

**Assessing Alcohol and/or Other Drug Use in Pregnancy, Short-term  
Health Outcomes of Newborn Infants and the Existing  
Role of Midwives in Australia**

**Submitted by**

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## **Abstract**

Alcohