcohol use in pregnancy have not been explored. The existing evidence base for psychosocial determinants of alcohol use in pregnancy is limited and inconclusive. Therefore, current data about the psychosocial determinants of alcohol use in pregnancy is needed to be able to design theory-informed and evidence-based health promotion messages to reduce intentions to consume alcohol in pregnancy. The overarching aim of this thesis was to establish an evidence base for future theory-informed prevention of alcohol use in pregnancy. To achieve this aim, the theory of planned behaviour and prototype/willingness model were used to underpin an in-depth exploration of modifiable determinants of alcohol use intentions during pregnancy and identifying previous strategies used to promote abstinence in pregnancy across four studies.

The first study was a systematic review of the literature documenting the strategies that have been used to design health promotion messages aimed at preventing alcohol use in pregnancy and the evidence supporting the use of such strategies. The review aimed to explore the extent to which these campaigns use theory and evidence regarding psychosocial determinants to both develop and evaluate the campaigns. Thus, the development, implementation, and evaluation of previous health promotion messages were systematically reviewed, and the findings synthesised. In the second study, women's beliefs about alcohol use in pregnancy were explored via a mixed-methods approach using the theory of planned behaviour as a theoretical framework ($N = 435$). The third study explored the social construction of different

levels of alcohol use in pregnancy by comparing how prototypical individuals engaging in two different alcohol use behaviours in pregnancy were perceived by others. Individual's own willingness to engage in alcohol use behaviour was also explored using the prototype/willingness model ($N = 100$). The fourth and final study explored predictors of intentions to use alcohol while pregnant and identified factors that are important to target for health promotion messaging ($N = 746$). Variables from the theory of planned behaviour and the prototype willingness model, as well as impulsivity, venturesomeness, and self-efficacy were investigated for their capacity to explain variance in intentions to use alcohol in pregnancy.

Author's Note

The current thesis is presented in a hybrid format and consists of four separate papers. One paper is published and two are submitted for publication. As the papers are considered standalone pieces of work, repetition in literature reviews and description of methodology are inevitable. However, efforts were made to reduce overlap and repetition within the papers and the general Introduction and Discussion chapters of the thesis. Each of the four chapters that represent separate studies is preceded by a short paragraph connecting it with the previous chapters. Reference lists have been combined and are presented at the end of the thesis.

Acknowledgement of Country

We acknowledge that Curtin University works across hundreds of traditional lands and custodial groups in Australia, and with First Nations people around the globe. We wish to pay our deepest respects to their ancestors and members of their communities, past, present, and to their emerging leaders. Our passion and commitment to work with all Australians and peoples from across the world, including our First Nations peoples are at the core of the work we do, reflective of our institutions' values and commitment to our role as leaders in the Reconciliation space in Australia.

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Papers and Presentations

Papers Included as Part of the Hybrid Thesis

1. **Fletcher, T. M. D.**, Mullan, B., Dhamrait, G., & Finlay-Jones, A. Promoting abstinence from alcohol in pregnancy: A review of strategies used to design health promotion messages.
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Chapter 1

Introduction

1.1 Alcohol Use in Pregnancy

Alcohol use in pregnancy is associated with many risks, including fetal alcohol spectrum disorder (FASD; Flak et al., 2014). FASD occurs due to disruptions in fetal development caused by alcohol crossing the blood barrier from mother to fetus (Khalid et al., 2014). It is characterised by a cluster of lifelong behavioural and neurodevelopmental deficits (Williams & Smith, 2015) associated with pervasive functional impairments. Although much research has established the risks associated with high levels of alcohol use in pregnancy and the evidence on this is clear, there is less conclusive evidence regarding the impact of low to moderate maternal alcohol use on child developmental outcomes (Mamluk et al., 2017) with some studies finding no risk with low levels of use (O’Keeffe et al., 2014). Nonetheless, emerging research indicates that any level of alcohol use in pregnancy may have effects on the fetus. For example, recent research has found that low to moderate levels of alcohol use in pregnancy are associated with differences in children’s craniofacial shape at 12 months of age, suggesting that low levels of use can impact development (Muggli et al., 2017). Additionally, low to moderate prenatal alcohol exposure has been found to increase the risk of behavioural attention issues (Pyman et al., 2021) and hyperactivity amongst children (Pfinder & Lhachimi, 2020). These results indicate that the level of risk associated with drinking small amounts may have previously been underestimated.

There are a range of complex factors that moderate the impact of alcohol on the fetus (e.g., the mother’s weight, timing of consumption, age, and metabolism). These factors, alongside ethical considerations that preclude experimental studies of prenatal alcohol exposure make it difficult to conduct research that can accurately quantify the impact of alcohol exposure on fetal and child development (Mattson et al., 2011; Roozen et al., 2017). There is also a noted lack of consistency in how different factors related to alcohol use in pregnancy are measured (O’Leary & Bower, 2012). For example, differences in “standard drink” volumes across countries and differences in timing of prenatal exposure to alcohol lead to heterogeneity across studies. Additionally, definitions of what constitutes low and/or moderate levels of drinking also differ, for example, Mamluk et al. (2017) defined ‘light’ drinking as any

consumption up to 32 grams of pure alcohol a week while Muggli et al. (2017) defined low levels of drinking as up to 20 grams of alcohol per occasion and no more than 70 grams per week. In regard to broader categories, O’Keeffe et al. (2014) defined ‘low to moderate’ drinking as any consumption up to 70 grams of pure alcohol per week. Similarly, Pyman et al. (2021) defined it as anything from 1 to 7 standard drinks a week i.e., 10 to 70 grams of alcohol a week. In comparison Pfinder and Lhachimi (2020) did not specify an amount of amount but rather considered low to moderate consumption as anything other than abstinence. Together, these methodological issues regarding measurement of the effects of low to moderate levels of alcohol use hinder the capacity to establish whether there is any truly ‘safe’ level of alcohol use. In light of this, many governments and health authorities around the world are taking a precautionary approach and making the prevention of any alcohol use in pregnancy a priority (FASD Working Group, 2016).

Similar to the United Kingdom and the United States, Australian Alcohol Guidelines recommend alcohol abstinence when pregnant, breastfeeding, or planning a pregnancy (National Health and Medical Research Council, 2020). Despite this, between 30 and 60% of Australians have reported that they consumed alcohol at some point in their pregnancy (Australian Institute of Health and Welfare, 2017; Callinan & Room, 2012; McCormack et al., 2017). Moreover, it is generally expected that these figures are likely to be an underestimation given that self-report measures of alcohol use in pregnancy potentially lead respondents to under-report their alcohol use (Loxton et al., 2013; Scobie & Woodman, 2017). Additionally, while research indicates that most people reduce or cease alcohol use following recognition of pregnancy (McCormack et al., 2017), the time between conception and pregnancy recognition represents a period of risk of prenatal alcohol exposure. This is because people may use alcohol prior to becoming aware that they are pregnant, despite any intentions to abstain when pregnant (McCormack et al., 2017). Accordingly, there is a clear need for evidence-based health communication strategies to reduce harm associated with alcohol use, both prior to and following pregnancy recognition. Furthermore, recent Australian data collected between 2017-2018 found that of 935 women who drank pre-pregnancy, 18% continued to drink alcohol once they knew they were pregnant, a third of which reported drinking on special occasions only (Tsang et al., 2021). Thus, suggesting that social environments may be particularly conducive to alcohol use in

pregnancy. However, differences in the reporting of alcohol use during pregnancy, particularly in terms of specific time points and amounts, means it is difficult to compare rates between studies. For example, data collected in 2006 found that 34.1% of participants reported consuming alcohol at some point during their previous pregnancy however, they did not distinguish between consumption prior to and after awareness of pregnancy (Peadon et al., 2011).

In addition to inconclusive evidence for harm associated with low level use, the personal perspectives of health professionals play a role in their determination of whether someone is at risk of problematic alcohol use during pregnancy (Bagley & Badry, 2019). For example, health care students responding to situational vignettes depicting alcohol use during pregnancy brought their own biases and societal judgements to their professional interpretation of the situation and subsequent decision making (Coons et al., 2017a). Notably, participants made decisions about whether to be concerned about alcohol use depending on the education level and social background/perceived affluence of the individuals presented in the vignettes. These kinds of beliefs and attitudes held by health professionals and the public towards people who drink alcohol while pregnant may contribute to stereotypes about who is most likely to use alcohol in pregnancy, which may in turn influence the type of advice, screening, and support that different people receive. Understanding these stereotypes is central to understanding how alcohol use during pregnancy is conceptualised among not only health professionals but the broader public in general.

1.2 Determinants of Alcohol Use in Pregnancy

There are a range of determinants of alcohol use in pregnancy, including non-modifiable influences, such as age (Callinan & Room, 2012; May & Gossage, 2011; Muggli et al., 2016), and modifiable determinants (Popova et al., 2021), such as advice from health professionals; attitudes and behaviours of partners, friends, and family; social norms; and mainstream media (Elek et al., 2013; McBride & Johnson, 2016; Peadon et al., 2010). These modifiable influences are an important target for health promotion activities, yet relationships between modifiable influences can be complex. For example, qualitative research has highlighted that information people receive from different sources can be conflicting and that this can contribute to feelings of uncertainty about the risks associated with alcohol use in pregnancy (Crawford-

Williams, Steen, et al., 2015; Elek et al., 2013; Glik et al., 2008) and confusion about the effects of low to moderate alcohol consumption (France et al., 2013; Loxton et al., 2013). Furthermore, sociocultural context plays a clear role in influential factors such as abstinence being perceived as burdensome (Meurk et al., 2014); the importance placed on alcohol in social situations (France et al., 2013; Loxton et al., 2013); and the lack of importance placed on following alcohol consumption guidelines (Crawford-Williams, Steen, et al., 2015; France et al., 2013; Meurk et al., 2014).

When considering how individuals respond to information about alcohol use it is important to note that general drinking guidelines are considered irrelevant by many (Lovatt, et al., 2015). This suggests that a layperson's conceptualisation of different levels of alcohol use (e.g., low, moderate and binge) is unlikely to reflect that which is defined by national health bodies. In fact, when asked to specify the level of alcohol use that they would perceive as being 'too much' in one sitting (i.e., resulting in them being more drunk than desired) female Australian participants reported levels that were 5 times more than the recommended daily limit (Davies, et al., 2020). Furthermore, the mean amount of alcohol required to be 'as drunk as desired' was reported as being almost 4 times higher than the daily limit (Davies, et al., 2020). However, how relevant that mismatch is in regard to pregnant women is unknown given that they represent a group that is, typically, uniquely motivated to behave in a way that is perceived to be 'healthy' (McBride et al., 2003; Lindqvist et al., 2017) and that there is evidence that heavy drinking is largely considered to be socially unacceptable behaviour (Fletcher, et al., 2021; Gouilhers et al., 2019; Jones & Telenta, 2012). When considering the variety of definitions used, low to moderate use tends to incorporate anything other than abstinence or heavy use (Mamluk et al., 2017; Muggli et al., 2017; O'Keeffe et al., 2014; Pfänder & Lhachimi, 2020; Pyman et al., 2021). Given that studies which examine women's actual alcohol intake have found that the majority of women drink at levels that could be categorised as low to moderate (Muggli et al., 2016), distinguishing between safe (i.e., abstinence) versus at-risk (i.e., anything other than abstinence) behaviour for the purposes of studies exploring anything other than prevalence of specific alcohol use behaviours or to quantify the effects of different levels of alcohol use, is likely to be sufficient. Although this approach relies on the assumption that the term 'low to moderate alcohol use' is not likely to capture heavy use (e.g., binge drinking), if it does that is not necessarily a

confounding issue given that heavy drinking still falls into the category of at-risk drinking.

1.3 Health Promotion and Alcohol Use in Pregnancy

Given that there is no known safe level of alcohol use in pregnancy and that the majority of people who consume alcohol during pregnancy do so at low to moderate levels (Muggli et al., 2016), a prevention paradox may apply (McBride, 2014). A prevention paradox is when there is a greater proportion of the population at low risk of harm than there is at a high risk of harm, such that those at low risk represent the majority of the potential burden of harm (Hawks, 1989). In the context of alcohol use in pregnancy, this means that greater health behaviour change, and subsequent reduction of disease burden, may be achieved by targeting and achieving change with those consuming low to moderate amounts of alcohol rather than targeting the smaller group of women drinking at high levels during pregnancy (McBride, 2014). However, that is not to say that more specialised and intensive support should not also be provided to those at higher risk of an alcohol-exposed pregnancy, rather, that there is also a need for a population-level approach to the prevention of alcohol use in pregnancy. Achieving change with those more likely to drink at low to moderate levels when pregnant may also create a more amenable social environment to support behaviour change for those drinking at higher levels (France, 2011).

Health promotion is a public health approach to improving health outcomes for large numbers of people through the dissemination of messages targeting health-related intentions and behaviours (Young et al., 2018). Depending on the approach used, health promotion messages may target a wide variety of factors believed to predict intentions and behaviours, including knowledge, attitudes, beliefs, social norms, and self-efficacy. It has been suggested that failure to achieve behaviour change through health promotion campaigns may be because a campaign does not address the relevant determinants that underlie the target group's behaviour (Burgoyne, 2006; Fernandez et al., 2021; Peadon et al., 2010). For example, LaChausse (2008) found that an alcohol use in pregnancy awareness program for teenagers in the US increased knowledge about FASD but did not influence attitudes about the dangers of FASD or intentions to use alcohol during pregnancy. The authors highlighted that the design of the program did not give sufficient consideration to the specific attitude and belief changes necessary for an increase in awareness to translate into changes in the target

audience's intentions (LaChausse, 2008). Understanding the specific attitudes and beliefs of relevance to alcohol use in pregnancy is thus an important starting point for conceptualising an effective prevention approach (Bell et al., 2015; Neuhauser, 2017; Roozen et al., 2016). Specifically, taking a theory-based approach toward conceptualising the modifiable determinants of health behaviours (Kok et al., 2017) can contribute to the design and evaluation of effective behaviour change interventions (Glanz & Bishop, 2010; Webb et al., 2010).

1.4 Theoretical Approaches

The theory of planned behaviour is a health promotion theory that has been used extensively to predict alcohol use (Cooke et al., 2016). The theory states that an individual's behaviour is predicted by intention and perceived behavioural control, and intention in turn is predicted by three different constructs: attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). An attitude is the overall positive or negative evaluation an individual makes about adopting a behaviour, such as abstaining from alcohol during pregnancy. Subjective norms describe the extent to which an individual feels social pressure to adopt a behaviour, while perceived behavioural control is the overall evaluation an individual makes about their capacity to adopt a behaviour. The theory of planned behaviour also posits that different sets of beliefs underlie each construct; for example, behavioural beliefs (i.e., beliefs about advantages and disadvantages) underlie attitudes, normative beliefs (i.e., beliefs about those who would approve or disapprove) underlie subjective norms, and control beliefs (i.e., beliefs about barriers and enablers) underlie perceived behavioural control. Theoretically, the three constructs, attitudes, subjective norms, and perceived behavioural control, are considered to be mechanisms by which to strengthen behavioural intentions (Abraham, 2015). That is, the theory states that by influencing specific beliefs that underlie the different constructs of the theory it is possible to strengthen an individual's intention to engage in a behaviour. Therefore, Abraham (2015) notes that the theory of planned behaviour is most useful within populations where a lack of motivation to engage in a behaviour is a significant barrier, for example, lack of motivation to abstain from alcohol in pregnancy. Conversely, it would not be appropriate for situations in which motivation is not the primary barrier to behavioural change. For example, the theory of planned behaviour may not be appropriate to explain

alcohol use in pregnancy among those who have a dependence on alcohol or for whom the experience of domestic violence contributes to their alcohol use.

The theory of planned behaviour has been previously applied to alcohol use intentions during pregnancy in Scotland (Duncan et al., 2012) and to predict the intention of Canadians of child-bearing age to consume alcohol during a future pregnancy (Vézina-Im & Godin, 2011). It has also been used to explore Australians alcohol use intentions in general (Haydon et al., 2016, 2018). Duncan et al. (2012) found that the theory of planned behaviour predicted 59% of variance in participants' intentions to drink alcohol in pregnancy and although the study was limited by the small sample size ($N = 116$), the results lend credibility to the application of the theory of planned behaviour for predicting intention to use alcohol in pregnancy. It is important to note that while the validity of the theory of planned behaviour as a predictive model of intentions is well accepted, the link between intentions and behaviour is less established (Sheeran, 2002; Sheeran et al., 2016; Sniehotta et al., 2015). However, pre-pregnancy intentions have been shown to be predictive of alcohol use behaviour in pregnancy (Zammit et al., 2008), and a meta-analysis of studies using prospective designs to predict alcohol use found that the relationship between intentions and behaviour were strongest for light episodic drinking (Cooke et al., 2016). Additionally, the link between intentions and alcohol use has often been found to be relatively strong (Hagger et al., 2016), especially when the behaviour is measured shortly after intentions (Labhart et al., 2017). Therefore, a focus on intention to use alcohol in pregnancy using a theory of planned behaviour framework may have validity as a proxy for predicting actual drinking behaviour.

An underlying assumption of the theory of planned behaviour is that behaviour is planned and rational (Sheeran et al., 2013) and therefore it may not adequately account for reactive or momentary influences on behaviour (Rivis et al., 2006). Considering that actual alcohol use in pregnancy does not always necessarily align with intentions due to a variety of reasons, other theoretical approaches may need to be considered. For example, the prototype/willingness model (Gibbons et al., 1998; Gibbons et al., 1995) is a social cognitive theory that builds on the theory of planned behaviour by incorporating social influences on behaviour. It includes a socially reactive pathway represented by willingness to engage in a behaviour in the moment, in addition to the planned pathway represented by intentions. The theory also posits

that the perceptions one holds of the ‘typical person’ (i.e., prototypes) who engages in a behaviour (e.g., drinking alcohol while pregnant) contributes to an individual’s willingness to engage in a similar behaviour. In particular, perceived likeability of a prototype and perceived similarity of a prototype to oneself are expected to contribute to willingness. That is, an individual expects that if they were to engage in the same behaviour as the prototypical person, their peers would see them as sharing the traits of a prototypical person. This effect is likely to be heightened by how similar one perceives the prototype as being to oneself (Rivis et al., 2006).

Given the importance of the social context of alcohol use (Meque et al., 2020; Pennay et al., 2018) and the impact and prevalence of stigma regarding alcohol use in pregnancy (Bell et al., 2016), the prototype willingness model may be a useful theory for exploring alcohol use in pregnancy. The model has previously been used to predict a variety of behaviours including alcohol and substance use, smoking and sexual behaviour (Todd et al., 2016). Evidence from a systematic review of 81 studies applying the prototype/willingness model to the prediction of behaviour suggests that the relationships between variables differ according to the behaviour studied (Todd et al., 2016). Specifically, the model appeared to be best suited to explaining alcohol use, with results from a meta-analysis showing that prototypes predicted almost 20% of the variance in willingness and willingness predicted almost 60% of the variance in intentions (Todd et al., 2016). The integration of both the theory of planned behaviour and the prototype/willingness model can be considered in the context of the perception that all human behaviour involves two aspects, automaticity, and rationality (Kahneman, 2011). Thus behaviour can be explored scientifically through the application of dual-process models that incorporate both of these aspects to differing degrees. Although there a great number of theories that can be applied to behaviour, the theory of planned behaviour and the prototype/willingness model are two that are commonly used in conjunction and function in such a way as to incorporate these dual processes (Caputo, 2020).

1.5 Aims and Thesis Outline

The overarching purpose of this thesis is to establish an evidence base for future theory-informed prevention of alcohol use in pregnancy. The aims are:

1. Review the strategies that have been used to design health promotion messages about alcohol use behaviour change during pregnancy.
2. To explore how women perceive alcohol use during pregnancy.
3. To identify the psychosocial determinants of alcohol use intentions in pregnancy using the theory of planned behaviour and the prototype/willingness model.

The first aim is addressed in Study 1, the second aim within Studies 2 and 3, the third aim in Study 4. Overall, there are four studies within this thesis, presented in Chapter 2 through to Chapter 5 as outlined below:

Chapter 2 contains Study 1 of the thesis which is a systematic review with the aim of identifying strategies used to design health promotion messages to prevent alcohol use in pregnancy. Studies outlining processes used to develop, implement, and evaluate previous health promotion messages about alcohol use in pregnancy were systematically reviewed and the findings of $N = 18$ studies were synthesised, to identify the extent to which previous health promotion messages were informed by determinants of intentions or behaviour of the target audience. Further, if and how theoretical principles were employed in the development of messages and how outcomes were evaluated were also explored.

Chapter 3 contains Study 2 of the thesis where women's beliefs about alcohol use in pregnancy are explored. The theory of planned behaviour was used as a theoretical framework to elicit beliefs about alcohol use in pregnancy held by women from Australian and the United Kingdom ($N = 435$). This formative work was conducted as the underpinning of the remainder of the thesis with the objective of gaining insight into how women perceived alcohol use in pregnancy.

Chapter 4 is the third study of the thesis in which learnings from the previous chapter were used to drive an investigation into the social construction of different levels of alcohol use in pregnancy. In this chapter, the prototype/willingness model was employed, using an experimental methodology, to provide insight into whether perceptions of the likability, similarity and responsibility of a pregnant individual differed according to level of alcohol use (i.e., no amount of alcohol specified vs. 'small' amount of alcohol specified). Specifically, $N = 100$ women living in the United Kingdom were surveyed regarding their perceptions and their willingness to use small levels of alcohol during pregnancy according to exposure conditions was assessed.

Chapter 5 is the fourth study of the thesis which explored predictors of intentions to use alcohol while pregnant. This was done to test the second aim of the thesis and to identify factors that are important to target for health promotion messaging. Both socially reactive and planned pathways were explored based on findings from the previous studies. Variables from the theory of planned behaviour and the prototype willingness model, as well as impulsivity, venturesomeness, and self-efficacy were investigated, to identify their capacity to explain variance in the intentions of $N=746$ women, living in Australia and the United Kingdom, to use alcohol in pregnancy.

Chapter 6 concludes the thesis with a general discussion of the findings from all four studies, addressing strengths, limitations and implications of the accomplished work.

Chapter 2

Promoting Abstinence From Alcohol in Pregnancy

The first study of the thesis is aimed at synthesising the literature that describes the development, implementation and evaluation of strategies that have been used to design health promotion messages about alcohol use behaviour change during pregnancy. We were specifically interested in messages designed to reinforce the guidelines that recommend abstinence. This was done to establish the evidence for different strategies to address alcohol use in pregnancy using health promotion messages. Based on the findings of those studies reviewed, recommendations are made for the development of health promotion messages and the documentation of that process.

Paper 1 Promoting Abstinence From Alcohol in Pregnancy: A Review of Health Promotion Messages

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Statement of Contributions

Author	Contribution	Signed Acknowledgement
Tess Fletcher	Conceptualisation, Methodology, Data Analysis, Investigation, Data Curation, Writing, Project administration	I acknowledge that these represent my contribution to this research output.
Barbara Mullan	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision.	I acknowledge that these represent my contribution to this research output.
Gursimran Dhamrait	<i>Assisted in:</i> Investigation, Data Curation, Writing (Review & Editing)	I acknowledge that these represent my contribution to this research output.
Amy Finlay-Jones	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision	I acknowledge that these represent my contribution to this research output.

Abstract

Health promotion is a useful way to disseminate information about health behaviours and to promote guidelines. Prevention of low to moderate alcohol use in pregnancy is often addressed by broad-scale awareness campaigns. The extent to which these campaigns use research that has established the psychosocial determinants of behaviour is unknown. Previous reviews have focussed on efficacy due to intervention type, e.g., mass-media campaign, brief intervention, etc., none have explored the aspects that behaviour change experts posit will prompt behaviour change. Therefore, the aim of the current study is to identify the strategies used to develop, implement, and evaluate health promotion messages addressing alcohol use in pregnancy. With particular focus placed on the theoretical foundation and associated evaluation strategy used in the campaigns. A systematic literature review retrieved a total of 3867 studies, 2014 were identified as duplicates and removed, 409 were removed for not meeting inclusion criteria. A total of 1444 studies were screened at the title and abstract level; of these, 67 were selected for full-text screening, 17 of which were retained. The majority of studies did not provide detail on the proposed behaviour change mechanism, nor did they evaluate the antecedents to behaviour change. Specifically, only seven studies mention using a theoretical framework to inform message development, three of which went into any detail about how the framework was applied. Due to a lack of overlap in study design or level of detail provided about message design and/or content, it was also not possible to report on differences in efficacy according to delivery method, incorporation of formative work, or message content. These findings suggest that there is a paucity of evidence about the efficacy of messaging strategies to address alcohol use in pregnancy and highlight the need for greater transparency and detail regarding all stages of message development and evaluation.

2.1 Introduction

2.1.1 Health Promotion and Behaviour Change

Health promotion is a public health approach to improving health outcomes for large numbers of people through the dissemination of messages targeting health-related intentions and behaviours (Young et al., 2018). Depending on the approach used, health promotion messages may target a wide variety of factors believed to predict intentions and behaviours, including knowledge, attitudes, beliefs, social norms, and self-efficacy (Abraham et al., 2007). These factors may vary between populations; thus, it is important to ensure that the approach addresses the specific determinants that underlie the target group's behaviour (Peters, 2014). However, even communication strategies informed by behavioural determinants like knowledge or beliefs still operate on the assumption that increasing an individual's knowledge or endorsement of beliefs, for example, is likely to result in a change in their behaviour (Fishbein & Cappella, 2006). For example, Dixon et al. (2015) found that a public health intervention to raise awareness of the cancer risk associated with alcohol use successfully increased participants' knowledge and awareness however, they found no significant effect on behaviour. Thus, it is important to use experimental methods to test this assumption to ensure that health promotion efforts are effective (Lee et al., 2016; Whittingham et al., 2008). Therefore, evaluations of health promotion campaigns focussing on outcomes such as awareness and knowledge are not likely to provide sufficient detail on effectiveness such that it is possible to know if a campaign is effective at impacting the determinants of behaviour before a significant outlay of time and cost.

2.1.2 Prevention of Alcohol Use in Pregnancy

Alcohol exposure can adversely affect fetal development and there is no known 'safe' amount of alcohol use that can occur during pregnancy (National Health and Medical Research Council, 2020). Fetal alcohol spectrum disorder is a lifelong condition resulting from prenatal alcohol exposure and is associated with a range of cognitive deficits and behavioural outcomes (Pyman et al., 2021). Alcohol use in pregnancy is a behaviour that is often targeted by health promotion efforts to raise awareness, increase knowledge, and create behaviour change (Burgoyne, 2006; Cismaru et al., 2010). A large number of reviews have explored prevention approaches for alcohol use in pregnancy, including universal prevention through public health

campaigns as well as behavioural interventions (Erng et al., 2020; Fergie et al., 2018; Gilinsky et al., 2011; Reid et al., 2021; Samawi et al., 2020; Stade et al., 2009). Of those previous reviews that have explored public health interventions, the majority focussed on campaign effectiveness and study quality (Erng et al., 2020; Gilinsky et al., 2011; Reid et al., 2021; Stade et al., 2009) and concluded that, based on the evidence, educational interventions to address alcohol use in pregnancy may not be effective (Gilinsky et al., 2011). However, by grouping studies according to type of intervention, prior reviews on this topic may have missed the nuance of the behaviour change mechanism such interventions were using (Fergie et al., 2018). In comparison, Fergie et al. (2018) chose to identify the actual behaviour change techniques used in interventions, reasoning that exploring the efficacy of interventions via the basic building blocks of behaviour change techniques, would allow for deeper insight into the ways in which interventions are effective. This insight would also provide direction as to how the results could inform subsequent interventions. Although Fergie et al. (2018) explored the ways in which intervention strategies were effective, they only included randomised control trials and focussed wholly on behavioural interventions to reduce alcohol use in pregnancy. No review to date has explored the efficacy of different strategies employed by interventions using health messaging.

2.1.3 *Strategies to Address Alcohol Use in Pregnancy*

In terms of strategies to develop health promotion messages, understanding the specific determinants relevant to alcohol use in pregnancy is a crucial starting point for conceptualising an effective alcohol use prevention approach (Bell et al., 2015; Neuhauser, 2017). By using theoretical constructs to conceptualise the modifiable determinants of health behaviours (Kok et al., 2017), theory can underpin the design of effective behaviour change interventions (Glanz & Bishop, 2010; Webb et al., 2010). Despite this, Roozen et al. (2016) recently highlighted a lack of behaviour change theories being used to develop prevention strategies to address alcohol use in pregnancy. While neglecting to name the paradigm or theoretical basis used in a study does not mean that the intervention is not theoretically-based, failure to adequately document the development of messages means that the lessons learned from undertaking these evaluations are limited and lack detail sufficient for replication. No review to date has explored the method by which messages are developed, what they target and their efficacy. Therefore, it is unknown the extent to which existing health

promotion messages about alcohol use in pregnancy use different strategies and whether these strategies are efficacious.

This review was originally designed to look at the use of specific methods of message design such as tailoring messages to specific characteristics of individuals (Noar et al., 2009); however, the limited number of studies that document the design, delivery and/or evaluation of health promotion messages about alcohol and pregnancy meant that this focus was not possible. Instead, the decision was to focus on collating information on the processes used to design health promotion messages about alcohol use in pregnancy and the evidence for the efficacy of those messages. Therefore, this review aims to identify the strategies that have been used to design health promotion messages about alcohol use behaviour change during pregnancy and to summarise the evidence supporting the use of such strategies. The full protocol is registered and available on PROSPERO¹.

2.2 Methods

2.2.1 Eligibility

Studies were included if they reported on the design and/or evaluation of at least one health promotion message designed to reduce the risk of alcohol use during pregnancy. Any commentaries, doctoral theses, published abstracts and/or study protocols, and reviews or meta-analyses of the literature were excluded. Studies that had no description of message content were also excluded.

2.2.1.1 Search Strategy

The electronic databases MEDLINE, Embase, PsycINFO, CINAHL and Web of Science were searched on the 18th of November 2020 (with an updated search conducted on the 24th of January 2022). Studies were eligible for inclusion if they were conducted with pregnant people or those who could become pregnant. Search terms for pregnancy (e.g., pregnancy, pregnant, antenatal, prenatal, antepartum) were combined with health promotion (e.g., health promotion, public health, health campaign, messages/ing, health communication, primary prevention, social marketing) and with alcohol (e.g., alcohol, drink, ethanol, binge drinking, fetal

¹ https://www.crd.york.ac.uk/prospero/display_record.php?ID=CRD42020207499

alcohol). The specific search terms used were adapted for each individual database with the assistance of a university librarian. The search was restricted to studies written in English and published since 2010, when most alcohol guidelines (e.g., Australia, United Kingdom, the United States) were recommending either abstinence or considerable reduction in alcohol use in pregnancy (Tsakiridis et al., 2021).

2.2.1.2 Study Selection and Data Extraction

Records were exported to Endnote, and duplicates were identified and removed. Covidence (Covidence, 2022), an online software for the synthesis of healthcare evidence, was then used to screen titles, abstracts, and article types for eligibility with a 100% cross-check by a second reviewer. The relevant full texts were then independently examined by two reviewers. Any disagreement over eligibility was resolved through discussion with the research team. Data were extracted using a template designed specifically for this study and then exported to an excel spreadsheet.

A total of 1444 studies were screened at the title and abstract level; of these, 67 were selected for full-text screening, 17 of which were retained. See Figure 2.1. for a diagram outlining the search results and study selection process using the preferred reporting items for systematic reviews and meta-analysis (PRISMA; Liberati et al. (2009)). In addition to the studies identified in the initial search, an updated search was conducted prior to the publication of the review resulting in the addition of one more study (Lemon et al., 2021). See Table 2.1 for a summary of study characteristics.

2.2.1.3 Assessment of Study Quality

Due to the diversity of methodological approaches the quality of the included studies was assessed using the Quality Appraisal for Diverse Studies tool (Harrison et al., 2021). Using the tool, studies are assessed across 13 criteria rated along a 4-point scale (0 to 3) with total scores ranging from 0 to 39 for any one study. The tool specifies that there are no score cut-offs for categorising papers into 'high' or 'low' quality, therefore the papers are compared and a general overview provided regarding the areas of strongest and weakest performance.

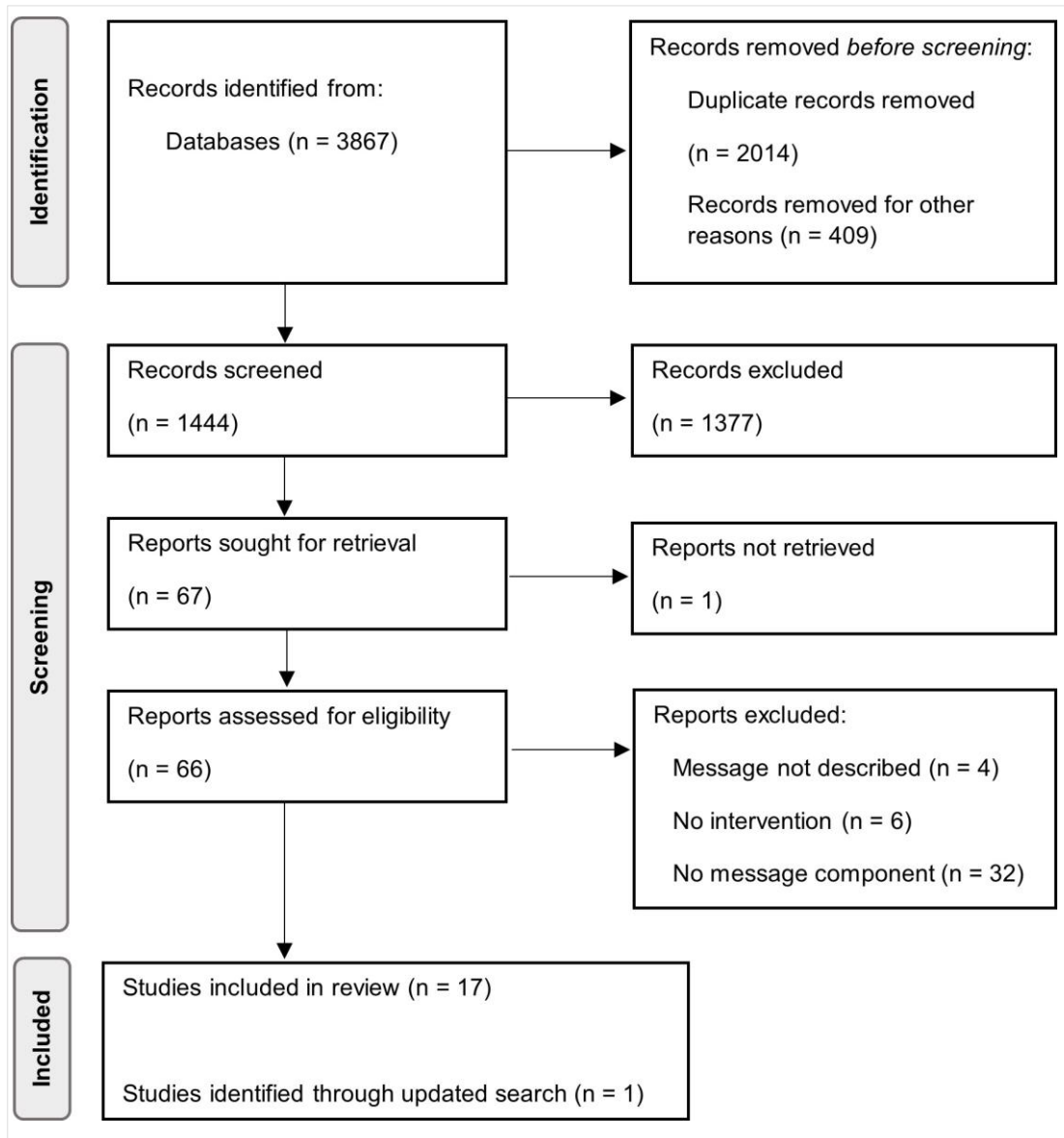
Figure 2.1*PRISMA flow diagram of the search strategy and study selection*

Table 2.1*Summary of study characteristics*

Author (year) Location Study design	Participant details	Total number of participants
Bazzo (2012) Italy Cross-sectional study	Parents or caregivers of children (0-2 years).	<i>N</i> = 690 565 female, 106 male
Bazzo (2015) Italy Observational comparative study	Pregnant women in final stages of pregnancy.	<i>N</i> = 250 127 intervention, 123 control
Crawford-Williams (2016) Australia Randomised controlled trial	Pregnant women in the 2 nd trimester of pregnancy.	<i>N</i> = 161 baseline 82 intervention, 79 control <i>N</i> = 96 follow-up 49 intervention, 47 control
Driscoll (2018) USA Formative evaluation study	Women of child-bearing age.	<i>N</i> = 2132 baseline <i>N</i> = 1182 baseline & follow-up
Dumas (2018) France Cross-sectional study	Pregnant and postpartum women (2 nd and 3 rd trimester or 1-3 months postpartum). Set quotas were applied for age, location, and occupation.	<i>N</i> = 3603
Evans (2012) USA Randomised controlled trial	Pregnant women presenting to a medical centre for their first pre-natal care appointment.	<i>N</i> = 123 baseline <i>N</i> = 90 follow-up

Author (year) Location Study design	Participant details	Total number of participants
Evans (2014 & 2015) USA Randomised controlled trial	Pregnant women presenting to a military medical centre for their first antenatal care appointment.	<i>N</i> = 943 baseline <i>N</i> = 459 4-week follow-up <i>N</i> = 231 postpartum follow-up
France (2013) Australia Formative evaluation study	Exploratory: Women who were currently pregnant, intending to become pregnant or had been pregnant within 3 years. Concept testing: Participants including women who met phase 1 criteria and male partners of recently pregnant women.	<i>N</i> = 23 <i>N</i> = 31
France (2014) Australia Randomised controlled trial	Women of child-bearing age.	<i>N</i> = 470 (116 pregnant women)
Hanson (2012) USA Cross sectional study	Formative work: Elder tribal women, adult women aged 18-44, and men and women of all ages. Evaluation: American Indian women of childbearing age (18-44)	<i>N</i> = 40 10 elder tribal women, 5 adult women aged 18-44, and 25 men and women of all ages <i>N</i> = 119
Lemon (2021) Australia Qualitative study	Development: Health service staff. Yarning circles: Community members aged 18 years and over who identified as being of Aboriginal and/ or Torres Strait Islander descent.	Unknown number. <i>N</i> = 35
Letourneau (2017) USA Randomised controlled trial	A subset of Hispanic women who participated in a larger study (Sobell, 2017).	<i>N</i> = 89

Author (year) Location Study design	Participant details	Total number of participants
Lowe (2010) USA Randomised controlled trial	Pregnant women waiting for appointments at 20 women, infant and newborns program sites.	<i>N</i> = 700 321 usual care, 379 intervention
Toyama (2014) Japan Randomised controlled trial	Women pregnant for the first-time attending maternity class.	<i>N</i> = 257 tailored=84, non-tailored=102, control=71
Sobell (2017) USA Randomised controlled trial	Women of child-bearing age who were at risk of an alcohol-exposed pregnancy (due to contraceptive practices and alcohol use).	<i>N</i> = 354
Sudo (2011) Japan Qualitative study	Women 5 to 8 months into their first pregnancy.	<i>N</i> = 33
Yu (2010) USA Randomised controlled trial	Female undergraduate students aged 18-25 years.	<i>N</i> = 213

2.3 Results

Of the 18 included studies, half were stand-alone studies, while the remainder were associated manuscripts that documented different aspects of the same intervention or reported on some combination of formative work, pilot-testing, and follow-up evaluation. Three papers that reported on the same intervention and sample of participants are referred to in conjunction from this point on (Sobell et al. (2017) and Letourneau et al. (2017), Evans et al. (2014) and Evans et al. (2015)) meaning that 16 individual studies are included in this review. Seven studies were conducted in the United States, four in Australia, two in Italy, two in Japan and one in France. Eight studies were randomised controlled trials, four were observational/cross-sectional, two were formative evaluations, and two were qualitative studies.

2.3.1 Study Quality

After assessing study quality Hanson et al., (2012), Sudo (2011) and Toyama and Sudo (2014) were found to have the lowest scores, with 13 out of a possible 39. The three studies with the highest scores were Evans et al., (2012), Crawford-Williams et al., (2016) and France et al., (2013) with scores over 33. The remaining studies had scores ranging from 18 to 30. The area in which the papers performed poorest was regarding the use of a theoretical or conceptual underpinning with 6 out of 18 making no mention of any. The other two areas of low performance were the provision of a rationale for the choice of data collection tools and the justification provided for the chosen analytic method. In comparison, provision of a clear and thorough statement of aims was an area in which the vast majority of studies scored highly, i.e., either a 2 or a 3. Additionally, the majority of included studies had appropriate study designs and methods of analysis to address the stated aims. Furthermore, only one study made no mention of how the data were analysed (Hanson, et al., 2012) while two studies used methods of analyses that only broadly addressed the stated aims. Both Hanson et al., (2012) and Toyama and Sudo (2014) made no mention of the strengths and limitations of their studies while Bazzo et al., (2015), Crawford-Williams et al., (2016), Letourneau et al., (2016), Lowe et al., (2017) and Sudo (2011) made very limited mention of the strengths and limitations of their respective studies. The remaining 11 studies provided relatively thorough discussions of the strengths and limitations.

2.3.2 *Message Delivery*

In terms of message delivery, six delivered their message via print media (e.g., posters, banners, and brochures), five studies documented a multi-media campaign for message dissemination, three presented their message as an advertisement concept (e.g., a storyboard or script), while two delivered their message as part of an intervention using text-messages. A summary of message types, content and primary aims are included in Table 2.2.

Table 2.2*Summary of message type, content and aims*

Study (date)	Message type	Objective	Framework	Primary message described	Additional messages described	Imagery
Bazzo (2012 & 2015)	Multi-media campaign.	Raise awareness of impact of alcohol on fetal development.	Social marketing	'Mum drinks, baby drinks'	<i>"drinking alcohol during pregnancy and breast-feeding can damage the physical and mental development of your baby"</i> <i>"avoid drinking during pregnancy, breastfeeding and while trying to conceive"</i> <i>"your doctor, midwife and family members can help you remember"</i>	A clear glass containing a distinctive drink that is popular in the local area. Within the glass was a photo-realistic rendition of a developing fetus with the implication that the baby is 'soaking' in the alcoholic beverage.
Crawford-Williams (2016)	Brochure	Increase knowledge about, change attitudes to and reduce alcohol use in pregnancy.	Knowledge, attitudes and practice model.	N/A	N/A	Unknown.
Driscoll (2018)	Posters	Increase knowledge about risks of drinking while pregnant.	None specified.	Any level of use can be harmful	<i>"any alcohol use during pregnancy can cause life-long health problems for the child"</i> <i>"the prospective adverse health outcomes associated with FASD are severe and difficult to address"</i> <i>"A woman should be aware of her potential pregnancy status prior to consuming alcohol"</i>	Image of a woman facing side-on in silhouette, holding up a large bottle of an unknown liquid and taking a drink. The image showed the path of the liquid through their throat and directly down into a depiction of a uterus containing the silhouette of a fetus.

Study (date)	Message type	Objective	Framework	Primary message described	Additional messages described	Imagery
Dumas (2018)	Warning label on beverages and communication campaign in print media and radio.	N/A	N/A	<i>“Zero alcohol during pregnancy”</i>	N/A	The design of the compulsory warning was not mandated, however the most common design was a small pictogram with the silhouette of a visibly pregnant woman side-on drinking out of an open glass/cup. This silhouette is encased by a red circle with a diagonal line drawn through it, with the implication being that the behaviour of drinking while pregnant was prohibited.
Evans (2012)	Text-messaging intervention.	Increase knowledge about risks of drinking while pregnant.	None specified.	Risks of alcohol use in pregnancy	Not known.	None.
France (2013 & 2014)	Storyboard.	Increase intentions and confidence to abstain.	Social cognitive theories focussing on threat and self-efficacy	No alcohol during pregnancy is the safest choice.	<p>Self-efficacy: <i>“If you were pregnant and trying to stop drinking alcohol during social situations it could be easier than you thought”</i></p> <p>Threat: <i>“If you drank alcohol during pregnancy the impact on the unborn baby could be mild, moderate or severe”</i></p>	<p>Self-efficacy storyboard: Not visibly pregnant woman with friends.</p> <p>Threat storyboard: Visibly pregnant women in a waiting room, not visibly pregnant woman & partner talking with an obstetrician.</p>

Study (date)	Message type	Objective	Framework	Primary message described	Additional messages described	Imagery
Hanson (2012)	Multi-media campaign.	Provide culturally appropriate information to women about alcohol use in pregnancy.	Social marketing.	Not known.	Not known.	Traditional imagery (turtle amulet/cepka and 'granddaughter dolls') was incorporated throughout the campaign. A poster was also made that represented a visibly pregnant woman at a party who is holding her pregnant stomach and not drinking.
Lemon (2021)	TV ad scripts.	Provide culturally appropriate information to women about alcohol use in pregnancy.	None specified.	<i>"Drinking grog while pregnant can cause FASD"</i>	<i>"Grog during and after pregnancy is No Good for Dad, Mum and Bub"</i>	Four scripts were developed with each focussing on one element of the life course, i.e., from planning a pregnancy through to the young adulthood of a healthy man. Each ad ended with a black screen with an image of a pregnant woman in profile with her hands on her stomach and a fetus represented in utero.
Lowe (2010)	Multi-media i.e., a TV commercial, videotape/DVD and a brochure.	Encourage women to talk to family and friends about alcohol use in pregnancy	None specified.	<i>"Being a good mother starts early and lasts a lifetime"</i>	N/A.	Unknown.

Study (date)	Message type	Objective	Framework	Primary message described	Additional messages described	Imagery
Sobell (2017) & Letourneau (2017)	Brochure.	Motivate women to make healthy choices around planned and unplanned pregnancies.	Motivational interviewing principles and the Transtheoretical Model.	How to make healthy choices around contraception, drinking and other health behaviours if pregnant (e.g., exercise, vitamins, smoking)	Control: <i>"Think before you drink"</i>	Control: Various, photo of woman's head & hands drinking a glass of wine, photo of woman's silhouette cradling a pregnant stomach, photo of a woman holding a baby, both facing camera, photo of a glass of wine. Intervention: Various, including photo of a smiling women sitting and leaving over and a cartoon depicting silhouette of woman's torso with fetus visible.
Sodo (2011) & Toyama (2014)	Leaflet.	Not specified.	None specified.	Multiple.	Control: Information on how alcohol impacts development in the womb, introduces the concept of FAS and that there is no known safe amount of alcohol. Intervention: Information on "What a mom can do for her baby to be born" including that there is no known safe amount or time to drink while pregnant.	Control: The leaflet has two simple cartoon images, one of a visibly pregnant woman at a table drinking out of a wine glass and a fetus visible in her womb and another of a woman breastfeeding an infant. Intervention: Similar to the control leaflet except that instead of cartoons, it features a photo of a young baby on the front cover, includes a bar graph about the effects of drinking on development, and includes a photo of a young child with facial features characteristic of FAS.
Yu (2010)	Text-based newspaper 'ad'.	Not known.	Prospect theory and exemplification theory.	Not known.	Not known.	None, print only.

2.3.2.1 Print

Of all the message delivery formats, print was the most common, but using a diverse range of methods. For example, Driscoll et al. (2018) conducted a pilot study and evaluation of two different FASD prevention campaigns where posters were placed either on pregnancy test dispensers or on the walls of women's bathrooms/toilets in venues that served alcohol. Crawford-Williams et al. (2016), on the other hand, conducted a randomised control trial that provided participants with a booklet that outlined various aspects of alcohol use in pregnancy and included recipes for mocktails as an alternative to alcoholic drinks. Sobell et al. (2017) and Letourneau et al. (2017) both report on different aspects of the same self-administered intervention to prevent alcohol-exposed pregnancies that also used brochures to deliver the messaging. The intervention was an adaptation of a multi-session intervention (Floyd et al., 2007) and involved exposure to brochures that explored alcohol use in pregnancy and contraception practices and encouraged participants to make a choice of behaviour change that would reduce their risk of an alcohol-exposed pregnancy. Sobell et al. (2017) evaluated the adapted intervention by comparing the results between students and non-students, while Letourneau et al. (2017) reported on a sub-sample of the same study participants and compared the outcomes of those receiving the intervention materials in Spanish language or English. Sudo (2011a) and Toyama and Sudo (2014) also used print media to promote abstinence from alcohol in pregnancy. Sudo (2011a) conducted focus groups to explore the acceptability of two leaflets promoting abstinence from alcohol in pregnancy, and Toyama and Sudo (2014) conducted a follow-up study that explored the efficacy of the same two leaflets, with one having been changed slightly.

2.3.2.2 Multi-media

Of the five studies that explored the design, implementation, and evaluation of a multi-media campaign, two were about the same health communication campaign with the aim of raising awareness about and reducing alcohol use in pregnancy in a local health region in Italy (Bazzo et al., 2015; Bazzo et al., 2012). This campaign was disseminated via several methods, including television advertisements, news segments, street and bus banners, posters in cafes and restaurants, and leaflets. Hanson et al. (2012) also used an observational design to evaluate a multi-media campaign.

The campaign aimed to increase awareness of FASD among a community of First Nations people in the United States of America. It was delivered via posters placed throughout the community (e.g., at medical centres), ads on the radio and in newspapers, and through community outreach activities (e.g., booths at local fairs and community centres). Lowe et al. (2010) described a health promotion intervention embedded within a supplemental food and nutrition program for low to moderate-income women. The intervention was delivered in the form of a short television commercial, a 10-minute educational DVD, and/or a brochure and was targeted at encouraging women to talk to family and friends about alcohol use in pregnancy. Compared to the other studies that explored multi-media campaigns, Dumas et al. (2018) did not have control over the campaign itself, instead of employing an observational approach to evaluate the impact of a compulsory warning about alcohol use in pregnancy placed on alcoholic beverages in France 5 years afterwards. The authors note that a health promotion campaign was also conducted; however, it is unknown exactly what this campaign entailed as it is not outlined in the study.

2.3.2.3 Concept testing

Four studies used experimental methods to compare the acceptability and efficacy of health promotion messages presented as advertisement concepts. Two studies by France et al. report on the formative work and pilot testing used to develop health promotion messages about alcohol use in pregnancy (France et al., 2013) and the subsequent evaluation of those messages (France et al., 2014). Both France et al. (2013) and France et al. (2014) used experimental message concepts presented as storyboards to outline a potential advertising campaign to participants. Yu et al. (2010) also used an experimental approach to investigate different adverts; however, the messages were presented as public service announcements like those that would appear in newspapers. Lemon et al. (2021) also pilot-tested potential messages; these were aimed at preventing prenatal alcohol exposure in a central Australian community and were piloted as scripts for television adverts read out by the researchers.

2.3.2.4 Text-messages

Three papers by Evans et al. focussed on evaluating a text-messaging-based intervention for health behaviour in pregnancy called Text4Baby (Evans et al., 2014; Evans et al., 2015; Evans et al., 2012). The aim of the intervention was to encourage

healthy behaviour in pregnancy and targeted a range of behaviours such as smoking, healthy eating, taking prenatal vitamins and alcohol use. Participants in the intervention documented by Evans et al. (2012) received three text messages per week, with an unknown number being about alcohol use in pregnancy. In comparison, participants in the trial reported in Evans et al. (2014), and Evans et al. (2015) received approximately 250 text messages across 17 topics throughout pregnancy, with six of the messages focussed on the risk of alcohol use in pregnancy.

2.3.3 Development

All studies included in this review bar one, Dumas et al. (2018), describe some aspect of the development of health promotion messages; however, the methodology and level of detail provided varies greatly. Dumas et al. (2018) focussed on a warning made compulsory by the government and a health promotion campaign organised by an un-named external body, so no description of the message development is provided. Of the remaining studies describing message development, two studies reported using a marketing agency to develop the messaging, ten described the use of formative research, and five mentioned using a theoretical approach or framework.

2.3.3.1 Formative Work

Ten studies describe the use of formative work to inform the development of health promotion messages, six of which conducted formative work with members of the target audience, one consulted/collaborated with external experts, and three did both. Half of the studies referring to formative work mentioned how the findings explicitly impacted the development of the message. In contrast, others provide no detail beyond mentioning prior work. The depth of the formative work also varied. Some studies went beyond the more common method of refining draft materials through consultation or piloting with the target audience, and conducted qualitative work to identify their beliefs, attitudes, and knowledge about alcohol use in pregnancy before designing the messages. For example, France et al. (2013) conducted extensive formative work before developing messages for use in their follow-up study (France et al., 2014). First, exploratory focus groups were undertaken with transcripts, then thematically analysed. The results were then used to inform the development of message strategies that incorporated women's motivations for behaviour change and the feelings associated with that motivation. The message concepts were then reviewed

in additional focus groups, the results of which were used to refine the messages for use in a further study, France et al. (2014). Lowe et al. (2010) stated that message development was based on formative work described in another text, Baxter et al. (2004), in which semi-structured interviews with women were used to explore the discourse regarding alcohol use in pregnancy. An additional text that is stated as having informed the design of the messages is a book chapter discussing strategies for health promotion messaging that have been used in prior research (Atkin, 2002). Exactly how either the formative work or book chapter were used to design messages for Lowe et al. is not made explicit. However, Lowe et al. (2010) does refer to the finding from Baxter et al. (2004) that rural women were reticent to discuss alcohol use in pregnancy with friends and family as justifying the decision to focus on designing messages that encouraged women to discuss alcohol use in pregnancy.

The development of materials for Crawford-Williams et al. (2016) was informed by learnings from focus groups with members of the target audience to gain feedback on existing health promotion materials (Crawford-Williams, Fielder, Mikocka-Walus, & Esterman, 2015). Content that was explicitly included due to this prior work included the provision of reasons to avoid alcohol, facts about general nutrition, and potential alcohol alternatives. The authors noted that members of the target audience also stated that they would welcome the addition of positive messages and not only negative or fear-based material. The development of the messages for this study was also informed by a critical review of existing printed materials about alcohol use in pregnancy that the primary author had conducted previously (Crawford-Williams, Fielder, Mikocka-Walus, Esterman, et al., 2015). The review identified the common strengths and areas for improvement and the authors concluded that their material should include easy-to-read language to ensure an equitable reading grade level. Other considerations were to provide evidence-based information, date of publication and links for additional information.

One study in particular also used formative research to ensure that materials were culturally and linguistically appropriate and relevant. Hanson et al. (2012) states that a marketing firm was engaged to conduct focus groups with a member of the target audience, local First Nations women. The themes identified from the focus groups, using an unknown analytical methodology, were then incorporated into the materials

developed for the campaign, i.e., use of traditional language (Lakota) and imagery (turtle amulet/cepka and ‘granddaughter dolls’).

The development process, as outlined by Sudo (2011a) and Toyama and Sudo (2014), was less carefully elucidated. The first leaflet was publicly available and created by an external, non-profit organisation, so there is no information in the manuscript, aside from a description and the source, which provides detail on its development. The second leaflet was made specifically for the project and was developed with respect to findings of an additional paper by the same author (Sudo, 2011b); however it is not mentioned exactly how. Despite being published earlier in the same year, the study is not mentioned in Sudo (2011a) and did not appear in the original search for papers. Although not explicitly mentioned as related studies, the number of participants and demographic characteristics of the participants suggest that the same sample was used for both studies. The paper describes the testing of multiple drafts of a leaflet and the incorporation of feedback resulting in a final version tailored to the preferences of the target population, women pregnant for the first-time attending maternity classes. The leaflet used in Toyama and Sudo (2014) appears to be very similar except for some slight wording differences and the inclusion of the statement “Refrain from drinking during lactation as well” there is no mention of why these changes were made.

Yu et al. (2010) also conducted some pre-testing with the target audience; this was done with a small group of target audience members to ensure the messages had face validity; however, this process and the impact on the development of the messages is not explained. The authors did note that the data were collected as part of a larger study so additional detail may be found there; however, this study is not linked and, if it was published, we were unable to easily locate it. In terms of expert review panels, an earlier paper that describes the development of the intervention used in Evans et al. (2012), Evans et al. (2014), and Evans et al. (2015) states that the messages used in the Text4Baby program were developed through a collaboration between multiple national health organisations and reviewed by a panel of experts from several health disciplines (Jordan et al., 2011). Note, the paper describing this did not appear in the search results for this review, presumably because there was no actual mention of alcohol in the actual manuscript.

The remaining studies combined methods, for example, Driscoll et al. (2018) detail how an expert advisory panel of local health professionals developed the initial draft of the prevention message with particular focus placed on the clarity, creativity, and personal relevance of the messages to maximise engagement and limit any potential stigma. A panel of an unspecified number of women then reviewed the materials and provided feedback, the nature of which was not detailed, nor was it made clear whether the feedback was incorporated into the message. Lemon et al. (2021) also combined expert consultation and pilot testing; first, local health promotion experts embedded within a community health service developed scripts for four television commercials to prevent prenatal alcohol exposure in a central Australian community. The scripts were then reviewed by a panel of external experts, revised over nine months, and piloted with local community members in yarning sessions (i.e., open, informal, and semi-scripted conversations with participants driving the conversation). The study's authors reported that changes to wording and taglines were made in response to findings from the yarning sessions and that consideration was given to those chosen to act in the campaign.

In comparison to these in-depth explanations, the campaign described in Bazzo et al. (2012) and Bazzo et al. (2015) was an initiative of the local health authority in the region, and the dissemination and evaluation plan was developed as a collaboration between professionals in the health organisation and university researchers, so little detail is provided. A research communication firm was then contracted to develop the resulting advertising campaign. Bazzo et al. (2012) and Bazzo et al. (2015) also stated that prior formative work was conducted exploring the alcohol use behaviours of local pregnant women and the opinions of healthcare workers about alcohol use in pregnancy. However, this work was unpublished, and it is not specified how it informed the resulting campaign's design.

2.3.3.2 Theoretical and Other Frameworks

Five studies mention using a theoretical framework to inform message development, with three studies going into some detail about how the framework was used. Two studies used a broad range of social cognition models; however, the level of detail provided varied. For example, Evans et al. (2012) state that the messages were designed using social cognition models, such as social cognitive theory, the

transtheoretical model and the health belief model, as the theoretical underpinning. Exactly how this was done is not clear. Evans et al. (2014) and Evans et al. (2015) report on the same randomised control trial that is conducted as a follow-up to Evans et al. (2012); however, it is not clear how or if the messages were changed between studies. Evans et al. (2014) and Evans et al. (2015) do report that the messages use the same theoretical underpinning as Evans et al. (2012) but also state that the messages are designed to build self-efficacy amongst participants and to use cues to action to prompt behaviour change. France et al. (2013) and France et al. (2014), on the other hand, also used social cognition models, such as the theory of planned behaviour (Fishbein & Ajzen, 1975), social cognitive theory (Bandura, 1977), protection motivation theory (Rogers, 1975) and the health belief model (Becker, 1974), to both analyse focus group transcripts and to inform the development of message strategies. Women's motivations for behaviour change and the feelings associated with that motivation were then incorporated into four message concepts. Specifically, these were built on the concepts of self-efficacy, positive social norms, positive motivation (e.g., feeling in control), barrier avoidance, self-approval, threat appeals and risk severity. The authors of the follow-up study also provided supplementary material that provides detail on the communication and modelling objectives used to design the message concepts.

Although not a framework based in theory, two studies reported using social marketing principles in the development of health promotion messages. Firstly, Bazzo et al. (2012) and Bazzo et al. (2015), who primarily focussed on highlighting the impacts of alcohol use in pregnancy on fetal development using social-marketing principles, and secondly Hanson et al. (2012), who used a social marketing approach to execute the message ideas raised in formative work. The remaining three studies all used different approaches. Crawford-Williams et al. (2016) specified that they drew on the knowledge, attitudes, and practices model to guide the development of the intervention and Yu et al. (2010) designed messages using prospect theory and exemplification theory. Finally, the brochure used in the studies by Sobell et al. (2017) and Letourneau et al. (2017) was based on a brief intervention, described by Floyd et al. (2007), that used motivational interviewing and drew on concepts from the Transtheoretical Model. How the study materials were adapted into the brochures used for Sobell et al. (2017) and Letourneau et al. (2017) is not specified.

2.3.4 Evaluation

Lemon et al. (2021) did not evaluate the final campaign, so findings from the development stage are described above only. Four studies exposed participants to a campaign and evaluated outcomes after only, and seven studies conducted both pre and post evaluations of interventions.

2.3.4.1 Post-exposure

Two studies evaluated the same campaign at two different time points; Bazzo et al. (2012) documented the response to a campaign one year after it launched in the community, whereas Bazzo et al. (2015) conducted a 3-year follow-up. Participants in the 1-year follow-up completed a questionnaire that used the campaign's imagery and explored participants' reactions to the campaign regardless of exposure prior. The 3-year follow-up compared outcomes between the residents of a town exposed to the campaign versus a town that was not exposed. To ascertain their level of awareness about alcohol use in pregnancy, participants were shown an image of a visibly pregnant woman drinking alcohol at a party and asked what they noticed, with the identification of alcohol use in pregnancy being considered a correct answer. Participants were also asked about the alcohol content of a series of beverages with different percentages of alcohol, with the correct answer being that they all contained the same amount. The other two studies assessed participants' outcomes after exposure via telephone assisted interviews; Dumas et al. (2018) contacted participants 5 years after campaign activities were first launched and Hanson et al. (2012) did so 3-5 years after the campaign was initially disseminated.

In comparison, Yu et al. (2010) randomly exposed participants to one of four messages that combined either a loss or gain-framed message with a statistics or exemplar appeal. Loss or gain appeals focused on children with or without FASD, respectively, and statistics or exemplar appeals highlighted either numbers or personal stories, respectively. Participants were randomly exposed to one of the messages, presented as text-only newspaper ads, in a classroom setting and then completed a questionnaire immediately afterwards.

2.3.4.2 Pre/post-exposure

The remaining studies collected data pre- and post-exposure to a health promotion message, with follow-up times varying from 2 weeks to 6 months. Participants in the study by Crawford-Williams et al. (2016) completed a baseline questionnaire, either received standard antenatal care or standard care and a brochure which they were instructed to read and share with friends; they then completed a follow-up questionnaire four weeks later. Participants in the text-messaging intervention described by Evans et al. (2014) completed both a baseline and a 4-week post-enrolment follow-up questionnaire. Evans et al. (2015) explored the dose-response effects of the same randomised control trial but with an additional follow-up questionnaire completed at their first medical appointment post-partum. In Lowe et al. (2010), pregnant women were randomised to receive either a copy of both an educational DVD and brochure or usual care only. Every participant was instructed to not drink alcohol while pregnant as part of usual care and had an opportunity to watch the TV commercial. A questionnaire was completed at baseline and at a 3-month follow-up. Participants in the study by Toyama and Sudo (2014) completed baseline questionnaires, were shown one of two educational leaflets or no leaflet, completed a questionnaire two to three weeks post-intervention and another follow-up questionnaire three to four months later. Participants in the intervention evaluated in both Sobell et al. (2017) and Letourneau et al. (2017) completed a baseline assessment and a follow-up questionnaire six months after receiving the relevant brochures. France et al. (2014) followed a similar approach to the study by Yu et al. (2010), where participants completed the outcome measures immediately after exposure. However, France et al. (2014) also had participants complete a baseline questionnaire prior to exposure to one of four messages, three experimental and one control. The study by Driscoll et al. (2018) did not follow a strict pre-post evaluation approach as participants completed a baseline questionnaire at the time of or shortly after exposure. Posters were placed in two different places in women's bathrooms/toilets, walls, or pregnancy test dispensers, at a series of locations matched by several characteristics such as demographics and participants were provided with the link to complete the baseline questionnaire. Those that did were then sent a follow-up questionnaire six months after exposure to the campaign.

2.3.4.3 Evaluation Findings

The studies included in this review explored a variety of outcomes associated with exposure to a health promotion campaign or message; six studies assessed measures of feasibility and acceptability, ten assessed a combination of knowledge, attitudes and/or beliefs, and seven identified behaviour change outcomes. For those studies that documented responses to community-level campaigns, measures such as recognition and recall provide insight into the campaign's feasibility. For example, Bazzo et al. (2012) found that almost all participants recalled the main message communicated in the campaign, with the accurate recall of the health message being significantly higher for those who remembered having seen the campaign during its original run versus those who saw it for the first time in the questionnaire. Dumas et al. (2018) also found that two-thirds of the participants had noticed an alcohol warning label. Those who reported drinking alcohol before pregnancy were more likely to have noticed the label. Two studies explored message recognition in terms of whether messages and campaigns conveyed what they intended to. Dumas et al. (2018) found that the majority of those who had noticed the label also recognised that it suggested that women should abstain from alcohol while pregnant as opposed to reducing their consumption. Additionally, France et al. (2014) found that most participants identified the correct intended message for each condition apart from the combined threat and self-efficacy message where only half were able to.

Several studies also assessed acceptability; for example, although most participants reacted strongly to the campaign message used by Bazzo et al. (2012), it appeared to be divisive as equal numbers of participants either accepted or refused it. In comparison, Hanson et al. (2012) found that the large majority of participants found the campaign to be culturally appropriate. As one of the only studies to specifically explore emotional reactions and unintended effects of exposure to the message, France et al. (2014) found that messages containing a threat element resulted in participants experiencing negative emotions, including worry and guilt. In contrast, a self-efficacy-only message resulted in positive feelings such as relief. However, few participants reported defensive reactions or agreed with potential unintended effects such as drinking the same amount of alcohol while pregnant or considering termination of pregnancy. Findings from the yarning sessions conducted by Lemon et al. (2021) indicated that concepts from the TV scripts, e.g., community strength and the role of

men, resonated with the participants. Overall, the feedback to the campaign materials was mostly positive and little to no negative feedback was received. Studies also found conflicting results in terms of acceptability; for example, Sudo (2011a) found that a higher percentage of participants agreed that they would prefer to take the tailored leaflet versus the generic leaflet; however, in a follow-up study, Toyama and Sudo (2014) found that a greater percentage of those who received the non-tailored leaflet read it completely compared to those who received the tailored leaflet.

Those studies that assessed knowledge change found mixed results; additionally, the level of evidence supporting the findings varied. Bazzo et al. (2015) found no statistically significant difference between knowledge scores for those exposed to the intervention and the control group, whereas Lowe et al. (2010) found that knowledge about the effects of alcohol had significantly increased for the intervention group but not the control. Toyama and Sudo (2014) also found a significant increase in knowledge of FASD for participants in both intervention groups; however, there was no control condition. Improvements in knowledge about alcohol use in pregnancy and FASD were also found by Crawford-Williams et al. (2016) and Driscoll et al. (2018), respectively. Crawford-Williams et al. (2016) found that knowledge was significantly higher for those exposed to the intervention. Driscoll et al. (2018) compared the outcomes of two different message delivery mechanisms, posters on the wall of a women's bathroom or a pregnancy test dispenser, and found that women in both groups showed improvement in knowledge of FASD. However, those in the dispenser group had significantly higher scores across both time points than those in the poster group. Although the large majority of participants in the study by Hanson et al. (2012) reported that their knowledge about FASD and the effects of alcohol use in pregnancy on children had increased, actual knowledge was not measured in this evaluation and no statistical analysis was undertaken. Additionally, although Dumas et al. (2018) reported on knowledge of risks and perceptions of risk thresholds, these were not examined in relation to exposure to the campaign message; therefore, conclusions about the campaign's impact cannot be drawn.

Several studies explored attitudes, perceptions, and beliefs, with both Crawford-Williams et al. (2016) and Evans et al. (2012) finding that participants were more likely to hold negative attitudes towards alcohol use in pregnancy after exposure to the interventions. Evans et al. (2015) also explored the effects of message dosage

on attitudes and found no significant results. A number of studies also assessed specific beliefs; for example, Bazzo et al. (2015) found that pregnant women not exposed to the campaign were statistically more likely to agree that pregnant women are safe to drink two ‘tails’ of wine (i.e., a common amount of wine served in Italy that is two fingers deep in a small glass). Additionally, Evans et al. (2014) found that agreement with the statement that “Drinking alcohol will harm the health of my developing baby” increased significantly for those in the intervention group, and Toyama and Sudo (2014) found that the proportion of women that stated that abstinence was necessary during pregnancy increased for those in one of two intervention conditions only, (non-tailored leaflet). Yu et al. (2010) explored perceptions of the severity of FASD after exposure to exemplar appeals and found no main effects; however, perceived severity was higher for those exposed to the loss-exemplar appeal as compared to the gain-exemplar appeal. The effect of gain and loss-framed exemplar appeals on perceived fear was also explored, with the loss-exemplar appeal eliciting greater fear. Additionally, internal and external efficacy were both significantly more likely to be higher for those exposed to gain-statistics vs. loss-statistics.

Of those studies that assessed change outcomes, eight measured actual alcohol use behaviour, two measured intentions and one study measured additional behaviour change outcomes directly related to the aim of the intervention. Specifically, Lowe et al. (2010) explored whether women talked to friends about alcohol use in pregnancy after exposure to the campaign and found that significantly more women in the intervention group than the usual-care group did so. Additionally, for those given the educational DVD, around half passed on information about what they had learned to other women. In terms of alcohol use intentions, France et al. (2014) found that participants’ intentions to abstain from alcohol during a future pregnancy significantly increased under all three conditions whereas confidence to abstain significantly increased under each condition except for self-efficacy only. Yu et al. (2010) also explored whether those exposed to the messages using gain frames would be more likely to intend to know more about FASD and to prevent it. They found that those in the gain-statistics condition were most likely to intend to prevent FASD; however, there was no difference between conditions in intentions to know more.

Four studies found no significant differences in alcohol use behaviour. Toyama and Sudo (2014) found that the majority of participants stated that they “did not drink

at all” at every time point during pregnancy, and drinking behaviour did not significantly change for participants in any of the groups. Crawford-Williams et al. (2016) found that those exposed to the intervention were more likely to abstain; however, this was not a statistically significant finding. In fact, over 70% of participants in the intervention group stated that they had already decided to stop drinking during pregnancy and that the booklet did not provide them with any further motivation. Both Evans et al. (2012) and Evans et al. (2014) also found no significant difference in alcohol use during pregnancy from baseline to follow-up. Evans et al. (2015) also found no effects of message dosage on alcohol use behaviour in pregnancy; however, those who received a higher number of messages did report lower levels of alcohol use behaviour post-partum. Two studies found that alcohol use in pregnancy decreased from baseline to follow-up regardless of the intervention group. Across the whole sample, Driscoll et al. (2018) found that the number of pregnant women who consumed alcohol while knowingly pregnant decreased from baseline to follow-up; however, there were no between-group differences for alcohol use behaviour during pregnancy. Sobell et al. (2017) found that participants in both conditions were less likely to be at risk of an alcohol-exposed pregnancy at follow-up with no differences between groups. However, Letourneau et al. (2017) explored the outcomes of Hispanic participants in the same study outlined by Sobell et al. (2017), and those who chose to receive the materials in English had a significantly lower risk of an alcohol-exposed pregnancy. Additionally, those acculturated to an English-speaking cultural domain were more likely to use effective contraception and less likely to be at risk of an alcohol-exposed pregnancy. Hanson et al. (2012) found that most participants also reported that they had decreased their drinking behaviour as a result of exposure to a health campaign; however, actual drinking changes were not measured and no statistical analysis was undertaken.

2.4 Discussion

The aim of this review was to summarise the peer-reviewed evidence available for health promotion strategies to reduce the risk of alcohol use during pregnancy. The detail provided in the included studies and the strategies used varied greatly, precluding nuanced comparison. Specifically, due to a lack of overlap in study design or level of detail provided about message design and/or content, it is not possible to report on differences in efficacy according to delivery method, incorporation of

formative work, or message content. In terms of message content, an interesting finding was that many of the studies included messages across multiple aspects of a 'healthy pregnancy'. Although potentially effective at creating positive behaviour change and contributing to improvement in health outcomes, when combined together within a holistic or multifaceted health promotion intervention the efficacy of the alcohol messages is not able to be ascertained. Additionally, the studies in this review were not similar enough such that those interventions where the alcohol message is combined with other health messages were able to be compared to those in which the message stands alone.

The studies which attempted to compare message efficacy due to variation in any one of message characteristics, e.g., type, delivery, mechanism, found varying results. For example, Driscoll et al. (2018) compared the use of two different locations to deliver a message about alcohol and pregnancy and found no difference between the groups. In comparison, when exploring language of delivery, Letourneau et al. (2017) found that receiving intervention materials in English was associated with a lower risk of an alcohol-exposed pregnancy. Those studies that compared outcomes according to different message concepts also found varied results, France et al. (2014) found that all three message concepts resulted in increased intentions to abstain from alcohol while pregnant whereas Yu et al. (2010) found that only one of four concepts increased intentions to prevent FASD. These findings suggest that self-efficacy, threat, and gain-frames may be useful strategies to increase intentions to prevent alcohol use in pregnancy. However, fewer than 2% of the participants in the study by Yu et al. (2010) actually intended to get pregnant in the future, meaning that these findings need to be interpreted with caution.

The four studies that delivered the message via a mass-media campaign had the longest follow-up times, from 1 to 5 years, and found mixed results in terms of outcomes. One study found no increase in knowledge scores (Bazzo et al., 2015) while another found that knowledge about the effects of alcohol had increased after exposure to the campaign (Lowe et al., 2010). The two other studies undertook no statistical evaluation of the effects of campaign exposure on outcomes (Dumas et al., 2018; Hanson et al., 2012). This lack of evidence for the efficacy of mass-media campaigns draws attention to the use of such campaigns and the fact that, although health agencies which deliver health promotion campaigns may conduct an evaluation, these findings

are often not publicly available nor are peer-reviewed. The cost associated with conducting this kind of work and the believed limited contribution to scientific evidence is important to consider when designing such campaigns in the future. The frameworks most commonly used were social marketing and social cognition models, like the health belief model. However, these were used by only two studies each and again, the inconsistent level of detail about the way these approaches informed message design and the variety in study designs means that comparison of these frameworks is not possible. Additionally, the links between formative work and theoretical basis were often not made explicit so the relationship between approach used and outcomes was not clear.

2.5 Conclusions

The evidence from research exploring the psychosocial determinants of alcohol use in pregnancy does not appear to be commonly translated into the design of health promotion messaging as documented in the peer-reviewed literature. It is important to note that space available for study details is limited in journal manuscripts and authors must prioritise key details for inclusion. Hopefully, the increase in use of open science principles and online supplementary materials associated with published articles will mean that greater detail will be made publicly available into the future.

To further the translation of research findings into practice it is necessary for evidence to be obtained that supports or rejects the use of discreet strategies to reduce the risk of alcohol use in pregnancy. The study authors would encourage researchers to provide supplementary material outlining the approach taken to design health promotion messages about alcohol use in pregnancy specifically, but all health behaviours more generally. Additionally, increasing the transparency of message design decisions will allow for a greater understanding of the effects of such messages and information sharing about promising strategies and approaches.

Chapter 3

Beliefs About Alcohol Use During Pregnancy

The previous Chapter outlined that there is limited evidence for the application of theoretical principles to the development of health promotion messages and limited detail provided regarding the formative work that contributed to the design of the messages. In light of this the second study of the thesis is dedicated to the exploration of women's beliefs about alcohol use during pregnancy using a mixed-methods approach. Women completed a belief elicitation questionnaire informed by concepts from the theory of planned behaviour.

Paper 2 Is 'A Little' Too Much?: An Exploration of Women's Beliefs About Alcohol Use During Pregnancy.

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Is 'a little' too much?: An exploration of women's beliefs about alcohol use during pregnancy

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Author	Contribution	Signed Acknowledgement
Tess Fletcher	Conceptualisation, Methodology, Data Analysis, Investigation, Data Curation, Writing, Project administration	I acknowledge that these represent my contribution to this research output.
Barbara Mullan	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision.	I acknowledge that these represent my contribution to this research output.
Elizaveta Novoradovskaya	<i>Assisted in:</i> Data Analysis, Writing (Review & Editing)	I acknowledge that these represent my contribution to this research output.
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Abstract

Interventions to address alcohol use during pregnancy need to target underlying determinants of the behaviour. Using the theory of planned behaviour as a theoretical framework, the aim of this study was to identify behavioural, normative and control beliefs regarding alcohol use during pregnancy among a sample of women. 435 women completed a 15-minute online questionnaire designed to identify beliefs about alcohol use during pregnancy. Data were categorised according to type of belief and then summarised and described. The majority of respondents saw few advantages of consuming alcohol during pregnancy and believed that most people would disapprove of alcohol use during pregnancy. Although most women endorsed alcohol abstinence during pregnancy, views on the perceived risk of different levels of alcohol use and perceptions of the 'typical' person who drinks while pregnant varied between participants. This work contributes to the understanding of women's beliefs about alcohol use during pregnancy. Future research should explore how women's beliefs inform their decision making about different levels of alcohol use in pregnancy. Additionally, further research or messaging about alcohol use in pregnancy must also consider the potential for contributing to stigmatising beliefs.

3.1 Introduction

Prenatal alcohol exposure disrupts the development of a child in utero and can result in a cluster of neurodevelopmental deficits and behavioural problems (Khalid et al., 2014). For example, a recent meta-analysis found that prenatal alcohol exposure was associated with deficits in cognitive function across five domains as well as internalising, externalising and attention problems in school-age children and adolescents (Jacobson et al., 2021). Prenatal alcohol exposure is also associated with long-term health impacts, including heart defects (Yang et al., 2015) and liver dysfunction (Liu et al., 2016). The umbrella term, fetal alcohol spectrum disorder (FASD) (Williams & Smith, 2015) is used to refer to particular constellations of these kinds of outcomes that are typically associated with heavy and prolonged use of alcohol. Due to the range of irreversible harms associated with prenatal alcohol exposure, preventing or reducing alcohol use in pregnancy has been recognised around the world as a major public health issue (Senate Community Affairs Reference Committee, 2021).

It is important to note, however, that while there is a large body of research that documents the harmful effects of high levels of prenatal alcohol exposure (Mattson et al., 2011; Subramoney et al., 2018), less is known about the specific effects of low to moderate levels of exposure (Mamluk et al., 2017). For example, while some evidence syntheses have found no effects of low-to-moderate prenatal alcohol exposure on speech and language outcomes (O’Keeffe et al., 2014) or preterm birth (Strandberg-Larsen et al., 2017) others have found that low-to-moderate prenatal alcohol exposure is associated with adverse effects on children’s shifting attention (Pyman et al., 2021) and offspring mental health (Easey et al., 2019). This mixed evidence is partially due to the complexity and range of factors that moderate the impact of alcohol on the fetus, including: the mother’s weight, timing of consumption, age, and metabolism; and difficulties in conducting research that can adequately control for all of those factors in order to establish whether there is any truly ‘safe’ level of alcohol use (Mattson et al., 2011; Roozen et al., 2017). This lack of certainty about the specific risks of low to moderate alcohol exposure is widely interpreted by scientists as a lack of evidence for a safe level of prenatal alcohol use (Mattson et al., 2011). Accordingly, many government and health bodies take a precautionary approach and recommend that abstinence from alcohol is the safest choice for those who are pregnant or breastfeeding (Department of Health, 2016; National Health and Medical Research Council, 2009).

When considering these guidelines it is important to recognise that pregnancy is often seen as a teachable moment whereby someone who is intending to become or is already pregnant may be especially receptive to enacting healthy behaviour change (Olander et al., 2016; Phelan, 2010). This is evidenced by the increasing role that primary health providers, such as midwives, play in encouraging individuals to adopt behaviour in line with various health guidelines (Crabbe & Hemingway, 2014), including alcohol (Tsang et al., 2020). In fact, since the introduction of the abstinence guidelines in Australia and the United Kingdom (UK) in 2009 and 2016 respectively, local efforts have been made to increase awareness about the risks of alcohol use during pregnancy and to encourage compliance with these guidelines (Bazzo et al., 2012; Crawford-Williams, Fielder, Mikocka-Walus, & Esterman, 2015). Despite this, the number of women using alcohol at any point during pregnancy, including before knowing they are pregnant, is up to 60% (McCormack et al., 2017). Although many women reduce or cease alcohol use when they find out they are pregnant (Muggli et al., 2016), estimates of the number of women using alcohol after pregnancy awareness range from 18 to 25% in Australia (Australian Institute of Health and Welfare, 2017; McCormack et al., 2017) and up to 46% in the UK (Schölin et al., 2019). These figures are also likely to represent an underestimate given that self-report measures of alcohol use in pregnancy - which frequently rely on retrospective recall or ask binary (i.e., yes/no) questions about alcohol use - potentially lead respondents to under-report their alcohol use (Loxton et al., 2013; Scobie & Woodman, 2017).

Given the lack of a known safe level of use and evidence that the majority of those who drink alcohol while pregnant do so at low to moderate levels (Muggli et al., 2016), achieving behaviour change with this population is likely to reduce the overall burden of harms associated with alcohol use in pregnancy at a population-level (McBride, 2014). Therefore, there is a clear need for evidence-based health communication strategies to provide women the opportunity to make evidence-informed decisions to reduce the risk of harm resulting from any alcohol use in pregnancy.

A common approach to encouraging health behaviour change, such as stopping or reducing alcohol consumption, is through the development of health promotion interventions that target health-related intentions and behaviours (Young et al., 2018). An important element for achieving behaviour change via this method is to ensure that *behavioural determinants* (i.e., the factors that contribute to whether or not an

individual engages in a particular health behaviour (Bartholomew et al., 2016)), are well understood and appropriately addressed in the content of the intervention (Burgoyne, 2006; Peadon et al., 2010). Following this approach, the behavioural determinants of alcohol use during pregnancy need to be identified as a first step in developing effective interventions to prevent prenatal alcohol exposure.

Previous research has identified a range of behavioural determinants for alcohol use intentions and behaviour during pregnancy, including non-modifiable determinants, such as increased age and higher socio-economic status (Callinan & Room, 2012; May & Gossage, 2011; Muggli et al., 2016), and modifiable determinants, such as attitudes towards alcohol use during pregnancy and knowledge about the potential risks (Corrales-Gutierrez et al., 2020; van der Wulp et al., 2015). Non-modifiable determinants of a behaviour can be used to help identify appropriate target groups for delivery of health promotion while modifiable determinants can be used as the elements of a health promotion intervention (Gratton et al., 2007; Norman et al., 2018; Peters et al., 2008).

Research on modifiable determinants, such as knowledge, attitudes, and behaviours relating to alcohol use during pregnancy, has identified various sources of influence including advice from health professionals; attitudes and behaviours of partners, friends, and family; social norms; and mainstream media (Elek et al., 2013; McBride, 2014; Peadon et al., 2010). These different sources of information often provide conflicting advice and this can contribute to feelings of uncertainty about the risks associated with alcohol use during pregnancy (Crawford-Williams, Steen, et al., 2015; Elek et al., 2013; Glik et al., 2008). Additionally, there are multiple psychosocial factors that have been found to impact on alcohol use during pregnancy. These include, but are not limited to: women considering abstinence to be a burden (Meurk et al., 2014); the normalisation of alcohol use in general (France et al., 2013; Loxton et al., 2013); the quantity of information women receive about risk avoidance in pregnancy (Loxton et al., 2013); scepticism about the effects of low to moderate alcohol use (Anderson et al., 2014; Holland et al., 2016; Loxton et al., 2013); and the limited emphasis that health professionals place on the need for women to adhere to the guidelines when giving advice (Crawford-Williams, Steen, et al., 2015; France et al., 2013; Meurk et al., 2014). Although this research provides important insight into alcohol use behaviour in pregnancy, it is not possible to know which determinants are

relevant to and/or malleable for whom due to an insufficient level of evidence and the lack of an underlying framework (Roozen et al., 2018).

Psychological theories, such as the theory of planned behaviour (Ajzen, 1991), can provide a useful framework for conceptualising and identifying the relevant determinants underlying the behaviour (Burgoyne, 2006; Glanz et al., 2008; Kok et al., 2017). The theory of planned behaviour, has previously been used to investigate determinants of women's alcohol use during pregnancy (Duncan et al., 2012; Vézina-Im & Godin, 2011), women's intentions to delay childbearing (Kearney & White, 2016) and to identify beliefs that are critical to women's intentions to engage in low-risk, frequent or binge drinking behaviours (Haydon et al., 2016, 2018). The theory of planned behaviour states that an individual's intention precedes behaviour and that there are three key constructs that contribute to this intention: attitudes, subjective norms and perceived behavioural control. Underlying each of these constructs are specific beliefs that individuals hold regarding a behaviour which contribute to an individual's decision to engage or not engage in the behaviour. By identifying the relevant beliefs held by members of specific groups of people, it is possible to design health behaviour interventions that target these key modifiable determinants (Bartholomew et al., 2016; Glanz & Bishop, 2010). This method provides an evidence-based approach to behaviour change while also furthering knowledge about a health behaviour and contributing to the evidence base for the use of theory (Webb et al., 2010). Specifically, the application of the theory of planned behaviour to alcohol use in pregnancy will allow for the identification of salient beliefs held by the target audience, which can be used to inform alcohol in pregnancy messaging.

Aside from these practical and methodological considerations, it is important to recognise that although the advice provided to women about alcohol use in pregnancy may not become actionable until one tries to or becomes pregnant, it does provide an opportunity for decisions about future behaviour. The advice provided to women about alcohol use in pregnancy specifically highlights that those who are pregnant or trying to become pregnant should not drink alcohol during those periods (National Health and Medical Research Council, 2020), thereby encouraging women to make decisions about alcohol use during pregnancy as early as the pre-conception stage. The use of mass media for dissemination of these messages means that the target audience includes

those who are able to and/or intend to become pregnant at some point. Accordingly, the existing attitudes and beliefs of these individuals are important to understand.

The beliefs, attitudes, and knowledge of women regarding alcohol use during pregnancy have been explored through prior research using focus groups and interviews (Balachova et al., 2007; Branco & Kaskutas, 2001; Elek et al., 2013; France et al., 2013; Holland et al., 2016; Vézina-Im & Godin, 2011). Of these qualitative studies, only one used a theoretical framework in their design or analysis (Vézina-Im & Godin, 2011). Using a theoretical framework to understand specific health behaviours is an important starting point for developing effective behaviour change interventions and specifying outcomes for intervention trials (Bell et al., 2015; Neuhauser, 2017; Roozen et al., 2016). Accordingly, there is a need for a theory-informed approach to eliciting the perspectives of those targeted by messages to reduce of alcohol use during pregnancy.

Therefore, the aim of this study is to identify the behavioural, normative and control beliefs regarding alcohol use during pregnancy of women aged 20-40.

3.2 Methods

3.2.1 Participants

Women aged 20-40 living in Australia and the UK were recruited via multiple avenues to participate in this study. Firstly, an advertisement inviting women to complete a short questionnaire about their beliefs regarding alcohol use during pregnancy was run on Facebook and Instagram over a 2-week period using a paid service. The advertisement was promoted to Australian residents and included a link to a website (hosted by Telethon Kids Institute) which outlined the study and included a copy of the participant information sheet. Secondly, to increase representation of a younger demographic, Australian undergraduate students were recruited to complete the study via a university participant pool consisting of health science students. To ensure a robust sample size additional recruitment was conducted, posts were made on local community Facebook pages as well as on online parenting forums in Australia and an additional 71 participants were recruited using the UK based website Prolific and paid AUD\$16.81/GBP£9.60 per hour for their time. Australian participants ($N = 363$) were either given the opportunity to enter a prize draw to win one of three \$100 vouchers or received course credit in exchange for participation.

3.2.2 Procedure

Participants were first asked for their informed consent and then asked to provide demographic information. Participants then completed a questionnaire designed to elicit the salient beliefs held by participants regarding alcohol use during pregnancy. According to guidelines for designing a belief elicitation questionnaire, outlined by Ajzen (2006) and Francis et al. (2004), participants should be asked to reflect on and list the advantages and disadvantages of the target behaviour (behavioural beliefs), the individuals or groups that they feel would approve or disapprove of the behaviour (normative beliefs) and the factors or circumstances that would make it difficult for or would enable someone to engage in the behaviour (control beliefs). While the guidelines recommend asking these questions as if it were the respondent engaging in the behaviour (e.g., who would disapprove of you drinking alcohol while pregnant?), we changed this to asking about the behaviour in general so that it was non-threatening and participants were able to respond in the way that was most salient for them, regardless of whether they were talking about their own behaviour or not. Thus, six open-ended questions were used “what would you say are the advantages/disadvantages of drinking alcohol in pregnancy?”, “are there any particular individuals or groups who you think would approve/disapprove of drinking alcohol in pregnancy?” and “what factors or circumstances do you think would make it difficult for/enable someone to not drink any alcohol in pregnancy?”. After each set of questions an open-ended question was included that allowed for any additional comments to be entered (e.g., *Is there anything else you associate with drinking or not drinking alcohol in pregnancy?*). Data collection took place between September 2019 and May 2020.

3.2.3 Analysis

Two researchers conducted content analysis on data from the $N = 435$ responses to the questionnaire using Nvivo 12. Responses were grouped together according to the question asked (advantages/disadvantages, approve/disapprove and barriers/enablers) and each researcher undertook deductive content analysis separately. Each response was analysed according to its parts, for example if multiple advantages were identified then they were each coded separately. After this initial coding the researchers met and compared their results. Initial agreement was high and

any coding disagreements were resolved through discussion until 100% agreement was met. Once agreement was reached regarding the initial content analysis, each researcher then grouped the individual codes under each category of the theory of planned behaviour into broader sub-categories using an inductive process.

In addition to the content analysis, the researchers used an inductive approach to note any themes more broadly present in the data. In particular, due to the open-ended nature of the response's participants tended to provide additional comment outside of the scope of the question asked. These comments were categorised thematically under the broader category 'additional comments' along with responses to the open-ended question included after each set of questions. These data are referred to as 'broader themes' from this point.

After each step of independent coding the researchers met and resolved any coding disagreements through discussion until 100% agreement was met.

3.2.4 Ethical Approval

The study was approved by the Curtin University Human Research Ethics Committee (HREC number HRE2019-0339).

3.3 Results

Table 3.1 displays the demographic characteristics of the study participants. Of the whole sample, 71.5% were aged 30 to 40 years old ($M = 29.47$, $SD = 5.35$). The majority of participants had high levels of formal education with 71.8% having completed an undergraduate or postgraduate degree. Additionally, 71.2% of participants were employed either part-time or full-time. Data on pregnancy history and future pregnancy intentions were reported for 76% ($N = 332$) of the sample; 41.9% ($N = 139$) of the sample had previously been pregnant, while 47.6% ($N = 158$) intended to become pregnant in the future but had not previously been pregnant (Table 3.2).

Table 3.1
Demographic characteristics (N = 435)

Demographic measure	N	%
Age		
20-25	112	25.7
26-30	135	31.0
31-35	119	27.4
36-40	69	15.9
Marital status		
Single, never married	122	28.0
Married/de facto	298	68.5
Widowed	2	0.5
Divorced	5	1.1
Separated	7	1.6
Prefer not to say	1	0.2
Education - highest level		
Some high school	11	2.5
High school graduation	51	11.7
Technical/Community College	51	11.7
Undergraduate university degree	186	42.8
Postgraduate university degree	126	29.0
Other	10	2.3
Employment status		
Employed full time	192	44.1
Employed part-time	118	27.1
Unemployed looking for work	10	2.3
Unemployed not looking for work	2	0.5
Student	62	14.3
Disability	3	0.7
Prefer not to say	3	0.7
Stay at home parent	45	10.3

Table 3.2*Pregnancy history and intentions (N = 332)*

	Previous pregnancy		No previous pregnancy		Total	
	N	%	N	%	N	%
Intend future pregnancy	71	21.4	158	47.6	229	69.0
No future pregnancy	68	20.5	35	10.5	103	31.0
Total	139	41.9	193	58.1	332	100.0

3.3.1 Behavioural Beliefs

3.3.1.1 Advantages of Alcohol Use During Pregnancy.

The majority of respondents (56%) who completed the questionnaire stated that there were no advantages to consuming alcohol in pregnancy. The remaining 44% of respondents suggested that there could be some benefits, for example, relaxation (see Table 3.3). However, 24% of those who named an advantage stated that they were responding hypothetically from what they imagined could be someone else's motivation: *"For myself, there were none. I believe people may choose to drink however to relax or to celebrate a special occasion and not be left out (such as a wedding)"*. An additional 13% of respondents stipulated that any benefit was only possible if the use was at a negligible level (e.g., a sip of alcohol every now and then): *"In very small quantities it could relax the mother"*.

Table 3.3*Advantages of alcohol use during pregnancy (N = 191)*

Advantages	Exemplar	N	%
Social engagement	<i>"Not feeling left out at social gatherings and events."</i>	79	42
Relaxation	<i>"Helping to unwind and relax."</i>	48	25
Enjoyment of alcohol	<i>"Enjoyment of a delicious drink as part of a meal."</i>	38	20
Stress relief	<i>"Pregnancy is stressful and a glass here and there can distress [sic] and stress isn't good for the baby."</i>	33	17
Regain or maintain sense of self	<i>"Might make you feel like you are 'back to normal' or 'getting your own life back' if you were feeling lost during pregnancy."</i>	19	10

3.3.1.2 Disadvantages of Alcohol Use During Pregnancy.

Almost every respondent (99.5%) mentioned at least one disadvantage of alcohol use during pregnancy (see Table 3.4). While almost all responses were centred on the health and wellbeing of the child, risks to the mother's health were also mentioned. Specifically, psychosocial harm to the mother (15%), such as feelings of guilt and shame and general harm to the mother (8%). Participants demonstrated extensive knowledge of the risks of alcohol use during pregnancy with a large majority of respondents naming a specific outcome of alcohol use on the child (59%) including a range of negative impacts on birth outcomes (33%). FASD was specifically mentioned by 48% ($N = 172$) of Australian respondents whereas 18% ($N = 13$) of UK respondents mentioned FASD.

Table 3.4

Disadvantages of alcohol use during pregnancy (N = 434)

Disadvantages	Exemplar	N	%
FASD	<i>"In extreme cases they can get fetal alcohol syndrome."</i>	184	42
Disrupted development of unborn child	<i>"Negative health impacts on the foetus development."</i>	96	22
Experience stigma or judgement	<i>"Public shaming or stigma from drinking while noticeably pregnant."</i>	61	14
Cognitive deficits	<i>"Effects on the unborn child's brain such as intellectual delays."</i>	52	12
Miscarriage	<i>"Worst case during the pregnancy is the mother could miscarry the child."</i>	39	9
Birth defects	<i>"Increased risk of birth defects."</i>	39	9

3.3.2 Normative Beliefs

3.3.2.1 Approve of Alcohol Use During Pregnancy.

There was less consistency amongst respondents' reported beliefs about those who would approve of alcohol use during pregnancy. Respondents reported beliefs that groups who would approve of alcohol use included those with low socio-economic status or who were deemed to be 'uneducated' by the respondents (see Table 3.5). Alcohol dependency was also commonly considered to be a characteristic of those who approved of alcohol use during pregnancy. In addition to alcohol dependency, participants also suggested that those who have a lax relationship with alcohol use in

general would be more likely to approve of alcohol use during pregnancy: *“People who come from families or social groups where drinking often is normalised, people who are uneducated in the risks of alcohol in general”*.

Table 3.5

Those who would approve of alcohol use during pregnancy (N = 434)

Approve	Exemplar	N	%
Low socio-economic status or ‘uneducated’	<i>“People from low SES backgrounds and those who have limited education.”</i>	77	26
Alcohol dependent	<i>“People with alcohol dependency or addiction problems.”</i>	43	15
Older generations	<i>“Older generations seem to have a more relaxed approach, having a couple of wines or beers seems to be more socially acceptable.”</i>	39	13
Those who do not know the risks	<i>“People who are not educated about the risks of drinking during pregnancy.”</i>	28	10

3.3.2.2 Disapprove of Alcohol Use During Pregnancy.

When asked to characterise groups of people or individuals who would disapprove of drinking alcohol in pregnancy, the most frequently reported belief was that health professionals would disapprove (see Table 3.6). An additional 27% of respondents believed that “most people” would or should disprove of alcohol use during pregnancy: *“Most of today’s society as it is a very known thing to be bad during pregnancy”*. Eight percent of respondents reported that ‘educated’ people were most likely to disapprove of alcohol use during pregnancy: *“I think most of the educated (completed high school) population would disapprove”*.

Table 3.6

Those who would disapprove of alcohol use during pregnancy (N = 390)

Disapprove	Exemplar	N	%
Health professionals	<i>“All medical professionals would disapprove.”</i>	164	42
Close family & friends of pregnant person	<i>“Parents of the pregnant person, grandparents and friends.”</i>	45	12
Religious people	<i>“I think people who are religious would disapprove more.”</i>	43	11
Other people who are parents	<i>“People with children already.”</i>	40	10

3.3.3 Control Beliefs

3.3.3.1 Barriers to Abstinence from Alcohol Use During Pregnancy.

Over half of the respondents believed that a history of alcohol dependence would be the circumstance most likely to contribute to alcohol use during pregnancy (see Table 3.7). Peer encouragement to engage in alcohol use was hypothesised to have a negative impact on women's ability to abstain from alcohol while pregnant by almost a third of respondents: *"Peer pressure from those who don't think it's a big deal"*. Peer pressure was mentioned as a barrier to abstinence by 17% more people in Australia than the UK (29% and 12% respectively). In addition to the influence of peers, respondents suggested that a strong culture of drinking at social events was a barrier to abstinence: *"A culture of drinking with friends and family"*.

Table 3.7

Barriers to abstinence (N = 370)

Barrier	Exemplar	N	%
Alcohol dependence	<i>"Pre-existing problems with dependence/ misuse."</i>	164	42
Peer influence	<i>"Pressure from peers to partake in alcohol consumption."</i>	45	12
Drinking culture	<i>"Alcohol is such a strong part of our social norms, it can be really difficult to abstain when pregnant."</i>	43	11
Life stress	<i>"Stressful life events."</i>		
Lack of support	<i>"Lack of support from friends/family."</i>		
Poor mental health	<i>"Poor mental health affecting ability to cope."</i>		
Lack of knowledge	<i>"Lack of education of risks to baby and mum."</i>	40	10

3.3.3.2 Enablers of Abstinence from Alcohol Use During Pregnancy.

Respondents identified raising awareness and educating people about alcohol use during pregnancy and the associated risks as one of the most important strategies to encourage women to abstain from alcohol during pregnancy (see Table 3.8). Having a strong support system of family, friends and health professionals encouraging women to abstain from alcohol was the other most commonly identified enabler of abstinence: *"A supportive partner or family that can encourage them not to drink or abstain in support"*. The third most common belief was that limiting women's exposure to drinking, both in the home and at social events, would help enable them to avoid drinking alcohol while pregnant: *"Having a supportive partner/friend/family who take time to "not drink with you" socially"*.

Table 3.8*Enablers of abstinence (N = 375)*

Enabler	Exemplar	N	%
Awareness and education	<i>“A good understanding of the short and long term impacts of drinking during pregnancy.”</i>	180	48
Support system	<i>“Support from friends and family not to drink.”</i>	176	47
Limited exposure to drinking	<i>“Lack of exposure to situations where alcohol consumption is expected.”</i>	46	12

3.3.4 Broader Themes

3.3.4.1 Nature of Harms Related to Prenatal Alcohol Exposure

An additional theme centred on the nature and risk of harm related to alcohol use during pregnancy ($N = 104$, 23.9%). When commenting, participants stated that prenatal alcohol exposure results in a spectrum of harms at different levels of severity (14.4%) that can be life-long (23.1%). In terms of how harm occurs in relation to prenatal alcohol exposure, 11.5% of participants stipulated that negative outcomes were only likely at high or excessive levels of alcohol use during pregnancy. When outlining harms, such as miscarriage and birth defects, alcohol use was stated as increasing the risk of such outcomes as opposed to causing them directly (21.2%).

3.3.4.2 Perceptions of ‘Drinkers’

Respondents were not explicitly asked to provide information about their perceptions of people who do or would drink while pregnant, however, responses to the open-ended invitations for comment included these data. In particular, negative perceptions of women who do or would use alcohol during pregnancy were prominent in the responses, however there was little consistency in how these individuals were described. People who would be likely to drink alcohol during pregnancy were categorised along a variety of socio-demographic characteristics. For example, descriptions of those most likely to drink ranged from irresponsible, young mothers to older, middle-class women. This lack of consistency regarding the characteristics of those perceived as likely to drink alcohol while pregnant may be indicative of a lack of agreement on what exactly constitutes the stereotypical ‘drinker’. However, regardless of which groups respondents identified as being more likely to drink, judgements were commonly made of their character for example describing those who would drink as, ‘amoral’, ‘selfish’ or ‘irresponsible’.

3.4 Discussion

The aim of this study was to explore the beliefs of women about alcohol use during pregnancy. Key learnings from this work indicate that there is support and acceptance among women of the ‘abstinence during pregnancy’ message. Additionally, there appears to be a relatively high level of awareness of the risks of alcohol use during pregnancy. The finding that more Australians identified FASD as an outcome associated with prenatal alcohol exposure is not unsurprising given that the abstinence guidelines have been in place for an additional 7 years in Australia compared to the UK. In line with the theory of planned behaviour, our study documents the salient beliefs held by women regarding the behaviour of alcohol use in pregnancy, thereby adding to the evidence base of potential avenues for interventions that aim to increase the number of women intending to and then ultimately abstaining from alcohol use during pregnancy. There are several key findings that may be useful to consider when planning prevention or health promotion approaches to reduce prenatal alcohol exposure.

The central role that alcohol plays in social interactions, whereby it is ever present at most social events, was identified as a significant barrier to abstinence. It was said to exacerbate feelings of exclusion and limitation when pregnant and trying to avoid drinking. This finding is in concurrence with the literature which suggests that trying to maintain abstinence while pregnant is particularly burdensome when attending social events at which alcohol use is typically normalised and encouraged (France et al., 2013; Loxton et al., 2013; Meurk et al., 2014). The social element of alcohol use is not only pertinent to abstinence during pregnancy but also abstinence in general. For example, participants in an online program to support abstinence from alcohol commonly identified the pervasive nature of alcohol at social events and the negative reactions from peers as significant barriers (Pennay et al., 2018). Participants in this study also commented on the use of alcohol during pregnancy as a way of maintaining a sense of self, a finding that has been found for other pregnancy health behaviours such as avoiding ‘risky’ foods (Atkinson et al., 2016).

The lack of consistency in participant’s descriptions of what constitutes a ‘typical’ drinker is reflective of research findings that there is no universal profile of someone who would drink alcohol while pregnant. For example, women of higher SES have been found to be more likely to drink while pregnant (Muggli et al., 2016;

Skagerstrom et al., 2011) but women of lower SES are more likely to drink at known harmful levels (Lepper et al., 2016). Importantly, the potentially stigmatising beliefs expressed by a large number of respondents regarding the morality of those who drink alcohol while pregnant may be reflective of a broader public sentiment in both Australia and the UK. This finding supports the need for caution when communicating about alcohol use during pregnancy to avoid further contributing to stigma in the community (Bell et al., 2016). It is also important to recognise that greater literacy about alcohol-related harms in pregnancy has not only been associated with individuals prioritising the prevention of those harms but also with the expression of stigma towards those who drink while pregnant (Corrigan et al., 2018). This is a concerning finding given the focus that is placed on communicating about harms of prenatal alcohol exposure in prevention messaging and must be considered when attempting to address this public health issue in the future.

Interestingly, it is unclear what actual behaviour is being judged by participants in this study, that is, it is unclear whether people are responding negatively to the idea of someone who would drink any amount of alcohol or just those who drink at levels they perceive as likely to result in negative outcomes. This is an important distinction as there is not unanimous agreement, even within the literature, around the harms associated with infrequent, low level alcohol use during pregnancy. This is due to both a lack of studies exploring low levels of use across a range of outcomes and conflicting results (Comasco et al., 2018; Mamluk et al., 2017). For example, some studies have found no relationship between low to moderate alcohol use and child development outcomes such as fetal growth (Reynolds et al., 2019), cognitive ability (Cluver et al., 2019) or behavioural attention (Nielsen et al., 2014). However, other studies have found a significant relationship between low to moderate levels of alcohol use and craniofacial development (Muggli et al., 2017), mental health outcomes (Easey et al., 2019) and behavioural attention (Pfinder & Lhachimi, 2020).

Ultimately, the public perception of who is at risk of harmful alcohol use while pregnant appears to be at the intersection of beliefs about who does or doesn't drink and the level of alcohol use that is seen as likely to be harmful. For example, individuals in this study expressed scepticism about the harmful nature of low to moderate amounts of alcohol use during pregnancy, in similarity with other research findings (Anderson et al., 2014; Holland et al., 2016; Loxton et al., 2013), while also stating that no-one

should drink while pregnant. This paradoxical view is unlikely to change unless further research addresses the question of how the behaviour of alcohol use during pregnancy is constructed in the public eye in terms of problematic/non-problematic or risky/safe levels of use. This direction would differ from previous research which has largely focussed on the amorphous behaviour of 'drinking alcohol in pregnancy' without the nuance that appears in people's discussion of the behaviour and what exactly it entails (Duncan et al., 2012; Holland et al., 2016; Meurk et al., 2014).

3.5 Strengths and Limitations

A strength of the study was the use of open-ended responses with clear prompts, which elicited extensive responses from participants in this study. Additionally, we recruited a robust sample which made it possible to calculate meaningful percentages that reflect the prevalence of any one belief across the sample. This is a strength of the study particularly when contrasted with prior research which has largely relied on significantly smaller samples. Additionally, the use of the theory of planned behaviour allowed for the beliefs elicited in this study to be categorised according to useful theoretical constructs such that future work can use these findings in a practically and methodologically useful way.

Limitations to this study should also be noted. Recruitment using a convenience sampling strategy introduces limitations to the generalisability of the findings. The stigma associated with alcohol use during pregnancy (Bell et al., 2016) may have influenced both recruitment and participation. That is, individuals who used alcohol in pregnancy may have been reluctant to participate in the study and those who participated may have been motivated to provide socially desirable answers. However, conducting the survey anonymously may have addressed some of these issues.

Questions in the study asked about participant's views on alcohol use while pregnant, however we did not collect data on participants' alcohol use during pregnancy (intended or actual). Therefore, although it is not possible to draw conclusions from this research regarding the beliefs and perceptions underlying an individual's actual alcohol consumption during pregnancy, it is important to note that this was not the aim of this study. As the majority of the sample had either previously been pregnant or planned on becoming pregnant in the future, they have been or currently are the likely recipients of public health messages aimed at reducing alcohol

use during pregnancy. Identifying the beliefs held by this population adds to the evidence base regarding perceptions of and understanding about alcohol use during pregnancy in both Australia and the UK.

Interestingly, participants tended to state that their responses did not necessarily apply to themselves but were instead responses to hypothetical scenarios (e.g., speculating on reasons as to why someone other than themselves may use alcohol while pregnant) or largely referred to others and not themselves (e.g., a friend's experience as a drinker as opposed to their own decisions to drink). This tendency to speak in the hypothetical is of interest as it suggests that perceptions of the 'typical' person drinking alcohol while pregnant may reflect a form of cognitive distancing from the behaviour or the associated stereotype. This has implications for how public health messaging is framed, as new strategies may be required to help women understand that these messages and the behaviours they target are of direct relevance to them. However, we also recognise that the nature of the actual questions used was likely to have contributed to participant's responses being centred on the hypothetical. Due to stigma surrounding the issue of alcohol use in pregnancy, we asked about participants beliefs about the behaviour in general, rather than their specific behaviour. This may have reinforced the cognitive distancing effect. However, the kinds of beliefs documented in the study are expected to be reflective of the public discourse in response to publicly available messaging and information. Future studies are required to understand cognitive dissonance as it pertains to alcohol use in pregnancy.

3.6 Future Directions

These findings can be used to help direct research to further explore the perspectives and understandings that contribute to decision making regarding alcohol use during pregnancy. Additional research is needed to determine the extent to which specific beliefs (or constellations of beliefs) predict behaviour, and for which populations. Future research should establish whether an endorsement of abstinence in pregnancy is predictive of actual abstinence behaviour. Further, to inform messaging research should examine how individuals perceive alcohol use during pregnancy at varying levels of use. Such work could identify the extent of support for 'small' amounts of alcohol use during pregnancy and determine whether the strength of the stigma surrounding 'heavy' alcohol use contributes to the emergence of a

socially ‘acceptable’ amount of use in contrast to the guidelines. To provide greater clarity to those who are or may become pregnant, larger and more nuanced epidemiological studies are also needed to lend further support to the science underlying recommendations for zero alcohol in pregnancy.

Additionally, any future work must be guided by the significant ethical responsibilities regarding such a sensitive topic as alcohol use in pregnancy and great consideration must be given to the potential for stigma that may arise from reinforcing or negating any belief expressed in this study. The findings of this work can be used to ensure that future prevention efforts are informed by the dialogue that is already occurring by recognising the potential and actual harm that can arise from furthering stigmatising beliefs.

3.7 Conclusion

The findings of this study indicate that some women are aware of and receptive to messages about alcohol use during pregnancy. This work contributes to the understanding of women’s beliefs about alcohol use during pregnancy and therefore provides directions for future research and prevention. In combination with additional evidence, the findings from this study can be used to inform research into both the prevalence of beliefs related to continued alcohol use during pregnancy within a broader population and whether altering those beliefs influences behaviour while also recognising the potential for stigma.

Chapter 4

Perceptions of Alcohol Use During Pregnancy

The second study of this thesis highlighted incongruities in how women perceive the behaviour of alcohol use in pregnancy. Participants were supportive of the guidelines and did not think it was ‘good’ to drink, they did feel however, that drinking a small amount was and would be acceptable. Despite knowing and being supportive of abstinence guidelines, participants expressed acceptance of small amounts of alcohol use, thus suggesting that typical questions asking about drinking behaviour in pregnancy might not capture this group as they did not appear to categorise small amounts of drinking as not following the guidelines. Participant responses also highlighted the role that different constructions of drinking play in the behaviour of alcohol use in pregnancy. Therefore, Study 3, as outlined in this chapter, was conducted to explore these different perceptions and any impact on willingness to use alcohol while pregnant. Specifically, this study was designed to test whether a prototype manipulation effect was present and to identify any subsequent differences in how the two behaviours were perceived. This study was conducted so that the results could inform the design of Study 4.

Paper 3 Perceptions of Two Different Alcohol Use Behaviours in Pregnancy: An Application of the Prototype Willingness Model.

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Statement of Contributions

Author	Contribution	Signed Acknowledgement
Tess Fletcher	Conceptualisation, Methodology, Data Analysis, Investigation, Data Curation, Writing, Project administration	I acknowledge that these represent my contribution to this research output.
Barbara Mullan	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision.	I acknowledge that these represent my contribution to this research output.
Amy Finlay-Jones	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision	I acknowledge that these represent my contribution to this research output.

Abstract

Considering the lack of consistency in how alcohol use in pregnancy is portrayed, interpreted, and studied, it is unknown whether the extent to which the associated stereotypes about the typical person who drinks alcohol while pregnant varies according to specific alcohol use behaviours. Additionally, whether these stereotypes impact an individual's willingness to also consume alcohol while pregnant is also unknown. Therefore, this study explored whether exposure to either an 'ambiguous consumption' prototype (no amount of alcohol specified) or a 'small consumption' prototype ('small' amount of alcohol specified) had an impact on prototype perceptions of, and willingness to use, small amounts of alcohol during pregnancy. Participants were 140 women living in the United Kingdom, aged 20 to 45 years old, of whom 92% had previously been, or intended to become, pregnant. Participants completed measures to assess how favourably they viewed alcohol use in pregnancy, how similar they felt to those who would use alcohol in pregnancy and how responsible they perceived those who would use alcohol in pregnancy to be. Participant's own willingness to use small amounts of alcohol during pregnancy was also assessed. Being older and having at least one child were both positively correlated with being willing to accept an alcoholic drink while pregnant for those exposed to the 'ambiguous consumption' prototype only. Although perceptions of favourability, similarity and responsibility were consistently higher for those exposed to a 'small consumption' condition, there were no differences in willingness to drink according to exposure. This research suggests that women's perceptions of those who drink alcohol while pregnant differ according to the amount of alcohol that they perceive as typical. This may have implications for how alcohol use in pregnancy is portrayed in public health messaging, particularly regarding the level of acceptance that may be associated with low to moderate alcohol use.

4.1 Introduction

4.1.1 Alcohol Use During Pregnancy

Alcohol use during pregnancy is an ongoing public health concern due to the risk prenatal alcohol exposure poses to a fetus' development (Williams & Smith, 2015). With no known safe level of exposure, many health agencies and governments take a precautionary approach by recommending no alcohol use during pregnancy (Department of Health, 2016; National Health and Medical Research Council, 2020; World Health Organization, 2021). Women receive much of their information and guidance about alcohol use and pregnancy from health professionals as well as from family and friends (Anderson et al., 2014; Tsang et al., 2020). However, the quality and veracity of this information can vary between sources and can be contradictory (Anderson et al., 2014; Elek et al., 2013), with one particular area of confusion being the level of risk associated with low to moderate alcohol use during pregnancy.

4.1.2 Confusion About 'Safe' Limits

The inconsistent evidence for harm associated with low to moderate levels of alcohol use (Comasco et al., 2018) can cause hesitation in recommending abstinence by some health professionals, as they may be concerned about alarming women unnecessarily (Coons et al., 2017b). Additionally, binge drinking and excessive drinking are often considered by health professionals as being of the most concern whereas low to moderate use is often seen as inconsequential (Coons et al., 2017a). This belief that abstinence is not always completely necessary may filter down to women who are perceived as being at low risk and therefore do not receive the abstinence message. Furthermore, the definition of low, moderate, and high levels of alcohol use is inconsistent (O'Leary & Bower, 2012) and often linked to known risks, such as with commonly used screening tools (Bush et al., 1998). This inconsistency may lead to further confusion among the public with regard to risk and what constitutes a 'safe' level of use, if any.

4.1.3 Determinants of Alcohol Use including Prior Use and Social Influences

Prior alcohol use is associated with the likelihood a woman will consume alcohol while pregnant. For example, alcohol use during a prior pregnancy is associated with intentions to drink alcohol while pregnant (Peadon et al., 2011) while levels of

alcohol use before conception are predictive of alcohol use during pregnancy (Skagerstrom et al., 2011). Drinking alcohol is a common aspect of social life in many countries and can be a barrier to abstaining from alcohol in general (Pennay et al., 2018) as well as during pregnancy (France et al., 2013; Gouilhers et al., 2019; Loxton et al., 2013). Prior research suggests that alcohol use decisions while pregnant may be influenced by social norms and pressures (Loxton et al., 2013; Meurk et al., 2014). In particular, drinking alcohol on special occasions, such as weddings or celebrations, is a commonly reported behaviour amongst those who otherwise tend to support or engage in alcohol avoidance during pregnancy (Muggli et al., 2016; Tsang et al., 2021). Given that women must navigate conflicting messages about risk, and social pressure to both drink and to avoid stigma, it is important to explore women's intentions regarding alcohol use from within the context of their social perceptions.

4.1.4 What is 'Alcohol Use in Pregnancy'?

An additional complexity in identifying determinants of alcohol use in pregnancy is the framing used when asking about alcohol use and related beliefs, intentions, and perceptions. For example, research has found that although women widely reported supporting abstinence in pregnancy, 'moderate' consumption of alcohol was also seen as reasonable (Fletcher et al., 2021; Hammer & Inglin, 2014). These conflicting perspectives may be due to the level and frequency of alcohol use which women use as a reference point when responding to questions about alcohol use in pregnancy. These different reference points may have implications for how women interpret advice about alcohol in pregnancy, for example if women do not consider having a sip of champagne at a wedding as 'alcohol use in pregnancy' they may feel that they are behaving in accordance with the guidelines if they were to do so. Furthermore, if they perceive themselves as drinking at a 'low' level, they may feel that the advice about not drinking alcohol in pregnancy does not apply to them but rather is intended for those who they perceive as being at greater risk of harm. This kind of thinking may be exacerbated by the stigma that surrounds alcohol use in pregnancy (Corrigan et al., 2018), with individuals who support alcohol use in 'moderation' also expressing judgemental beliefs about those who they perceive as drinking in pregnancy at a level that requires behaviour change, thus, creating a cognitive dissonance between their own casual use and that which can be considered categorically harmful. It is therefore important to determine whether these reference

points influence how women perceive the behaviour of alcohol use in pregnancy and whether this impacts their willingness to engage in the same behaviour.

4.1.5 *Prototype/Willingness Model*

The prototype/willingness model (Gibbons et al., 1998; Gibbons et al., 1995) is a social cognitive theory that explores the role that perceptions of the ‘typical person’ (i.e., prototypes) play in someone’s willingness to enact certain behaviours. When thinking of a particular behaviour, an individual has a perception of the typical person who would engage in that behaviour and their associated traits or attributes (van Lettow et al., 2013). The prototype/willingness model states that perceptions of a prototype predict an individual’s willingness to engage in the same behaviour given the opportunity (Rivis et al., 2006). That is, if someone holds certain perceptions of the prototypical person engaging in a behaviour, they would expect their peers to hold the same views, which in turn would make them more or less willing to engage in similar behaviour (Norman et al., 2007). One such perception is the perceived favourability of a prototype; that is how favourably or unfavourably one sees the prototype. In addition to perceptions of favourability, an individual can also reflect on the extent to which they identify themselves as similar or dissimilar to the prototypical person. The more similar to the prototype they see themselves as being, the greater impact that favourability is expected to have (Rivis et al., 2006). For example, holding a favourable prototype about an individual who smokes is more likely to result in an individual smoking if they also see themselves as similar to someone who would smoke.

Alcohol use during pregnancy appears to be dichotomised into ‘risky’ alcohol use and ‘safe’ alcohol use by both health professionals and broader society despite any evidence of a safe level of use (Bagley & Badry, 2019; Fletcher et al., 2021). This is likely to have implications for the level of risk that is perceived, that is if one believes that there is a ‘safe’ level of alcohol use they may be more likely to perceive the behaviour of low to moderate alcohol use in pregnancy as being responsible and risk-free. Although not explicitly mentioned in the prototype/willingness model, perceived responsibility may be a relevant aspect of how the behaviour of alcohol use in pregnancy is constructed in the public eye (Hammer & Inglin, 2014). Additionally, an emphasis on the harm associated with heavy alcohol use may compound this distinction between what constitutes a safe/responsible and a risky/irresponsible

behaviour and contribute to furthering stigmatising beliefs (Coons et al., 2017a). Importantly, prior research into alcohol use behaviour in pregnancy has many inconsistencies with regard to what is considered “no exposure” (e.g., up to 2 drinks) and what is considered “alcohol use” (Popova et al., 2017). Furthermore, qualitative research into women’s attitudes and beliefs does not typically discriminate what exactly the behaviour of alcohol use in pregnancy being studied entails (Meurk et al., 2014). Considering the lack of consistency in how alcohol use in pregnancy is portrayed, interpreted, and studied, it is unknown whether the extent to which the associated stereotypes about the typical person who drinks alcohol while pregnant varies according to specific alcohol use behaviours. Additionally, whether these stereotypes impact an individual’s willingness to also consume alcohol while pregnant is also unknown. To further explore this possible distinction, it is necessary to conduct research that clearly outlines or documents the behaviour being studied and to establish whether willingness to engage in alcohol use during pregnancy differs according to perceptions of the typical person who drinks while pregnant.

4.1.6 *The Present Study*

The aim of the present study was to use the prototype/willingness model to compare prototype perceptions between participants exposed to two different prototypes and to explore willingness to use small levels of alcohol during pregnancy according to exposure conditions. The two prototypes were ‘ambiguous consumption’ (no amount of alcohol specified) and the ‘small consumption’ prototype (‘small’ amount of alcohol specified). Three prototype perceptions were examined, the perceived favourability of the prototype, the respondent’s perceived similarity to the prototype, and the perceived responsibility of the prototype.

It was hypothesised that:

- **H1:** Exposure to the ‘small consumption’ prototype would have a stronger positive correlation with willingness to drink a small amount of alcohol during pregnancy than the ‘ambiguous consumption’ prototype.
- **H2:** Prototype perceptions would have a strong positive relationship with self-reported willingness to drink a small amount of alcohol during pregnancy.

- **H3:** Respondents in the ‘small consumption’ condition would perceive prototypes to be higher in similarity, responsibility, and likeability than those in the ‘ambiguous consumption’ condition.

4.2 Method

4.2.1 *Participants and Procedure*

Participants in this study were 140 people aged between 20 and 45 years who identified as women, lived in the UK, and consumed alcohol. Participants were recruited through the paid recruitment platform Prolific and completed an online survey by providing their informed consent and demographic data, including age, marital status, education, employment status, and pregnancy history. Participants were then presented with the definition of a prototype, taken from Gibbons et al. (1995, p. 85): “The following questions concern your images of people. What we are interested in here are your ideas about typical members of different groups. For example, we all have ideas about what typical movie stars are like or what the typical grandmother is like. When asked, we could describe one of these images — we might say that the typical movie star is pretty or rich, or that the typical grandmother is sweet and frail. We are not saying that all movie stars or all grandmothers are exactly alike, but rather that many of them share certain characteristics”. Participants were randomised to one of two conditions, whereby they were presented with a prompt to consider either the ‘typical person who drinks alcohol in pregnancy’ (‘ambiguous consumption’ condition) or the ‘typical person who drinks a small amount of alcohol in pregnancy’ (‘small consumption’ condition). They were then asked to provide three to five words that best describe that kind of person. This was used to prime participants with a clear image of the typical person who engages in the behaviour. Respondents were primed to think of one of two different ‘types’ of behaviours, i.e., a small level of alcohol use in pregnancy and an ambiguous level of alcohol use in pregnancy, as they completed the measures in the survey. Following survey completion, participants were paid GB£9.6 per hour for their time. Data collection took place in November 2020 and June 2022.

4.2.2 Measures

4.2.2.1 Pregnancy Intentions

Participants were asked whether they intended to become pregnant in the future (<2, 3-5, 5< years).

4.2.2.2 Alcohol Consumption

Participants were asked when they last had a drink containing alcohol (never, a week or less ago, between 2 to 4 weeks ago, between 1 to 3 months ago, over 3 months ago and prefer not to say).

4.2.2.3 Prototype Perceptions

Following randomisation to either the ‘ambiguous consumption’ or ‘small consumption’ conditions, participants were asked to assign a rating on a 5-point Likert scale of how likeable they thought the prototype individual was (from ‘extremely unlikeable’ to ‘extremely likeable’), how responsible they believed they were (from ‘extremely responsible’ to ‘extremely irresponsible’) and how similar they felt they were to them (from ‘not at all similar’ to ‘very similar’). Although not originally part of the prototype/willingness model, responsibility was included as an additional prototype perception due to it being commonly referenced in the literature about alcohol use in pregnancy (Hammer & Inglin, 2014; Lyall et al., 2021).

4.2.2.4 Subjective Measure of Alcohol Use in Pregnancy

Participants in the ‘ambiguous consumption’ were asked to specify how much alcohol they thought the typical person who drinks alcohol in pregnancy would have, including the amount of alcohol, type of alcohol and frequency of use. Conversely, those in the ‘small consumption’ condition were asked to specify how much alcohol someone who had a small amount would typically drink.

4.2.2.5 Willingness to Consume Small Amounts of Alcohol in Pregnancy

Two items were used to assess the respondents’ willingness to consume alcohol in pregnancy when provided the opportunity. The respondents were presented with two hypothetical scenarios and asked to indicate, along a 7-point Likert scale, how willing

(from ‘not at all willing’ to ‘very willing’) they would be to accept and finish a glass of champagne at a wedding and how willing they would be to say no and refuse the offer of a glass of wine at dinner with a friend. These scenarios were chosen as they reflect situations in which women report being inclined to or actually consuming alcohol while pregnant (Fletcher et al., 2021; Tsang et al., 2021). Responses to item two (willingness to refuse the drink) were reverse coded and added together with responses to item 1. This score was then divided by two to create a composite measure of willingness to consume a small amount of alcohol while pregnant (N.B. willingness).

4.2.3 Ethical Approval

The study was approved by the Curtin University Human Research Ethics Committee (HREC number HRE2019-0339).

4.3 Results

4.3.1 Demographics

Of the whole sample ($N = 140$), 54% were aged 20 to 30 years old ($M = 30.81$, $SD = 7.482$). The majority (69%) had completed either an undergraduate or a postgraduate degree and 74% were employed either part-time or full-time. Additionally, 90% drank alcohol within the last month (86% ‘ambiguous’, 94% ‘small’), 40% had previously been pregnant (44% ‘ambiguous’, 36% ‘small’) and 59% intended to become pregnant in the future (56% ‘ambiguous’, 62% ‘small’). Six percent of participants had never been and did not ever intend to become pregnant. Additional demographics are outlined in Table 4.1. An a priori power analysis was conducted using G*Power version 3.1.9.7 (Faul et al., 2007) to determine the minimum sample size required. Results indicated the required sample size to achieve 80% power for detecting a medium effect, at a significance criterion of $\alpha = .05$, was $N = 64$ for each group. As such the study was adequately powered.

Table 4.1
Demographic Characteristics (N = 140)

Demographic measure	Prototype exposure			
	'Ambiguous' N = 71		'Small' N = 69	
	N	%	N	%
Age				
20-25	19	26.8	25	36.2
26-30	17	23.9	15	21.7
31-35	14	19.7	9	13.0
36-40	10	14.1	9	13.0
41-45	11	15.5	11	15.9
Marital status				
Single, never married	31	43.7	36	52.2
Married/de facto	37	52.1	31	44.9
Divorced	2	2.8	0	0.0
Separated	0	0.0	1	1.4
Prefer not to say	1	1.4	1	1.4
Education - highest level				
Secondary education	5	7.0	5	7.2
High school diploma	15	21.1	11	15.9
Technical/Community College	5	7.0	2	2.9
Undergraduate degree	30	42.3	39	56.5
Graduate degree	15	21.1	12	17.4
Doctorate degree	1	1.4	0	0.0
Employment status				
Employed full-time	43	60.6	41	59.4
Employed part-time	11	15.5	9	13.0
Unemployed looking for work	2	2.8	5	7.2
Stay at home parent	3	4.2	3	4.3
Student	11	15.5	9	13.0
Disability	1	1.4	1	1.4
Prefer not to say	0	0.0	1	1.4
Pregnancy history				
Currently pregnant: No	71	100.0	69	100.0
Previously pregnant: Yes	31	43.7	25	36.2
Biological children: Yes	24	33.8	17	24.6
Pregnancy intention				
Yes, within the next 2 years	17	23.9	14	20.3

Demographic measure	Prototype exposure			
	'Ambiguous' <i>N</i> = 71		'Small' <i>N</i> = 69	
	<i>N</i>	%	<i>N</i>	%
Yes, within the next 5 years	11	15.5	14	20.3
Yes, in 5 years or more	12	16.9	15	21.7
No, never	15	21.1	17	24.6
Unsure	16	22.5	9	13.0
<i>Last drink of alcohol</i>				
A week or less ago	46	64.8	44	63.8
Between 2 to 4 weeks ago	15	21.1	21	30.4
Between 1-3 months ago	4	5.6	2	2.9
Over 3 months ago	6	8.5	2	2.9

4.3.2 *Prototype characteristics*

Respondents generated 278 characteristics to describe the typical person who would drink an ambiguous amount of alcohol in pregnancy and 268 characteristics to describe the typical person who would drink a 'small' amount of alcohol during pregnancy. The characteristics reported by at least 10% of the sample are outlined in Table 4.2.

Table 4.2

Words used to describe each prototype (N = 140)

Prototype exposure					
'Ambiguous' <i>N</i> = 71			'Small' <i>N</i> = 69		
Characteristic	<i>N</i>	%	Characteristic	<i>N</i>	%
Irresponsible	30	42	Selfish	16	23
Selfish	24	34	Irresponsible	16	23
Careless	13	18	Risky/risk-taker	15	22
Uneducated	11	15	Careless	10	14
Addict	7	10	Normal	8	11

4.3.3 *Descriptive Statistics*

To assess the first hypothesis the bivariate correlation between prototype exposure and willingness was assessed, however no significant relationship was found, $r(138) = .105, p = .218$. Hypothesis 2 was then assessed by examining the correlations between willingness to consume small amounts of alcohol during pregnancy and perceived likeability, responsibility, and similarity of the presented prototype. All three variables had significant, positive relationships with willingness to drink while pregnant; similarity, $r(138) = .459, p < .001$; responsibility, $r(137) = .289, p < .001$; and, likeability, $r(138) = .247, p = .003$.

To identify any bivariate relationships between the remaining variables, correlations between variables for each prototype condition were calculated and are presented in Table 4.3 along with means and standard deviations. The mean prototype likeability, responsibility and similarity ratings were well below the scale mid-point for both groups. A Fisher's z-test was then used to compare the significance of the difference between correlations for each group (Fisher, 1921; Soper, 2022). Of all the correlations, the only significant difference between groups was for similarity and responsibility with the relationship being significantly stronger for the 'small' group compared to the 'ambiguous' group, $z = 2.909, SEM = 0.085, p = 0.004$ (two tails). No relationship between any prototype perception and willingness was significantly different between groups.

Table 4.3

Descriptive statistics and correlations between the study variables for 'ambiguous consumption' prototype (N = 40) and 'small consumption' prototype (N = 60).

	Age	Children	Likability	Responsibility	Similarity	Willingness	'Ambiguous'		'Small'	
							Mean	SD	Mean	SD
Age	1	0.51*	0.20	0.05	0.12	0.21	31.21	7.45	30.41	7.54
Children	0.62*	1	0.39*	0.21	0.21	0.13	N/A	N/A	N/A	N/A
Likability	0.26	0.17	1	0.45*	0.48*	0.20	1.97	0.83	3.01	1.02
Responsibility	0.09	0.13	0.65*	1	0.49*	0.17	1.68	0.98	2.60	1.27
Similarity	0.11	0.13	0.68*	0.78*	1	0.45*	1.76	1.10	2.46	1.45
Willingness	0.02	-0.04	0.24	0.35*	0.46*	1	2.59	1.58	2.92	1.64

Note. 'ambiguous consumption' prototype represented above the diagonal and 'small consumption' below the diagonal.

* $p < 0.01$.

4.3.4 Group Differences

To partially assess hypothesis 3 independent samples *t*-tests were run to compare the ratings of responsibility reported by those in the ‘ambiguous consumption’ condition ($N = 71$) to the ratings reported by those in the ‘small consumption’ condition ($N = 69$). Due to the assumption of homogeneity of variances being violated, as assessed by Levene's test for equality of variances (similarity, $p = .001$; responsibility, $p = .001$), to continue to test hypothesis 2 a series of Welch's *t*-tests were run to determine if there were differences in ratings of similarity and likeability for those in both conditions. Although there was no significant correlation between prototype exposure and willingness an independent samples *t*-test was also run to compare the willingness of individuals in each group to consume small amounts of alcohol in pregnancy. Although the Shapiro-Wilk statistic was significant for all variables, upon examination of the histograms and QQ plots the data appeared to be normally distributed except for the scores for perceived responsibility. However, given that large and relatively equal sample sizes ($N > 30-40$) are robust against violations of the assumption of normality (Pallant, 2011), the results were interpreted as having satisfied the assumption. As four *t*-tests were run a Bonferroni correction was applied and the results were interpreted at a significance value of 0.01. Table 4.4 outlines the findings of the independent samples and Welch's *t*-tests.

The *t*-test for likeability was statistically significant with those exposed to the ‘ambiguous consumption’ prototype ($M = 1.97$, $SD = 0.83$) rating the prototype as less likable than the group exposed to the ‘small consumption’ prototype ($M = 3.01$, $SD = 1.02$). For similarity, the Welch's *t*-test was statistically significant with those exposed to the ‘ambiguous consumption’ prototype ($M = 1.76$, $SD = 1.10$) rating themselves as less similar to the prototype than the group exposed to the ‘small consumption’ prototype ($M = 2.46$, $SD = 1.45$). Similarly, the Welch's *t*-test was statistically significant for responsibility with those exposed to the ‘ambiguous consumption’ prototype ($M = 1.68$, $SD = 0.98$) rating the ‘ambiguous consumption’ prototype as less responsible than the group exposed to the ‘small consumption’ prototype ($M = 2.60$, $SD = 1.27$). There was no statistically significant difference in willingness to consume small amounts of alcohol while pregnant as a function of prototype exposure.

Table 4.4*t*-test results comparing prototype exposure, prototype perceptions and willingness (*N* = 140)

	‘Ambiguous’		‘Small’		<i>T</i> (df)	<i>p</i>
	Mean	SD	Mean	SD		
Likability	1.97	0.83	3.01	1.02	6.58 (138)	<.001
Responsibility	1.68	0.98	2.60	1.27	4.80 (126)	<.001
Similarity	1.76	1.10	2.46	1.45	3.09 (126)	0.002
Willingness	2.59	1.58	2.92	1.64	1.24 (138)	0.218

4.4 Discussion

In this study we explored whether exposure to one of two drinker prototypes, ambiguous consumption, and small consumption, was related to perceptions of those who drink alcohol during pregnancy and individual willingness to use small amounts of alcohol during pregnancy. Hypothesis 1 was not supported by the findings as there was no significant relationship between prototype exposure and willingness to consume small amounts of alcohol while pregnant. Hypothesis 2 was supported as there were significant positive relationships between perceived likeability, responsibility and similarity and individual’s willingness to consume small amounts of alcohol while pregnant. Hypothesis 3 was also supported with respondents in the ‘small consumption’ condition perceiving prototypes to be higher in similarity, responsibility, and likeability than those in the ‘ambiguous consumption’ condition.

Although there were differences in perceptions of the prototypes, there was a lack of a difference between the groups regarding their willingness to consume a small amount of alcohol while pregnant. Therefore, the first hypothesis was not supported. Other studies have also found limited to no effect due to prototype manipulation, for example, there was no effect on the willingness of female undergraduates to binge drink as a result of prototype manipulation; (Todd & Mullan, 2011). Further research is needed to explore the role that manipulating prototypes may play in altering prototype perceptions and willingness and in prompting or facilitating behaviour change (Davies and Todd, 2021). For those exposed to the ‘ambiguous consumption’ prototype, having at least one child was positively correlated with being willing to accept a drink while pregnant. This finding was not present for the ‘small consumption’ condition. Given the relatively recent move towards recommendations

for abstinence in the UK and the associated public health efforts, it could be expected that those of younger age may have been exposed to that messaging earlier and more consistently (Department of Health, 2016).

In comparison, the second hypothesis that prototype perceptions would have a strong positive relationship with self-reported willingness to drink a small amount of alcohol during pregnancy was supported, for example similarity was significantly correlated with willingness to consume alcohol while pregnant. This suggests that if someone has friends or influencers that they see as similar to themselves, who drink while they are pregnant, they may be more willing to also drink while pregnant. Conversely, abstinence messages may need to be delivered by a relatable figure that people perceive as likeable and similar to increase the likelihood that others will be willing to engage in abstinence behaviours themselves. Due to the ambiguity of the behaviour, it was expected that there would be greater variation in how individuals interpreted the 'ambiguous consumption' prototype versus the 'small consumption' prototype in terms of the amount of alcohol consumed. However, there was less variation and lower ratings in similarity scores under the ambiguous condition than the small condition suggesting that participants in this condition interpreted the behaviour similarly. This may have made the effect of perceived similarity to be more pronounced as scores were skewed to the negative and more universal within the ambiguous group. Additional exploration of this finding would be needed to make any further inferences. The findings of this study also support the third hypothesis that ratings of favourability, similarity and responsibility would be higher for those exposed to the 'small consumption' prototype as opposed to the 'ambiguous consumption' prototype. This is not surprising given that research into alcohol and pregnancy has documented widespread stigma surrounding alcohol use in pregnancy (Corrigan et al., 2018; Eguiagaray et al., 2016).

Interestingly, perceived responsibility was positively correlated with willingness to consume a small amount of alcohol while pregnant for the 'small consumption' condition but not the 'ambiguous consumption' condition. Potentially, there was a floor effect such that there was little variability in the perceived responsibility of those who engage in the ambiguous behaviour of drinking alcohol while pregnant so a relationship with willingness could not be detected. Additionally, in opposition to expectations, the 'small consumption' condition could have actually

left more room for interpretation and therefore greater variability in perceptions of responsibility. That is, participants may have differed in the reference point they were using to compare a small amount of use to, for example some people may have been comparing a “small amount” to “total abstinence” (ergo, irresponsible) while others may have compared a “small amount” to “a lot” (ergo, responsible).

Due to the open-ended nature of the question about the typical amount of alcohol consumed by each prototype, it is difficult to quantify any differences in the amount of alcohol underpinning the perceptions of the alcohol use behaviours for participants in each condition. For example, responses covered a broad range including from “a glass of prosecco on an evening out or special occasion” to “binge drinking, e.g., once a week, likely vodka, cheap wine, gets really drunk” for those in the ‘ambiguous consumption’ condition and from “a sip of wine on special occasions - not more than once per fortnight” to “A glass of wine a day throughout their pregnancy” for those in the ‘small consumption’ condition. However, the fact that the small amount of consumption was rated more positively overall supports the assumption that a small amount of alcohol was likely perceived as lower than the ambiguous amount. Additionally, data were collected in this way so that the range of responses could be used to develop a more precise question for further research. That is, these findings will inform the development of a question that allows for the standardised measurement of the type, amount and frequency of alcohol use and the calculation of the amount of alcohol consumed per week/maximum amount on any given day.

The findings of this research indicate that there are distinctions in how the ambiguous behaviour of alcohol use during pregnancy is perceived as opposed to “small amount” use during pregnancy. However, highlighting these distinctions does not appear to be related to willingness to drink a small amount while pregnant. Further research should explore the specific beliefs that underlie decisions regarding alcohol use during pregnancy. Although willingness to drink a small amount while pregnant does not appear to be related to perceptions of the prototypical drinker, further research should explore whether the reasoned pathway reflecting intentions to drink differs according to the level of alcohol use being studied.

4.5 Strengths and Limitations

This study allowed for respondents to nominate characteristics that they felt reflected the stereotypical person who drinks alcohol instead of asking participants to respond to pre-determined characteristics. For a sensitive and highly stigmatised issue such as alcohol use in pregnancy, this approach meant that participants were able to spontaneously nominate characteristics and thus provided an ethically responsible way to collect these data. The use of an online panel for recruitment may also have had implications for the generalisability of the findings however, a meta-analysis of comparisons between field data and online panel data did not find meaningful differences in the validity and reliability of the data collected. Thus, suggesting that online panels are an appropriate recruitment method (Walter et al., 2018).

Although there were significant differences between how the two behaviours were perceived, there was little discernible impact on whether participants would be willing to drink alcohol while pregnant. One potential reason for this lack of relationship could be how willingness was measured in this study. Although the willingness questions were devised to represent common scenarios in which a pregnant person may have to make a momentary decision about whether to drink, they may have been too specific. Additionally, the use of two different scenarios for inclusion as a composite may have complicated the measure. Another reason for the lack of a relationship may be due to the inclusion of those who did not intend to become pregnant in the future. Additional research in this space could explore the willingness of those who intended to become pregnant in the future and could stratify the sample according to past pregnancy history. Given a larger sample size, the sample could also be stratified according to different levels of current alcohol use to determine the impact on prototype perceptions and willingness. Additionally, it may be important to explore the specific contexts in which individuals drink, to then identify whether perceptions of prototypical alcohol consumers and individual willingness differed between those with high rates of social drinking as compared to those drinking in private or not regularly.

An additional limitation in regard to measurement of willingness in this study may be the requirement placed on participants to deliberate on questions about alcohol use in pregnancy prior to measuring willingness. It has previously been suggested that

the momentary aspects of willingness are not being sufficiently accounted for when conducting studies using the prototype/willingness model as a theoretical framework (Davies and Todd, 2021). However, in lieu of a real-life social situation, it was necessary for participants in this study to be prompted to consider their perceptions of the behaviour prior to stating their willingness to engage in the behaviour of alcohol use in pregnancy. Particularly as this research was focussed on the role that the different perceptions of alcohol use behaviours played in individual's willingness. However, as suggested by Davies and Todd (2021) future research should explore novel techniques, such as measuring implicit attitudes (Davies et al., 2017; Ratliff and Howell, 2015), to better approximate the conditions in which the prototype/willingness model is expected to be a useful model of behaviour. This type of method could be particularly useful for an ethically complicated area such as alcohol use during pregnancy.

4.6 Conclusion

The results of this study indicate that people perceive those who drink alcohol while pregnant differently depending on their perceived consumption level. This may have implications for health promotion messaging because although people may not approve of drinking alcohol while pregnant, they may be more accepting of what they perceive to be a small or "low-risk" amount. However, the amount that constitutes a 'small amount' of alcohol is subjective and open to interpretation. More clarity about what people perceive the behaviour of 'drinking alcohol during pregnancy' to entail is necessary to better understand people's willingness to do so.

Chapter 5

Predicting Alcohol Use Intentions in Pregnancy

In Study 2 of this thesis (Chapter 3) women's beliefs about alcohol use in pregnancy were explored. In Study 3 (Chapter 4) perceptions of likeability, similarity and responsibility were found to differ according to the amount of alcohol prototypes were said to consume, however, willingness to use a small amount of alcohol while pregnant did not. Study 4 built on these findings to explore whether these different perceptions may impact intentions via a planned pathway rather than willingness via a social pathway.

Paper 4 Intention to Engage in Alcohol Use During Pregnancy: The Role of Attitudes and Prototypes.

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Statement of Contributions

Author	Contribution	Signed Acknowledgement
Tess Fletcher	Conceptualisation, Methodology, Data Analysis, Investigation, Data Curation, Writing, Project administration	I acknowledge that these represent my contribution to this research output.
Barbara Mullan	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision.	I acknowledge that these represent my contribution to this research output.
Amy Finlay-Jones	<i>Assisted in:</i> Conceptualization, Methodology, Writing (Review & Editing), Supervision	I acknowledge that these represent my contribution to this research output.

Abstract

There is no known risk-free level of alcohol use in pregnancy. Despite this, many still believe that occasional drinking is safe. To-date, there is limited evidence of the influences on women's decisions about low to moderate alcohol use in pregnancy. The aim of this study was to explore the planned and socially reactive pathways associated with alcohol use intentions during pregnancy, using variables from the theory of planned behaviour (Ajzen, 1991) and the prototype willingness model (Gibbons & Gerrard, 1995). The study also investigated whether priming participants with exposure to prototypes describing different alcohol use behaviours had an impact on future intentions to use alcohol during pregnancy. Participants, 746 women aged 20 to 45 years, were randomised to be prompted to think of one of two different 'types' of behaviours, i.e., small level of alcohol use in pregnancy and ambiguous level of alcohol use in pregnancy. They then completed measures of theoretical variables, impulsivity, venturesomeness, and self-efficacy. Participants then answered whether they intended to use alcohol during a future pregnancy. Over half of the variance in intentions to consume alcohol while pregnant were predicted by the final model ($R^2 = .527$, $F(1, 438) = 13.201$, $p < .000$). Attitude was the most significant predictor of intentions and intentions did not differ between groups according to prototype exposure. This research suggests that the theory of planned behaviour and prototype/willingness model are useful models for understanding intentions to use alcohol while pregnant. The findings indicate that interventions to reduce low to moderate alcohol use in pregnancy should aim to change attitudes and social norms regarding low to moderate alcohol use in pregnancy and to consider ways to reduce individual's willingness to drink alcohol in particular social situations while pregnant.

5.1 Introduction

5.1.1 *Alcohol Use During Pregnancy*

Alcohol exposure in utero can impact on a child's development in many ways (Khalid et al., 2014), including adversely impacting brain development (Ornoy & Ergaz, 2010). As there is no known safe level of prenatal alcohol exposure, it is commonly recommended that no alcohol use during pregnancy is safest (Department of Health, 2016; National Health and Medical Research Council, 2020). However, the evidence for harm associated with low levels of alcohol use during pregnancy is mixed (Comasco et al., 2018), in part due to methodological issues, including a lack of consistency in how alcohol use in pregnancy is measured (O'Leary & Bower, 2012). Importantly, the mixed evidence for low to moderate alcohol use during pregnancy, does not mean that there is evidence of limited harm (Mamluk et al., 2017) or that there is a level at which drinking alcohol while pregnant can be considered risk-free. Nonetheless, prior research into determinants has largely focused on heavy alcohol use, with little evidence for determinants of low to moderate alcohol use in pregnancy (Roozen et al., 2017). In addition to perceived risk, the importance of social context is increasingly being recognised in relation to alcohol use decisions during pregnancy. In particular, prior research has documented that women experience peer pressure to drink alcohol while pregnant (Meurk et al., 2014), and that friends and family are influential in their decision making (Gouilhers et al., 2019). Additionally, a recent study found that of those who reported drinking alcohol during pregnancy over half drank on "special occasions" only (Tsang et al., 2021), suggesting that social environments may be particularly conducive to alcohol use in pregnancy.

5.1.2 *The Theory of Planned Behaviour*

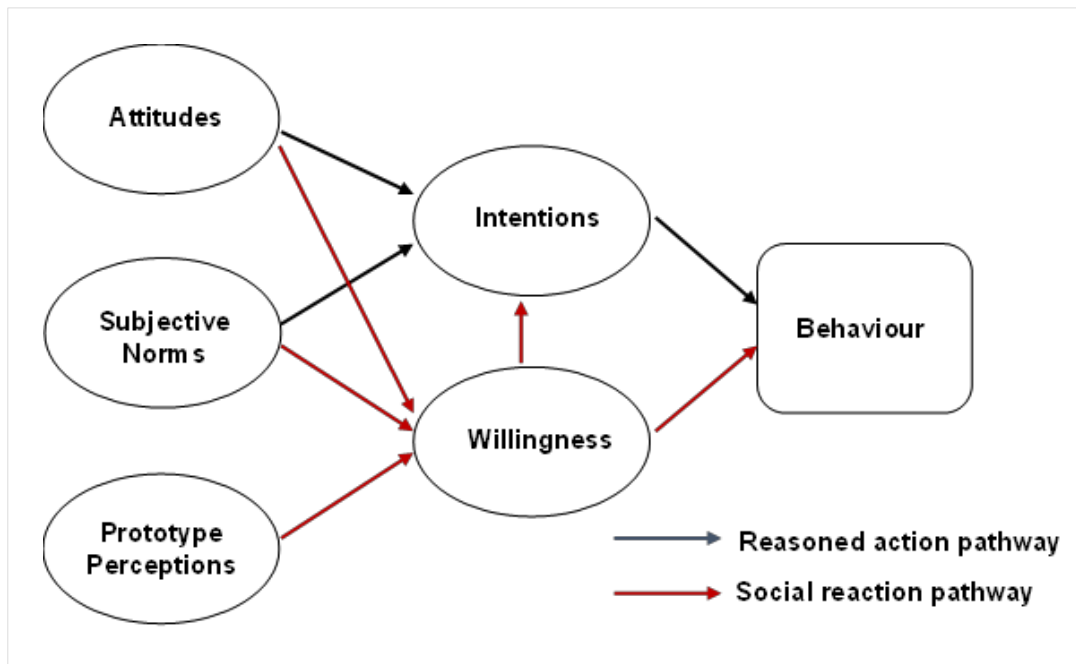
The theory of planned behaviour, which has been used extensively to predict individuals' alcohol use (Cooke et al., 2016), states that an individual's behaviour is predicted by their behavioural intention which is predicted by attitudes, subjective norms, and perceived behavioural control (Ajzen, 1991). Attitude is the overall positive or negative evaluation an individual makes about the behaviour. Subjective norms reflect the extent of social pressure experienced, while perceived behavioural control is the overall evaluation about capacity to adopt the behaviour. Abraham (2015) notes that the theory is best applied to behaviours where motivation is important

(e.g., lack of motivation to abstain from alcohol in pregnancy). Hence, the theory of planned behaviour may be particularly useful for understanding low to moderate alcohol use that appears to be a product of decision-making impacted by motivation (Corrales-Gutierrez et al., 2020).

5.1.3 *The Prototype/Willingness Model*

The theory of planned behaviour has been criticised for its underlying presumption that behaviour is planned and rational (Sheeran et al., 2013) and that it may not adequately account for reactive or momentary influences on behaviour (Rivis et al., 2006). Given the importance of the social context of risk behaviours such as alcohol use in pregnancy, the applicability of the theory of planned behaviour to alcohol use in pregnancy may be limited in this aspect. One model that does incorporate the socially reactive aspect of planned and unplanned behaviour is the prototype/willingness model (See Figure 5.1). The prototype/willingness model was initially developed to explore the decision making of adolescents in regards to health-risk behaviours (Gibbons & Gerrard, 1995), by including not only intentions, but also including willingness, i.e., an individual's willingness to engage in a behaviour under certain circumstances. Willingness is different from intention because it is situationally specific such that despite having the intention to behave a certain way someone may act in opposition to that intention when provided the opportunity (e.g., accepting a glass of champagne at a wedding while pregnant despite previously intending to abstain during pregnancy). The model further incorporates the social aspect of decision-making by proposing that an individual holds an image of the prototypical person who engages in the behaviour and expects that their peers share this same image. It is then assumed that if a prototype is seen favourably, then the individual would be motivated to behave in a similar way, such that they are also seen favourably. Additionally, the more similar one feels they are to a prototypical person they view favourably, the more likely they are to feel that they would be viewed favourably if they were to do the same behaviour.

Figure 5.1
Prototype/Willingness Model



Adapted from (Gerrard et al., 2008).

5.1.4 *Impulsivity, Venturesomeness and Self-Efficacy*

In addition to social influences, research has found a relationship between personality and alcohol use in pregnancy (Lupattelli et al., 2021). Openness to experience (Beijers et al., 2014; Lupattelli et al., 2021), extraversion (Lupattelli et al., 2021; Ystrom et al., 2012) and novelty-seeking (Magnusson et al., 2007) have all linked been to increased alcohol use during pregnancy, suggesting that those high in these traits may be more likely to be willing to engage in the behaviour (Lupattelli et al., 2021). Further, these traits are broadly captured by the concepts of venturesomeness and impulsivity. That is, an individual's level of venturesomeness is their appetite for risk and sensation seeking (e.g., skydiving) (Cross et al., 2011). In addition to how venturesome someone may be individuals also have a level of impulsivity in regard to decision making. In particular, decisions that are made hastily, with little to no forethought or consideration of consequences can be described as impulsive (Moeller et al., 2001). High impulsivity has been found to be related to both social alcohol use (Lannoy et al., 2017) and problem drinking (Haeny et al., 2019).

Although Ajzen (2002) considers perceived behavioural control to be a combination of self-efficacy (i.e., one's perception of their ability to engage in a

behaviour) and perceived control (i.e., the level of control individual's feel they have over a behaviour) many studies operationalise those aspects separately and have found that they have varying relationships with intentions. For example, a meta-analysis of studies exploring the theory of planned behaviour and general alcohol use found that, when examined separately, self-efficacy had a strong relationship with alcohol use intentions whereas perceived control over alcohol use had an insignificant, negative relationship with intention (Cooke et al., 2016). In addition to behaviour-specific self-efficacy, general self-efficacy has been found to be predictive of intentions to engage in a variety of behaviours such that higher levels of general self-efficacy are associated with stronger intentions to engage in desired behaviours (Luszczynska et al., 2005).

5.1.5 Overview and Hypotheses

The present study sought to provide more insight into influences on women's decisions about *low to moderate* alcohol use in pregnancy. We sought to explore both the general and socially reactive (i.e., context specific) pathways that may contribute to alcohol use in pregnancy using a theory-based approach. The theory of planned behaviour and the prototype/willingness model were applied to the prediction of intention to use low to moderate amounts of alcohol while pregnant. Additionally, we used an experimental methodology to examine whether there were differences in perceptions of low to moderate alcohol use during pregnancy ('small use' prototype condition) compared to an undefined level of alcohol use during pregnancy ('ambiguous use' prototype condition). Scores on the outcome measures according to prototype exposure were compared.

Specifically, it was hypothesised that:

- **H1:** Attitudes, subjective norms and perceived behavioural control would be predictive of intention to use low-moderate amounts of alcohol in pregnancy after controlling for impulsivity, venturesomeness, and self-efficacy.
- **H2:** The addition of prototype/willingness model variables to the theory of planned behaviour would increase the amount of variance explained in intentions to use low-moderate amounts of alcohol in pregnancy after controlling for impulsivity, venturesomeness, and self-efficacy.
- **H3:** An 'ambiguous use' prototype would be rated less favourably than a 'small use' prototype.

5.2 Method

5.2.1 Participants and Procedure

Ethical approval was obtained by the Curtin Human Research Ethics Committee (HREC number HRE2019-0339). Participants were 746 women aged 20 to 45 years. Firstly, 461 participants were recruited via posts made on local community Facebook pages as well as on online parenting forums in Australia. These posts provided a brief overview of the study and included a link to the survey where the study was outlined in full, participants were provided with a copy of the participant information sheet and were entered into a random draw for one of three \$100 vouchers. An additional 285 UK participants completed the study via the paid recruitment platform Prolific and were paid AUD\$16.81/GBP£9.60 per hour for their time. Data collection took place between January and April 2021.

Participants provided informed consent and were then randomised to one of two conditions and were presented with the following definition of a prototype:

“The following questions concern your images of people. What we are interested in here are your ideas about typical members of different groups. For example, we all have ideas about what typical movie stars are like or what the typical grandmother is like. When asked, we could describe one of these images- we might say that the typical movie star is pretty or rich, or that the typical grandmother is sweet and frail. We are not saying that all movie stars or all grandmothers are exactly alike, but rather that many of them share certain characteristics” (Gibbons et al., 1995, p. 85).

Participants were also presented with a prompt to consider either the ‘typical person who drinks alcohol in pregnancy’ (‘ambiguous use’ prototype) or the ‘typical person who drinks a small amount of alcohol in pregnancy’ (‘small use’ prototype).

5.3 Measures

5.3.1 Demographics

Included age, marital status, education, employment status and pregnancy history.

5.3.2 Current Alcohol Use

Current alcohol use was assessed by asking when participants had last consumed alcohol ranging from never to over 3 months ago.

5.3.3 Pregnancy History And Intentions

Participants were asked whether they were currently pregnant, whether they had previously been pregnant, whether they had biological children and whether they intended to become pregnant in the future.

5.3.4 Previous Alcohol Use During Pregnancy

Participants with a biological child were asked questions about their alcohol use habits at different times during their last pregnancy.

5.3.5 Impulsivity and Venturesomeness

The Eysenck Impulsivity and Venturesomeness Scale was used (Eysenck et al., 1985). The 35-item scale asks Yes/No questions about whether respondents would engage in a series of 'risky' experiences (e.g., Would you enjoy parachute jumping?) or behave impulsively (e.g., Do you generally do and say things without stopping to think?). There were 19 items on the impulsivity subscale ($\alpha = .811$) and 16 on the venturesomeness subscale ($\alpha = .779$).

5.3.6 Self-Efficacy

Self-efficacy was measured using the ten item General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995). Respondents were presented with 10 statements expressing an ability to achieve goals even under difficult situations and are asked to identify how true each statement was for them on a 4-point scale ranging from 'not true at all' to 'completely true' ($\alpha = .843$).

5.3.7 Prototype Measurement

Dependant on randomisation, participants were asked to describe, in three to five words, the kind of person who would drink either a small or an ambiguous amount of alcohol in pregnancy. Describing the prototype in their own words was meant to produce a clear image in the participants' minds about the characteristics of the prototype. Participants were then asked to assign a rating on a 5-point Likert scale of

how likeable/unlikeable they thought the individual was, how responsible/irresponsible they believed they were and how similar/dissimilar they felt they were to them.

5.3.8 *Subjective Measure of Alcohol Use in Pregnancy*

To determine what behaviour each participant was considering when responding to questions about alcohol use in pregnancy, they were asked to specify how much the person they were considering in the previous question would drink. Participants randomised to the 'ambiguous use' condition were also asked to specify how much they thought someone who drank a small amount while pregnant would have.

5.3.9 *Willingness to Consume Low to Moderate Amounts of Alcohol in Pregnancy*

Six items assessing willingness to consume low to moderate amounts of alcohol in pregnancy under particular circumstances were included ($\alpha = .796$). Three different hypothetical situations were presented, that asked participants to suppose that they were pregnant and that they had the opportunity to have a drink containing alcohol (e.g., at a wedding, at home with their partner, at a friend's house). These particular situations to reflect previous situations from the literature (McBride et al., 2012; Tsang et al., 2021). Participants first rated on a 7-point Likert scale how willing they would be to accept and finish the drink in each scenario (from not at all willing to very willing). They were then asked to respond to the three scenarios in the same way but to indicate how willing they would be to say no and refuse the drink. Refusal responses were reverse scored.

5.3.10 *Intention to Consume Low to Moderate Amounts of Alcohol in Pregnancy*

Participants were told that the following questions were about drinking 'small' amounts of alcohol in pregnancy and were prompted to consider the amount that they specified when responding to the question assessing a subjective measure of low to moderate amounts of alcohol. Participants who previously stated that they intended to become pregnant in the future were then asked to indicate their agreement with the statement 'I intend to drink alcohol at some point during any future pregnancy' along a 7-point Likert scale ranging from 'strongly agree' to 'strongly disagree'.

5.3.11 Theory of Planned Behaviour Direct Measures

The attitude (four items, $\alpha = .87$), subjective norm (four items, $\alpha = .811$) and perceived behavioural control (three items, $\alpha = .583$) items from the Study on Alcohol Abstinence Questionnaire (Vézina-Im & Godin, 2011) were used as direct measures of the theory of planned behaviour constructs.

5.4 Findings

5.4.1 Demographics

Of the whole sample, 57.1% were aged >25 to 35 years old ($M = 31$, $SD = 5.8$). The majority (73.7%) had completed either an undergraduate or a postgraduate degree and 80.7% were employed either part-time or full-time. Additionally, 77.9% drank alcohol within the last month and 68.5% of participants intended to become pregnant in the future. Less than 2% of participants had never been and did not ever intend to become pregnant. Additional demographics are outlined in Table 5.1 and Table 5.2.

Table 5.1
Demographic Characteristics (N = 746)

Demographic measure	'Ambiguous' N = 381		'Small' N = 365		Total N = 746	
	N	%	N	%	N	%
Age						
20-25	68	17.8	1	0.3	1	19.4
26-30	126	33.1	77	21.1	145	30.2
31-35	96	25.2	99	27.1	225	26.9
36-40	62	16.3	105	28.8	201	16.5
41-45	29	7.6	61	16.7	123	6.8
Marital status						
Single, never married	110	28.9	94	25.8	204	27.3
Married/de facto	258	67.7	258	70.7	516	69.2
Widowed	2	0.5	0	0.0	2	0.3
Divorced	5	1.3	7	1.9	12	1.6
Separated	6	1.6	4	1.1	10	1.3
Prefer not to say	0	0.0	2	0.5	2	.3
Education - highest level						
Some secondary education	7	1.8	6	1.6	13	1.7
High school graduation	42	11.0	40	11.0	82	11.0
Technical/Community College	52	13.6	43	11.8	95	12.7
Undergraduate degree	164	43.0	179	49.0	343	46.0
Postgraduate degree	111	29.1	96	26.3	207	27.7
Other	4	1.0	0	0.0	4	0.5
Prefer not to say	0	0.0	1	0.3	1	0.1
Employment status						
Employed full-time	205	53.8	202	55.3	407	54.6
Employed part-time	105	27.6	90	24.7	195	26.1
Unemployed looking for work	11	2.9	13	3.6	24	3.2
Unemployed not looking for work	18	4.7	21	5.8	39	5.2
Student	36	9.4	34	9.3	70	9.4
Disability	3	0.8	3	0.8	6	0.8
Prefer not to say	3	0.8	1	0.3	4	0.5

Table 5.2*Previous Alcohol Use, Pregnancy History, and Pregnancy Intentions (N = 746)*

Measure	'Ambiguous' N = 381		'Small' N = 365		Total N = 746	
	N	%	N	%	N	%
Last drink of alcohol						
A week or less ago	232	60.9	226	61.9	458	61.4
Between 2 to 4 weeks ago	62	16.3	61	16.7	123	16.5
Between 1-3 months ago	35	9.2	36	9.9	71	9.5
Over 3 months ago	50	13.1	41	11.2	91	12.2
Prefer not to say	1	0.3	0	0.0	1	0.1
Pregnancy history						
Currently pregnant: No	327	85.8	322	88.2	649	87.0
Previously pregnant: Yes	203	53.3	193	52.9	396	53.1
Biological children: Yes	170	44.6	170	46.6	340	45.6
Pregnancy intention						
Yes, within the next 2 years	128	33.6	101	27.7	229	30.7
Yes, within the next 5 years	87	22.8	108	29.6	195	26.1
Yes, in 5 years or more	47	12.3	40	11.0	87	11.7
No, never	74	19.4	69	18.9	143	19.2
Unsure	45	11.8	47	12.9	92	12.3

5.4.2 Alcohol Use Intentions and Behaviour in Pregnancy

This study found that 30.72% of participants reported that they intended to drink a 'small' amount of alcohol while trying to get pregnant whereas 7.63% intended to drink at some point while pregnant. In comparison, Australian data from 2003 found that 31.6% of women intended to drink an ambiguous amount of alcohol when planning to get pregnant while 23.7% intended to drink during a future pregnancy (Peadon et al., 2011). Although the percentage of participants intending to drink alcohol while trying to get pregnant was similar between studies, significantly fewer participants intended to drink while pregnant in this study. This may be reflective of health promotion efforts in recent years focussing on preventing alcohol use while pregnant.

Reporting on their most recent pregnancy, of those in this study who had previously had a child ($N = 340$), 62.7% stopped drinking when they found out they were pregnant while 11.6% continued to drink after they became aware they were pregnant. In comparison, recent Australian data collected between 2017-2018 found

that of 935 women who drank pre-pregnancy, 18% continued to drink alcohol once they knew they were pregnant, a third of which reported drinking on special occasions only (Tsang et al., 2021). However, differences in the reporting of alcohol use during pregnancy, particularly in terms of specific time points and amounts, means it is difficult to compare rates between studies. For example, data collected in 2006 found that 34.1% of participants reported consuming alcohol at some point during their previous pregnancy however, they did not distinguish between consumption prior to and after awareness of pregnancy (Peadon et al., 2011).

5.4.3 *Descriptive Findings*

Apart from perceived behavioural control, all other variables had acceptable reliability coefficients. The perceived behavioural control items had low reliability ($\alpha = .385$). Removing one item which did not correlate very highly with the other three items (corrected item–total correlation = .046) increased the reliability to $\alpha = .584$ which was more acceptable.

Intentions to consume alcohol when pregnant were significantly correlated with age ($r(746) = .154, p < .001$), having a child ($r(746) = .106, p < .001$), venturesomeness ($r(716) = .110, p < .001$), perceived likeability ($r(745) = .356, p < .001$), perceived responsibility ($r(745) = .439, p < .001$), perceived similarity ($r(746) = .598, p < .001$), attitudes ($r(746) = .660, p < .001$), subjective norms ($r(736) = .432, p < .001$), perceived behavioural control ($r(743) = -.231, p < .001$), willingness to accept a drink while pregnant ($r(740) = .588, p < .001$), willingness to drink alcohol ($r(733) = .295, p < .001$) while pregnant and intention to consume alcohol while trying ($r(511) = .422, p < .001$).

5.4.4 *Group Differences*

A series of independent samples *t* tests were used to compare the ratings for all the outcome measures reported by those in the ‘ambiguous use’ condition ($N = 381$) to the ratings reported by those in the ‘small use’ condition ($N = 365$).

Although the Shapiro-Wilk statistic was significant for all variables, upon examination of the histograms and QQ plots the data appeared to be normally distributed. Additionally, given that large and relatively equal sample sizes ($N > 30-40$) are robust against violations of the assumption of normality (Pallant, 2011) the

results were interpreted as having satisfied the assumption. Levene's test was significant for responsibility, similarity, perceived behavioural control and willingness to accept a drink while pregnant so the t-test for equal variances not assumed are reported. Independent t-tests demonstrated that there were significant differences related to prototype exposure for likeability, responsibility, similarity, perceived behavioural control and willingness to accept a drink while pregnant. Specifically, those exposed to the 'small use' prototype rated its likeability, level of responsibility and degree of similarity to themselves as higher. Those exposed to 'small use' prototype also had a greater level of perceived behavioural control and a greater overall willingness to accept and finish a drink while pregnant. However, there was less than a 1.5-point difference in the means between groups for each of the variables.

5.4.5 Predicting Intentions to Drink While Pregnant

Stepwise hierarchical regression was used to predict intentions to drink alcohol at any point while pregnant, with prototype exposure entered in the first step, followed by age, and having a biological child in the second step, impulsivity, venturesomeness, and self-efficacy in the third step, subjective norms, attitudes, and perceived behavioural control in the fourth step, likeability, similarity, and responsibility in the fifth step, and willingness in the final step (see Table 5.3). The model accounted for 52.7% of variance in intentions to drink alcohol while pregnant ($R^2 = .527$, $F(1, 438) = 13.201$, $p < .001$). The following were all significant predictors of variance in intentions to drink alcohol at any point in a future pregnancy; venturesomeness, which predicted 0.8% of variance; subjective norms, which predicted 0.6% of variance; attitudes, which predicted 8.9% of variance; perceived similarity, which predicted 5.0% of variance; and, willingness to drink while pregnant; which predicted 1.4% of variance. Those who were more venturesome, felt that they were similar to someone who would drink alcohol while pregnant, had a greater situational willingness to drink while pregnant and/or held more positive subjective norms and attitudes towards drinking alcohol while pregnant were more likely to intend to drink alcohol while pregnant. As willingness is proposed to have a direct relationship with behaviour steps 1 to 5 were also run as an additional analysis with willingness as the dependent variable. This model accounted for 38% of the variance in willingness ($R^2 = .38$, $F(1, 645) = 5.023$, $p < .05$).

Table 5.3

Summary of hierarchical regression analysis for variables predicting alcohol use intentions during pregnancy (N = 511)

Variable	B					
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
Step 1 Prototype	-0.097*	-0.101*	-0.106*	-0.094**	-0.046	-0.042
Step 2 Age		0.110*	0.131**	0.036	0.020	0.028
Biological child		0.054	0.062	0.079*	0.041	0.038
Step 3 Impulsivity			-0.007	-0.024	-0.032	-0.036
Venturesomeness			0.164**	0.087*	0.090*	0.094**
Self-efficacy			-0.102*	-0.038	-0.041	-0.041
Step 4 Subjective norm				0.123**	0.090*	0.088*
Attitude				0.548**	0.419**	0.401**
Perceived control				-0.075*	-0.040	-0.034
Step 5 Likeability					-0.075	-0.063
Similarity					0.358**	0.345**
Responsibility					-0.015	-0.028
Step 6 Willingness						0.125**

Note. $R^2 = 0.009$ for Step 1, $p = .040$; $\Delta R^2 = 0.019$ for Step 2, $p = .012$; $\Delta R^2 = 0.029$ for Step 3, $p = .004$; $\Delta R^2 = 0.389$ for Step 4, $p < .001$; $\Delta R^2 = 0.065$ for Step 5, $p < .001$, $\Delta R^2 = 0.014$ for Step 6, $p < .001$ ** $p < 0.05$ *.

5.5 Discussion

The aim of this research was to explore women's intentions to consume alcohol when pregnant. Additionally, this study used concepts from the prototype/willingness model to determine whether prototype perceptions and situationally specific willingness to drink alcohol while pregnant added to the prediction of alcohol use intentions.

5.5.1 Predictive Utility of the Theory of Planned Behaviour and the Prototype/Willingness Model

In this study, over half the variance in low to moderate alcohol use intentions was accounted for by the final model. In combination with impulsiveness, venturesomeness, and self-efficacy, variables from the theory of planned behaviour explained 39% of variance in intentions, with the addition of variables from the prototype/willingness model a further 8% of variance was explained. In comparison, a study of pregnant women found that 59% of the variance in intentions to consume

alcohol while pregnant was predicted by the theory of planned behaviour alone (Duncan et al., 2012).

Although the theory of planned behaviour had greater predictive utility in the study by Duncan et al. (2012) than the model used in this study, it is important to note the differences in the two populations, namely, currently pregnant women as opposed to women intending a future pregnancy. These differences may indicate that, despite thinking that exposure to guidelines for alcohol use in pregnancy can act as an opportunity for planning future behaviour, actual decisions about alcohol use intentions may not be made until one becomes pregnant. Mixed acceptance of alcohol use at different periods during pregnancy, e.g., different trimesters, may also extend the intention building period such that there are many opportunities to revise intentions throughout the different stages of pregnancy meaning that intention is not necessarily stable.

5.5.2 *Predictors of Intentions to Use Alcohol in Pregnancy*

In this study venturesomeness, subjective norms, and situational willingness to drink while pregnant each predicted 0.6, 0.8 and 1.4% of variance in alcohol use intentions respectively. Attitudes and perceived prototype similarity predicted 8.9% and 5% of the unique variance in intentions. The remaining variables (i.e., self-efficacy, impulsivity, perceived behavioural control, perceived prototype likeability and responsibility) were all non-significant in the final model. Because impulsivity likely has more influence in-the-moment than on planned decisions, the influence of trait impulsivity on alcohol use decisions may have been difficult to establish through the proxy of intentions. Future research may look at the intention-behaviour relationship as moderated by impulsivity to determine how this trait influences planned behaviour. Although both self-efficacy and venturesomeness were significant predictors at step 3 of the model, only venturesomeness was still significant at steps 4 and 5. These findings suggest that trait levels of venturesomeness have more influence on intentions to drink alcohol in pregnancy than self-efficacy does on intentions to abstain. These findings also align with prior work demonstrating that risk-taking (of which venturesomeness is one facet) increases the odds of binge-drinking among women (de Haan et al., 2015). However, the results for this study may have differed if a more specific measure of self-efficacy was used, such as drink refusal self-efficacy

which assesses whether individuals feel that they are able to resist drinking alcohol under specific circumstances (Oei et al., 2005).

Intentions to drink while pregnant have been found to be significantly associated with neutral or positive attitudes to alcohol use during pregnancy (Peadon et al., 2011). The current study also found that a positive attitude was a significant predictor of intention, however, despite the shared finding, it is important to note that Peadon et al. (2011) did not use a theoretical framework in their study and direct comparisons on attitude measures between studies are not possible. The finding that perceived behavioural control was not a significant predictor of intentions in this study is unsurprising, given that scores on the perceived behavioural control measure were relatively high overall, ($x = 6.61$, $SD = .748$) with over 86% of the respondents agreeing or strongly agreeing with each item. Additionally, a meta-analysis of the predictive utility of the theory of planned behaviour in relation to alcohol and dietary behaviours found that perceived behavioural control had minimal effect on intention and that attitude was the strongest predictor overall (Hagger et al., 2016). In concordance with the findings of this study, Duncan et al. (2012) also found that attitudes and subjective norms were significant predictors of intention in the final model while perceived behavioural control was not. In comparison, Vézina-Im and Godin (2011) examined non-pregnant women's intentions to abstain from alcohol during a future pregnancy and found that although attitude and perceived behavioural control were significant predictors of intentions to abstain, subjective norms were not. Despite the apparent contradictions, these differences in results are not unusual given that the study by Vézina-Im and Godin (2011) was conducted with a population that consisted primarily of university students and that although the authors were addressing the same health behaviour as the current study (alcohol use in pregnancy), it was framed as abstinence from alcohol during a future pregnancy as opposed to intentions to drink low to moderate amounts during a future pregnancy. The level of control needed to completely abstain from alcohol in pregnancy may be higher than that needed to limit drinking to a small or moderate amount. This may explain why perceived behavioural control was relevant when examining intentions to abstain as opposed to intentions to drink even though they are two different sides of the same coin.

The hypothesis that the addition of prototype/willingness model variables to the theory of planned behaviour would increase the amount of variance explained in

intentions to use low-moderate amounts of alcohol in pregnancy was partially supported. Perceived similarity of the prototype and willingness to consume alcohol were the only predictors from the prototype/willingness model that were significant in the final model. Interestingly, perceived similarity contributed to the model above and beyond willingness which is inconsistent with the prototype/willingness model. However, this finding is not uncommon, in fact a meta-analysis of predictive studies using the prototype/willingness model found that intention was better predicted by prototype similarity (.47) than willingness (.41) (Todd et al., 2016). The extent to which willingness contributed to the model in this study was minimal compared to that found by the meta-analysis, that is 1.4% of variance in intention as opposed to 21.6% respectively. However, this is not unexpected given that willingness-intention and similarity-intention relationships are moderated by behaviour type (Todd et al., 2016). Furthermore, the meta-analysis found that in relation to alcohol use specifically, willingness accounted for 56.4% of variance in alcohol use intentions, however, this finding was in regard to the prototype/willingness model only and did not include variables from the theory of planned behaviour.

5.5.3 *Prototype Exposure and Perceptions*

The experimental use of different prototype exposures had mixed results. Although there was a significant effect of exposure to prototypes on the resulting prototype perceptions, such that exposure to the ‘ambiguous use’ prototype was associated with less positive ratings of the perceived likeability, similarity and responsibility of the prototype, the means for each condition only differed by less than 1.5 scale points each. Additionally, prototype exposure had no significant relationship with any variable other than prototype/willingness model ratings; thus, the hypothesis that prototype exposure would be associated with intentions to drink alcohol while pregnant was not supported.

5.6 *Strengths and Limitations*

The main strategy for reducing low to moderate alcohol use during pregnancy is public health messaging, with a reliance on communicating health guidelines. Therefore, this study aimed to explore determinants of intentions to consume low to moderate amounts of alcohol while pregnant in order to better inform such messaging. Although we were unable to measure actual alcohol use behaviour during pregnancy,

by including women who had previously had children as well as those who intended to in the future, we were able to explore the planned aspects of alcohol use in pregnancy that health promotion messaging often targets.

It is important to note that while the validity of the theory of planned behaviour as a predictive model of intentions is well accepted, the link between intentions and behaviour is less established (Sheeran, 2002; Sheeran et al., 2016; Sniehotta et al., 2015). Accordingly, there are limitations in the extent to which the current findings can provide insight into predictors of actual alcohol use behaviour during pregnancy. However, pre-pregnancy intentions have been shown in previous research to be predictive of alcohol use behaviour in pregnancy (Zammit et al., 2008), and a meta-analysis of experimental studies across a wide range of behaviours found that medium/large changes in intention led to small/medium changes in behaviour (Webb & Sheeran, 2006). Therefore, targeting the determinants of intentions to use alcohol while pregnant may be useful for promoting behaviour change.

A strength of this study was the choice to prompt participants to be specific about the behaviour they were considering when answering the questions. That is, when asked about alcohol use intentions, participants were instructed to identify what they considered a ‘small’ amount of alcohol to be. This was done to avoid asking about intentions to drink neither an ambiguous amount of alcohol nor a specific, possibly irrelevant/hard to understand amount of alcohol during pregnancy.

5.7 Conclusion

The findings of this study indicate that the theory of planned behaviour and the prototype willingness model are useful theoretical frameworks with which to explore determinants of alcohol use intentions and possibly behaviour in pregnancy. In particular, future behaviour change interventions should focus on changing the attitudes of women towards low to moderate alcohol use during pregnancy. Additional factors that could be targeted by interventions to reduce low to moderate alcohol use in pregnancy include, the perception of those who drink alcohol during pregnancy, the subjective norms people hold in relation to alcohol use in pregnancy and individual’s willingness to drink alcohol in particular social situations.

Chapter 6

General Discussion

6.1 Summary of the Aims

The overarching purpose of this thesis was to establish an evidence base for future prevention efforts by conducting an in-depth and theoretically-informed exploration of modifiable determinants of alcohol use intentions during pregnancy. Prior research on health promotion approaches aimed at reducing alcohol use in pregnancy was also reviewed. Study 1 was a systematic review of the literature that aimed to identify strategies that have been used to design health promotion messages targeting alcohol use during pregnancy (Chapter 2). The second and third studies used the theory of planned behaviour and the prototype/willingness models to explore how alcohol use during pregnancy is perceived and whether perceptions of the behaviour and those who engage in it impacts willingness to engage in alcohol use (Chapter 3 and 4). These models were integrated and extended in Study 4 to explore modifiable determinants of intentions to use alcohol in pregnancy (Chapter 5).

6.2 Key Findings

6.2.1 *Health Promotion Strategies*

It was originally planned that the findings from the first study would be combined with the findings of the remaining studies to provide an evidence-base that could be used to inform future message development. That is, evidence for effective messaging strategies would be combined with the evidence documenting perceptions and determinants of alcohol use in pregnancy. However, the lack of detail in studies reporting on the development, implementation and dissemination of health promotion messages hinder the learnings that can be made from previous efforts at addressing alcohol use in pregnancy (Abraham & Michie, 2008; Bartholomew & Mullen, 2011). As such, there is a paucity of evidence about the efficacy of messaging strategies to address alcohol use in pregnancy (Burgoyne, 2006). Study 1 found that there was little to no documentation of how existing messages conceptualised alcohol use in pregnancy (e.g., Bazzo et al., 2015; Evans et al., 2012; Hanson et al., 2012), what the primary messages were (e.g., Crawford-Williams et al., 2016; Hanson et al., 2012; Yu et al., 2010) nor how they aimed to impact behaviour or intentions (e.g., Dumas et al.,

2010; Toyama and Sudo 2014; Yu et al., 2010). Due to lack of detail reported there was little ability to establish whether interventions addressed or assessed aims appropriately. Accordingly, the contribution to the evidence base is limited in terms of generalisability and replicability to other populations, behaviours, or contexts. Additionally, for those studies that conducted their own formative research it was not always possible to ascertain how those findings were utilised in the design of message. Thus, the ability to identify any link between message strategy and message outcomes was extremely limited.

Although much research has previously been and continues to be published regarding the modifiable determinants of alcohol use intentions or behaviour in pregnancy, very few studies identified in Study 1 included any indication of whether the existing literature was incorporated into the design of prevention messages. This is of concern given the importance of research translation to ensure that research is contributing to the community beyond academia (Finlay-Jones et al., 2021) and the need for theory-informed and evidence-based messaging. By providing detail regarding the resources and methods used to inform the development of health promotion messages for alcohol use in pregnancy, future research can contribute to the advancement of scientific understanding regarding effective and ineffective behaviour change (Michie et al., 2008; Sheeran et al., 2016).

Other researchers have pointed to the lack of information in the reporting of the design and evaluation of health promotion messages and campaigns as significantly hindering the ability to learn from their strengths and weaknesses (Gardner et al., 2014; Michie & Abraham, 2004; Roozen et al., 2016). The findings from Study 1 highlight that this is also true for the reporting of alcohol use in pregnancy universal prevention strategies. This highlights the need for standardization of reporting for health promotion message development, including reporting of theoretical and empirical evidence supporting the content, framing, and delivery of the messages, as well as evidence of their effectiveness.

6.2.2 *Perceptions of Alcohol Use in Pregnancy*

Study 2 highlighted the wide variations in perceived risk associated with different levels of alcohol use in pregnancy, as well as differences in stereotypes regarding the “typical” person who uses alcohol while pregnant. Respondents in

Study 2 expressed somewhat contradictory views, that is, they were supportive of the guidelines and did not think it was ‘good’ to drink alcohol in pregnancy, but also reported that drinking a small amount was acceptable. This finding points to previously unexplored nuances in how people conceptualise alcohol use in pregnancy and highlights that individuals appear to hold what researchers may classify as contradictory views but that they may view as congruous. Additionally, although participants were not asked to consider a specific level of alcohol use (e.g., low, moderate, or high use), their views appeared to vary with regard to what they perceived ‘drinking in pregnancy’ to entail. Further, respondents with the view that small, occasional amounts of use were acceptable also believed that drinking small amounts occasionally fell within the guidelines. This suggests that if when answering questions regarding alcohol use in pregnancy, a person does not think that the questions related to small, occasional alcohol use, then the answers provided might not be accurate. In combination with evidence that more than half of respondents who reported drinking alcohol while pregnant, noted that they drank on ‘special occasions’ only (Tsang et al., 2021), the finding that occasional alcohol use was viewed as acceptable suggested that determinants of low to moderate alcohol use may need more in depth exploration. Additionally, people commonly report that abstinence during pregnancy is the predominant social norm they encounter (Gouilhers et al., 2019; Jones & Telenta, 2012). However, research exploring this tends to frame abstinence in relation to a non-specific amount of ‘alcohol use in pregnancy’ (Duncan et al., 2012; Meurk et al., 2014; Schölin et al., 2017). That is, it is unknown whether participants conceptualise ‘alcohol use in pregnancy’ as heavy use only or as also including occasional use. It appears that despite high levels of knowledge of abstinence guidelines, misunderstandings about what experts consider alcohol use in pregnancy appear to be common. These findings suggest that conceptualisations of alcohol use in pregnancy do vary according to the question asked. Therefore, it is necessary for future research to be explicit about the behaviour studied and to consider the limitations of findings drawn from ambiguous questions.

Given the finding in Chapter 3 that there was a dichotomy between ‘safe’ and ‘risky’ levels of use and how those were perceived by participants, in Chapter 4 we chose to explore the question of whether ‘low to moderate’ use was perceived differently to an ‘ambiguous’ (i.e., non-specific) level of use. Additionally, as both

social context and perceptions of the ‘typical’ person were found to be important aspects of alcohol use in pregnancy we decided to explore the prototype/willingness model as a theoretical framework for the study. The key finding from Chapter 4 was that the perceived likeability, similarity and level of responsibility of the prototypical person who would drink a ‘small’ amount of alcohol in pregnancy was significantly higher than for the prototypical person who would use an ambiguous amount of alcohol in pregnancy. These differences in perceptions were in line with expectations around the stigma surrounding those who drink alcohol in pregnancy, with the assumption being that not specifying an exact level of use would result in participants estimating that the prototypical person would drink a heavier amount of alcohol in pregnancy. However, this assumption was not explicitly tested.

Corrigan et al. (2018) also explored individuals’ perceptions of different levels of alcohol use in pregnancy. Specifically, they explored people’s perceptions of mothers of children with FASD, which was contextualised as occurring due to heavy and/or binge drinking during pregnancy, and people’s perceptions of those with an ambiguous amount of alcohol use in pregnancy. Individuals were rated on how different they were to the general population (analogous to similarity in the prototype/willingness model) and respondents reported their level of disdain towards them compared to the general population (analogous to likeability in the prototype/willingness model). Interestingly, Corrigan et al. (2018) found that those with an ambiguous amount of alcohol use in pregnancy were judged more negatively compared to mothers of children with a confirmed diagnosis of FASD. However, participants were not randomised to the conditions, so were presented with both vignettes. This may have clouded comparison between the conditions as the ambiguous vignette specifically made reference to the potential for the behaviour to result in FASD meaning that the only real difference between the vignettes was in terms of the timing of the behaviour. This may have meant that participants were more likely to express judgemental views of someone actively engaging in risky behaviour as opposed to judging someone for behaviour they cannot change. Future research could compare whether the amount and timing of alcohol consumption during pregnancy has an impact on perceptions of the behaviour. Findings from this kind of research could inform the design of health promotion messages in terms of how best to frame the behaviour. Another key finding from Chapter 4 was that perceived

likeability and similarity were highly correlated with willingness for both conditions. This suggests that alcohol in pregnancy decisions are likely to be influenced by those people whom one likes and feels similar to. Further research should be conducted to establish whether manipulating how likable and/or similar a prototype is perceived to be has an impact on willingness, intentions or behaviour for alcohol use in pregnancy. These findings could then inform the development of health promotion messages that enhance such an effect. Additionally, further development of health promotion messaging should consider the need for diversity in the types of prototypes used in alcohol use in pregnancy messaging so as to increase relevancy and authenticity whilst not perpetuating stigma against particular groups of individuals.

6.2.3 *Determinants of Intentions to Use Alcohol in Pregnancy*

Despite the clear finding that the two different levels of alcohol use were perceived differently, participants “own” willingness to drink a ‘small’ amount of alcohol while pregnant was no different between groups (Chapter 4). This suggests that highlighting distinctions between two different behaviours of alcohol use in pregnancy does not have an impact on whether an individual would be more willing to engage in low to moderate alcohol use in pregnancy. However, the willingness measure used in this study may not have been able to tap into participants’ actual willingness due to its composite nature. Despite the finding that the manipulation did not impact willingness (reactionary pathway) we still wanted to explore whether it may impact intention (planned pathway), thus leading to the next study.

Consequently, the next study explored variables from both the prototype/willingness model and the theory of planned behaviour to explore the determinants of intentions to use alcohol while pregnant (Study 4, Chapter 5). For this study we adapted the previous willingness measure to include a broader range of hypothetical scenarios and changed the structure of the measure such that there were three pairs of questions each asking about willingness to abstain and willingness to drink. Findings from Study 3 regarding perceptions of the two different alcohol use behaviours were replicated in Study 4. That is, someone engaging in an ambiguous level of alcohol use in pregnancy was perceived to be less likeable, similar, and responsible than one specified as using a ‘small’ amount of alcohol while pregnant. Similar to Study 3, in Study 4 we also found that intention to drink alcohol while

pregnant was not impacted by prototype exposure. This consistent finding that, although prototype perceptions varied significantly between conditions, there was no effect on either willingness or intentions for both Studies 3 and 4 is surprising. Especially considering that a meta-analysis of 80 studies, including 28 assessing drinking, found that there were consistently small to medium effect sizes between prototype ratings and behaviour (van Lettow et al., 2016).

Results from van Lettow et al.'s (2016) meta-analysis also indicated that the strength of the relationship between prototype ratings and behaviour varied depending on whether they were health-risk or health-protective behaviours. In particular, prototype similarity had a stronger relationship with health-protective behaviours than health-risk behaviours whereas prototype favourability (analogous to likeability) had the opposite relationship (van Lettow et al., 2016). Throughout the current project the behaviour at hand has been framed as a health-risk behaviour (i.e., engaging in alcohol use in pregnancy) as opposed to a health-protective behaviour (i.e., abstaining from alcohol during pregnancy). Thus, the Study 3 finding that only similarity had a significant relationship with intentions is of interest as it would be expected that favourability/likability would be the more relevant predictor. However, as the prototype/willingness model was initially developed to explain the decision making of adolescents, much of the research has been conducted with that population. Accordingly, the majority of studies reviewed by van Lettow et al., (2016) were conducted with those under the age of 30. Given this, it may be that the differing effect of prototype perceptions on health-risk versus health-protective behaviour is more pronounced with a younger population. Further research should be conducted to explore whether the prediction of alcohol use behaviour and/or intentions during pregnancy differs depending on whether it is framed as abstinence (health-protective) or as consumption (health-risk). Future studies may consider using a similar methodology to Ravis et al. (2006), who conducted separate regression analyses to compare the predictive utility of an integrated model of theory of planned behaviour and the prototype/willingness model for actor vs. abstainer prototypes.

In Study 4, over half of the variance in intentions to use alcohol at any point in a future pregnancy was predicted by a combined model consisting of variables from the theory of planned behaviour, prototype/willingness model, as well as additional variables of impulsivity, venturesomeness, and self-efficacy. The theory of planned

behaviour predicted about 40% of variance in intentions whereas the prototype/willingness model contributed to just under a tenth of predicted variance. Thus, the theory of planned behaviour and, to a lesser extent, the prototype/willingness model are useful models for understanding intentions to use alcohol while pregnant. Although the relative predictive validity of theoretical models is important, a systematic review of interventions using the theory of planned behaviour to reduce smoking found that 6 of the 13 studies resulted in significant change in behaviour. Of those studies only 1 also reported change in all of the theory of planned behaviour variables while 3 reported no change in the theory of planned behaviour variables (Lareyre et al., 2021). However, the authors noted that application of the theory to the design of the intervention varied significantly between studies and was done poorly overall. This again highlights the need for interventions that are based on theoretical principles to both ensure the principles are being adhered to authentically and to document the details regarding how it is done so (Gardner et al., 2014). Individually significant predictors included venturesomeness, subjective norms, willingness to drink while pregnant, perceived similarity and attitudes. In particular, attitudes towards small levels of alcohol use in pregnancy were the greatest individual predictors of intentions. Thus, attitudes may represent an ideal starting point for the design of health promotion messaging. However, although mass media campaigns have been found to change attitudes towards alcohol use, the evidence for behaviour change is mixed (Young et al., 2018). In comparison, a meta-analysis exploring interventions targeting a range of health behaviours (including alcohol use) found that changes in attitudes has a causal effect on behaviour (Sheeran et al., 2016). Therefore, any intervention targeting attitudes must be tested to ensure that changes in behaviour also occur.

Perceived similarity was the only variable, other than willingness, from the prototype/willingness model that contributed to the final model tested in Study 4. When testing an integrated model of the theory of planned behaviour and the prototype/willingness model for exercise, breakfasting and sleeping behaviours, Ravis et al. (2006), also found that perceived similarity provided the most significant addition to the theory of planned behaviour. Although the level of variance explained by the prototype/willingness model was not particularly large in Study 4, future research could explore the role of perceived similarity of a prototype further through experimental testing of health promotion messages highlighting expected similarities

and differences between prototypes. In fact,, Davies (2018) employed the prototype/willingness model using a prospective design and found that ratings of the perceived similarity of either a heavy drinking or a non-drinker prototype predicted risky drinking amongst adolescents. Therefore, the authors suggested that to reduce intentions to get drunk similarity to the non-drinker prototype could be enhanced. Furthermore, Davies (2018) found that intentions and willingness mediated the relationship between similarity and behaviour. In comparison, when comparing gender differences among a sample of young adults ($x = 25$ years), Zimmerman and Sieverding (2010) found that prototype perceptions and willingness contributed to the prediction of alcohol use intentions for men only. Thus, the authors suggested that reasoned pathways may be of greater relevance to women's alcohol. Conversely, findings from this project suggest that the socially reactive pathway may have more relevance for women of child-bearing age than assumed by theories such as the theory of planned behaviour. Thus, further research needs to be conducted exploring the applicability of the prototype/willingness model to health behaviours amongst older adults. Additionally, studies conducted among larger populations and across behaviours may allow for examinations of the moderating effects of social influences on determinants of planned behaviour.

6.2.4 *Stigmatising Beliefs and Ethical Considerations*

A significant but not unexpected finding from Studies 2 and 3 was that participants expressed stigmatising beliefs about those who would drink alcohol while pregnant. Judgement surrounding women's choices in pregnancy or otherwise is commonplace (Bell et al., 2016), however it is unclear how much assumptions about the "typical" person who drinks during pregnancy (for example, assumptions about their level of alcohol use) plays into this. Given that only one study included in Study 1 explored the unintended effects of exposure to an abstinence message, finding that messages containing a threat element resulted in worry and guilt amongst participants, it is important to reiterate that health promotion efforts should consider and actively address the potential for furthering or contributing to stigmatising beliefs. As noted by Bell et al. (2016), the need to maximise benefit and minimise harm through public health requires consideration of the potential harm from contributing to perpetuating stigmatising beliefs as well as the potential benefit from reducing alcohol use behaviours. To do so, not only must the effectiveness of interventions be established

but the unintended consequences also need to be quantified. Despite hypothesising that those with greater health literacy regarding FASD would be less likely to endorse stigma towards mothers of children with FASD, Corrigan et al. (2018) found the opposite. This finding further highlights the need to ensure that the aim of many public health campaigns to increase awareness is balanced with the potential to contribute to furthering stigma. Positively, current health promotion campaigns appear to be focussed on demystifying the behaviour of alcohol use in pregnancy and highlighting the message that any and all types of alcohol use should be avoided during pregnancy (e.g., every moment matters). However, peer-reviewed evidence supporting the efficacy of such campaigns does not appear to be publicly available yet.

6.3 Limitations and Future Directions

6.3.1 *Strengths and Limitations*

This project had several significant strengths including the use of established and testable theoretical frameworks which provided unique insights into the prediction of alcohol use intentions for pregnancy. The integration of two theoretical approaches has also provided evidence regarding promising areas for further research into the prediction of alcohol use behaviours in pregnancy as well as the prevention of said behaviours. Additionally, the theoretical foundation of this work provides clear direction for the translation of these research findings into practice. Specifically, using a theoretical approach to elicit and categorise beliefs about alcohol use in pregnancy has allowed for translation of those findings into interventions that can address the prevention of alcohol use in pregnancy. Additionally, exploring the predictive validity of two relevant health behaviour theories and the role of individual predictors has provided direction for future research to further the field. In particular, these findings can be used to direct research that explores ways to build intentions and to translate those intentions into actions. The well-defined and consistent use of theoretical principles and frameworks will also increase the applicability of these findings to research exploring determinants of other health behaviours using theory and to allow future work to use these findings in a practically and methodologically useful way.

Another strength of this research was the decision to explore an under-researched specific alcohol use behaviour, i.e., low to moderate use in pregnancy, as opposed to a general behaviour, i.e., ‘alcohol use in pregnancy’. This provides unique insights and nuance regarding a complex behaviour such as alcohol use in pregnancy.

Additionally, this unique perspective has provided a clear rationale supporting the need for further research in this area. Although we did not quantify exactly how much alcohol consumption that behaviour entailed it would not have been appropriate to specify exactly what was meant by a ‘small’ amount as that could have been conflated by participants as a ‘safe’ amount. Additionally, specifying amounts of alcohol use may create additional complexities if participants are not familiar with what a standard drink is. Instead, a small amount of use was juxtaposed with an ambiguous amount to see if that differentiation had an impact on perceptions or intentions such that might occur in the day to day. The large sample sizes recruited for this project differentiates it from other research in this area (Holland et al., 2016; Latuskie et al., 2018; Raymond et al., 2009) and allowed for the use of novel experimental methodologies. Additionally, the mixed-methods approach contributed to the depth of the research findings throughout. However, despite the benefits of the mixed-methods approach, additional qualitative work may have allowed for the distinctions between levels of alcohol use to be more clearly defined. Conducting a qualitative study that explored perceptions of specific levels of alcohol use could have been done at the beginning of the project and allowed for the generation of a population-specific understanding of alcohol use amounts. A further study that could have supplemented the findings of this program of work would have been a replication of the study outlined in Chapter 3 that used both the theory of planned behaviour and the prototype/willingness model as theoretical frameworks. This would have provided further insight into the automatic aspects of alcohol use in pregnancy that were touched on in the subsequent studies.

A limitation of this work is the focus on intentions as opposed to behaviour, thus limiting the ability to draw conclusions about influences on the behaviour of alcohol use during pregnancy itself. The decision to focus on intentions was made for a variety of reasons, one being that the logistical implications of exploring alcohol use behaviour during pregnancy over a meaningful period would have limited the achievability of conducting this research within the context of a doctoral degree. Additionally, focusing on intentions rather than behaviour may better inform the design of health promotion initiatives to promote abstinence intentions during pregnancy. A focus on intentions provides strategic direction for health promotion messaging for both women who are currently pregnant and those who may become pregnant in the future. Ultimately, this supports the reduction of the risk posed by

alcohol consumption in the period prior to pregnancy confirmation/awareness. Additionally, the inclusion of participants who had either previously been pregnant or intended to become pregnant increased the applicability of the findings considering that prior alcohol use behaviour in pregnancy is a significant predictor of alcohol use in a future pregnancy and that the target audience of abstinence messages are primarily women of child-bearing age regardless of pregnancy history. However, given the limitation of exploring intentions and not behaviour, further research is required that explores post-intentional processes in order to provide greater understanding of how to utilise intentions to directly translate into behaviour (Abraham et al., 1998).

Although a strength in some ways, another key limitation of this work was the inclusion of participants with a wide range of pregnancy histories and intentions. Although effort was made to ensure the sample would include those for whom this research would be relevant, the research may have benefitted from using quotas when recruiting such that the sample could be stratified according to key characteristics, for example pregnancy history. This would allow for the detection of any sub-group differences; however, pregnancy history was accounted for where possible and did not appear to impact the results but this was not formally tested. Future research that directly explored those potential distinctions between groups may have more practical utility and implications for implementation. An additional consideration when interpreting the findings of this study is that the locations and times that data were collected may have impacted the results. Data for this study were collected from both Australia and the UK at different time points, specifically, the second and fourth studies were conducted in both the UK and Australia whereas the third was conducted with participants from the UK only. Therefore, there may be differences in how the samples responded to the measures, these differences could have been explored in further detail with larger sample sizes that could be stratified in similar ways as described in the previous paragraph. Additionally, the second study was primarily conducted prior to the outbreak of the coronavirus pandemic whereas studies three and four were during the pandemic. Different countries responded to coronavirus in a variety of ways including 'lockdowns' in which individuals were limited to their homes and workplaces except for exceptional circumstances. These lockdowns were more extensively implemented in the UK for an extended period of time whereas only particular states of Australia were exposed to similar measures for any extended period

of time (Irizar et al., 2022; Miller et al., 2022). In particular, data collection for all three studies was conducted while lock-down measures were implemented in the UK. Although the expectation was that Australia and the UK share a similar drinking culture, given that coronavirus has been shown to impact drinking behaviours, such as increasing the extent to which individuals were drinking at home (Irizar et al., 2022), this may have affected the findings in unknown ways. For example, although studies 3 and 4 focussed on hypothetical scenarios and intentions regarding future behaviour, the limitations placed on physical social interaction may have impacted how relevant the scenarios used were to participants and may have suppressed the effect of prototype perceptions.

In addition to potential differences in findings due to the location and timing of data collection, the representativeness of the samples included in the study may not be indicative of the broader population. Australian census data indicates that 34.2% of women aged 15-74 in Australia have a non-school qualification (Australian Bureau of Statistics, 2021) while 33% aged 16-64 years in the UK have a university degree (Office for National Statistics, 2021). In comparison, the participants in this study were highly educated with 73% having a post-graduate degree. Furthermore, while women in the UK and Australia drink alcohol at similar levels, with around 40% of women in the UK aged 25-44 drinking alcohol on a daily or weekly basis (National Health Service, 2020) as compared to 30% of Australian women aged 25-39 and 40% of women aged 40-49 (Australian Institute of Health and Welfare, 2019), over 60% of our total sample drank alcohol at least weekly. However, this difference is not unexpected given that women in this project were required to have had a drink within the last year at least to be included in the project. Additionally, the findings of these studies do not necessarily need to be applicable to the broader population as evidence suggests that those who are most likely to drink in pregnancy are of higher socioeconomic status and that previous alcohol consumption is predictive of alcohol use in pregnancy (Anderson et al., 2013).

Another potential limitation is that the stigma associated with alcohol use during pregnancy (Bell et al., 2016) may have influenced both recruitment and participation throughout all stages of this project. That is, individuals who used alcohol in pregnancy may have been reluctant to participate in the study and those who

participated may have been motivated to provide socially desirable answers. However, conducting the research anonymously may have addressed some of these issues.

6.3.2 Future Directions

Given the key findings of this research, several suggestions, recommendations and considerations for future research can be presented. Although positive attitudes towards low to moderate alcohol use in pregnancy significantly contributed to alcohol use intentions, trying to counteract this by increasing negative attitudes may exacerbate self-stigma and stigma towards those who use alcohol during pregnancy. Further exploration of how to reduce this unintended consequence is necessary. It is also recommended that designers of messages promoting abstinence clarify harms associated with alcohol use in pregnancy can occur at any level of use. Considering the inherent dichotomisation of alcohol use in pregnancy (i.e., ‘risky’ and ‘safe’ use), abstinence promotion may choose to focus on increasing the perceived personal relevancy of alcohol use in pregnancy by highlighting why low levels of use matter. Given the lack of evidence for effective health messaging about alcohol use in pregnancy, future research should use experimental methods to explore whether messages that attempt to address theoretical determinants of behaviour actually result in change in intentions or behaviour. Therefore, it is necessary for future research to be explicit about the behaviour studied and to consider the limitations of findings drawn from ambiguous questions. Additionally, the current project explored alcohol use as a health-risk behaviour, in comparison to work that has explored this area using a health-protective frame. Future research should compare the two frames using an experimental methodology to explore whether there is a difference in the impacts on intentions and behaviour.

Further, given the nuance in people’s interpretation of alcohol use in pregnancy, research needs to be conducted asking about intentions and willingness to engage in specific alcohol use behaviours e.g., low, moderate and high levels of alcohol use in pregnancy, along with ‘special occasion’ use. This would provide practical evidence into the determinants of distinct alcohol-use behaviours, highlighting subpopulations for targeted messaging. In addition to being clear about the target behaviour, the impact of different representations of alcohol use in pregnancy on behaviour also needs to be explored. Future research needs to better

understand the how prototypes presented in health promotion messaging are interpreted by the public. This could be achieved by conducting a study that presents images/representations of women retrieved from recent/current health promotion campaigns targeting alcohol use in pregnancy and ascertaining prototype perceptions about those individuals. A longitudinal study could then explore whether exposure to each of the prototypes impacts on actual behaviour. Further, these representations could be altered in terms of different levels and timing of alcohol use behaviour, as well as other key characteristics that may influence perceived likability and similarity.

Again, this project found that although ratings were different there was no effect of prototype perceptions on willingness. Future research should explore whether placing the prototype within a social context (e.g., a pregnant person having a glass of wine in a social context) heightens the effect of perceptions on willingness. Furthermore, our willingness measure was operationalised using three different alcohol use behaviours, however participants were only presented with a prototypical person engaging in one behaviour (e.g., drinking a small amount of alcohol in pregnancy). Future research should explore whether presenting the pregnant prototype as engaging in the exact same behaviours as the willingness measure (e.g., having a glass of wine in a social context) heightens the impact of the prototype perceptions.

6.4 Conclusions

By taking an iterative and theoretically rigorous approach to the exploration of alcohol use in pregnancy, this project has provided an in-depth understanding of women's beliefs, intentions, and social constructions regarding alcohol use in pregnancy. It has provided evidence to guide the development of theoretically-informed messaging to address alcohol use behaviour in pregnancy. The numerous opportunities for future research highlight the contribution of this project to the science regarding not only alcohol use in pregnancy, but also the application of theoretical frameworks to understand other health behaviours. This project also highlighted the need for greater transparency, detail, and standardisation in the reporting of the development and evaluation of health promotion messages targeting alcohol use in pregnancy. Thus, it is hoped that the knowledge gained in this project will improve the application of effective health promotion strategies targeting alcohol use in pregnancy through the development of evidence-based messages that minimise stigma.

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Every reasonable attempt has been made to acknowledge the owners of copyright material. I would be pleased to hear from any copyright owner who has been omitted or incorrectly acknowledged.

APPENDICES

Appendix A

Ethics Approval Letter for Studies 1, 2 and 3

Ethics Approval Letter for Studies 1, 2 and 3 (Chapters 2, 3 and 4)

	 Curtin University							
<p>Research Office at Curtin</p> <p>GPO Box U1987 Perth Western Australia 6845</p> <p>Telephone +61 8 9266 7863 Facsimile +61 8 9266 3793 Web research.curtin.edu.au</p>								
<p>04-Jun-2019</p> <p>Name: Simone Pettigrew Department/School: School of Psychology Email: Simone.Pettigrew@curtin.edu.au</p> <p>Dear Simone Pettigrew</p> <p>RE: Ethics Office approval Approval number: HRE2019-0339</p> <p>Thank you for submitting your application to the Human Research Ethics Office for the project Understanding Women's Beliefs about Alcohol and Pregnancy.</p> <p>Your application was reviewed through the Curtin University Low risk review process.</p> <p>The review outcome is: Approved.</p> <p>Your proposal meets the requirements described in the National Health and Medical Research Council's (NHMRC) <i>National Statement on Ethical Conduct in Human Research (2007)</i>.</p> <p>Approval is granted for a period of one year from 04-Jun-2019 to 03-Jun-2020. Continuation of approval will be granted on an annual basis following submission of an annual report.</p> <p>Personnel authorised to work on this project:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;">Name</th> <th>Role</th> </tr> </thead> <tbody> <tr> <td>Pettigrew, Simone</td> <td>CI</td> </tr> <tr> <td>Fletcher, Tess</td> <td>Student</td> </tr> </tbody> </table> <p>Approved documents:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 100%;">Document</td> </tr> </table> <p>Standard conditions of approval</p> <ol style="list-style-type: none"> 1. Research must be conducted according to the approved proposal 2. Report in a timely manner anything that might warrant review of ethical approval of the project including: <ul style="list-style-type: none"> • proposed changes to the approved proposal or conduct of the study • unanticipated problems that might affect continued ethical acceptability of the project • major deviations from the approved proposal and/or regulatory guidelines • serious adverse events 3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants) 4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion 		Name	Role	Pettigrew, Simone	CI	Fletcher, Tess	Student	Document
Name	Role							
Pettigrew, Simone	CI							
Fletcher, Tess	Student							
Document								

report submitted on completion of the project

5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
8. Data and primary materials must be retained and stored in accordance with the [Western Australian University Sector Disposal Authority \(WAUSDA\)](#) and the [Curtin University Research Data and Primary Materials policy](#)
9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
11. Approval is dependent upon ongoing compliance of the research with the [Australian Code for the Responsible Conduct of Research](#), the [National Statement on Ethical Conduct in Human Research](#), applicable legal requirements, and with Curtin University policies, procedures and governance requirements
12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

Special Conditions of Approval

None

This letter constitutes low risk/negligible risk approval only. This project may not proceed until you have met all of the Curtin University research governance requirements.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at hrec@curtin.edu.au or on 9266 2784.

Yours sincerely



Amy Bowater
Ethics, Team Lead

Appendix B

Sample Participant Information Sheet and Consent Form for Study 1 (Chapter 2)

Participant Information Beliefs about Alcohol and Pregnancy Study

Who is doing the Research and What is the Project About?

My name is Tess Fletcher and I am a PhD student based at Telethon Kids Institute. This research is funded by the University and Telethon Kids Institute.

We would like to hear from women about alcohol use in pregnancy. In particular, their thoughts, feelings and understanding about drinking alcohol during pregnancy. The information collected from this research will be used to develop messages to provide accurate information about alcohol and pregnancy for women in Australia.

Why am I being asked to take part and what will I have to do?

You have been asked to take part because you are a woman aged 20-40 years old. Your participation will help us to understand women's knowledge and beliefs about alcohol and pregnancy.

Once you have read this information sheet you will be asked to provide informed consent. This will mean that you have understood the information provided here and agree to participate in the study.

After that, you will be asked to complete this 10-minute questionnaire.

At the end of the questionnaire you will be asked whether you would like to participate in a 30-minute virtual interview to discuss alcohol consumption during pregnancy with a researcher. Further information about participation in the interview will be provided when you are contacted by the researcher. Expressing interest in an interview does not mean you are obligated to participate.

There will be no costs to you from participating in this study. Survey participants will go in the draw for 1 of 3 \$100 Kmart vouchers. Interview participants will receive a \$25 Kmart voucher as reimbursement for their time.

Are there any benefits to being in the research project?

Although there may be no direct benefit to you from participating in this research, the results of this research will benefit the community by allowing us to develop health promotion messages about alcohol and pregnancy that are relevant to Australian women.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study. We have been careful to make sure that the questions asked in the questionnaire and interviews are unlikely to cause any distress. But if you feel anxious about any of the questions then you do not need to answer them and can stop your participation at any point.

If you do experience any distress from any of the questions many online/telephone resources are available. We have included a list of them at the end of this survey.

Who will have access to my information?

We will ask for your name, email address and contact number to allow us to contact you to complete the follow-up interview and/or to let you know if you are the winner of our prize draw.

This means that when you provide your name and email address the data we collect will be identifiable. However, after the study is completed and we have done the random prize draw we will remove all identifying information from the data. That means the data we analyse and the data we store will be non-identifiable, and we will have no way to identify your information. All information will be stored securely at Telethon Kids Institute and electronic data will be password-protected.

The people who will have access to the information we collect in this research are: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research and Development.

The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented. The information we collect in this study will be kept under secure conditions at Telethon Kids Institute for seven years from the date of publication or after the conclusion of the project, whichever is later, and then it will be destroyed.

Will you tell me the results of the research?

If you are interested in the findings please let us know and we will contact you in about 6 months to provide you with a summary via email. Results will not be individual but will be a summary of the general findings based on the information we collect as part of the project.

Do I have to take part in the research project?

Taking part in a research project is voluntary. It is your choice to take part or not. You do not have to agree if you do not want to. If you decide to take part and then change your mind, that is okay, you can withdraw from the project. If you choose not to take part or start and then stop the study, it will not affect your relationship with either Telethon Kids Institute or University staff.

If you do not provide your contact details we are unable to withdraw your data from the study. If you wish to withdraw your participation after submitting your responses and you have provided us with your contact details then contact us and we will delete your data.

What happens next and who can I contact about the research?

If you have any questions or require any further information, please contact the researchers:

Tess Fletcher at Tess.fletcher@telethonkids.org.au or on (08) 63191494
Professor Barbara Mullan at barbara.mullan@curtin.edu.au or on (08) 9266 2468

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2019-0339). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

- Yes
 No



Appendix C

Sample Participant Information Sheet and Consent Form for Study 2 (Chapter 3)

Alcohol and Pregnancy Beliefs

Who is doing the research and what is the project about?

My name is Tess Fletcher and I am a PhD student from Curtin University. This research is funded by the University and Telethon Kids Institute.

We would like to hear from women about alcohol use in pregnancy. The information collected from this research will be used to develop messages to provide accurate information about alcohol and pregnancy.

How do I know if I am eligible and what will I have to do?

You are eligible to take part if you:

- Identify as a woman;
- Are 20-45 years of age;
- Have either been pregnant before, are currently pregnant or plan on becoming pregnant in the future; and,
- Consume alcohol at any level.

Your participation will help us to understand women's thoughts and feelings about alcohol and pregnancy.

Once you have read this information you will be asked to provide informed consent. This will mean that you have understood the information provided here and agree to participate in the study. After that, you will be asked to complete a **10-minute questionnaire** on the topic of alcohol use and pregnancy.

Are there any benefits to being in the research project?

Although there may be no direct benefit to you from participating in this research, the results of this research will benefit the community by allowing us to develop health promotion messages about alcohol and pregnancy.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study. We have been careful to make sure that the questions asked in the questionnaire are unlikely to cause any distress. But if you feel anxious about any of the questions then you do not need to answer them and can stop your participation at any point. If you do experience any distress from any of the questions many online/telephone resources are available. We have included a list of them at the end of the survey.

Who will have access to my information?

The data we collect will be non-identifiable and we will have no way to identify your information aside from your Prolific ID. All information will be stored securely at Telethon Kids Institute and electronic data will be password-protected.

The people who will have access to the information we collect in this research are: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research and Development.

The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented. The information we collect in this study will be kept under secure conditions at Telethon Kids Institute for seven years from the date of publication or after the conclusion of the project, whichever is later, and then it will be destroyed.

Will you tell me the results of the research?

If you are interested in the findings please let us know and we will contact you in about 6 months to provide you with a summary via email. Results will not be individual but will be a summary of the general findings based on the information we collect as part of the project.

Do I have to take part in the research project?

Taking part in a research project is voluntary. It is your choice to take part or not. You do not have to agree if you do not want to.

If you decide to take part and then change your mind, that is okay, you can withdraw from the project. If you choose not to take part or start and then stop the study, it will not affect your relationship with either Telethon Kids Institute or University staff.

If you wish to withdraw your participation after submitting your responses then contact us and we will delete your data. However, if you do decide to stop the study you will not be eligible to receive payment through Prolific.

What happens next and who can I contact about the research?

At the start of the questionnaire there is a checkbox to indicate that you provide your consent to participate in this research. Providing consent tells us that you understand what you have read and what has been discussed on this information sheet, and that you agree to be in the research project and have your information used as described. Please take your time and ask any questions you have before you decide what to do.

If you have any questions or require any further information, please contact the researchers:

Tess Fletcher at Tess.fletcher@telethonkids.org.au or on (08) 63191494
Professor Barbara Mullan at barbara.mullan@curtin.edu.au or on (08) 9266 2468

Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2019-0339). Should you wish to discuss the study with someone not directly involved, in particular, any matters concerning the conduct of the study or your rights as a participant, or you wish to make a confidential complaint, you may contact the Ethics Officer on (08) 9266 9223 or the Manager, Research Integrity on (08) 9266 7093 or email hrec@curtin.edu.au.

I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

- Yes
 No



Appendix D

Sample Participant Information Sheet and Consent Form for Study 3 (Chapter 4)

Who is doing the research and what is the project about?

My name is Tess Fletcher and I am a PhD student from Curtin University. This research is funded by the University and Telethon Kids Institute.

We would like to hear from women about health, pregnancy and alcohol. The information collected from this research will be used to develop messages to provide accurate information about women's health, pregnancy and alcohol.

Why am I being asked to take part and what will I have to do?

You are invited to take part if you:

- are a woman aged 20-45 years old who lives in Australia,
- have either been pregnant previously/are currently pregnant or intend to become pregnant at some point in your life,
- and you drink alcohol at least occasionally.

Once you have read this information you will be asked to provide informed consent. This will mean that you have understood the information provided here and agree to participate in the study. After that, you will be asked to complete a 15-20 minute questionnaire on the topic of women's health, pregnancy and alcohol.

There will be no costs to you from participating in this study you be able to enter in a draw for 1 of 5 \$100 Kmart vouchers.

Are there any benefits to being in the research project?

Although there may be no direct benefit to you from participating in this research, the results of this research will benefit the community by allowing us to develop health promotion messages about women's health, pregnancy and alcohol.

Are there any risks, side-effects, discomforts or inconveniences from being in the research project?

Apart from giving up your time, we do not expect that there will be any risks or inconveniences associated with taking part in this study. We have been careful to make sure that the questions asked in the questionnaire are unlikely to cause any distress. But if you feel anxious about any of the questions then you do not need to answer them and can stop your participation at any point.

If you do experience any distress from any of the questions many online/telephone resources are available. We have included a list of them at the end of the survey.

Who will have access to my information?

We will ask for your name, email address and contact number to allow us to contact you if you are the winner of our prize draw.

This means that when you provide your name and email address the data we collect will be identifiable. However, after the study is completed and we have done the random prize draw we will remove all identifying information from the data. That means the data we analyse and the data we store will be non-identifiable, and we will have no way to identify your information. All information will be stored securely at Telethon Kids Institute and electronic data will be password-protected.

The people who will have access to the information we collect in this research are: the research team and, in the event of an audit or investigation, staff from the Curtin University Office of Research and Development.

The results of this research may be presented at conferences or published in professional journals. You will not be identified in any results that are published or presented. The information we collect in this study will be kept under secure conditions at Telethon Kids Institute for seven years from the date of publication or after the conclusion of the project, whichever is later, and then it will be destroyed.

Will you tell me the results of the research?

If you are interested in the findings please let us know and we will contact you in about 6 months to provide you with a summary via email. Results will not be individual but will be a summary of the general findings based on the information we collect as part of the project.

Do I have to take part in the research project?

Taking part in a research project is voluntary. It is your choice to take part or not. You do not have to agree if you do not want to. If you decide to take part and then change your mind, that is okay, you can withdraw from the project. If you choose not to take part or start and then stop the study, it will not affect your relationship with either Telethon Kids Institute or University staff.

If you do not provide your contact details we are unable to withdraw your data from the study. If you wish to withdraw your participation after submitting your responses and you have provided us with your contact details then contact us and we will delete your data.

What happens next and who can I contact about the research?

At the start of the questionnaire there is a checkbox to indicate that you provide your consent to participate in this research. Providing consent tells us that you understand what you have read and what has been discussed on this information sheet, and that you agree to be in the research project and have your information used as described. Please take your time and ask any questions you have before you decide what to do.

If you have any questions or require any further information, please contact the researchers:

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I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent and possible risks of my involvement in this project and I voluntarily consent to take part.

- Yes
- No

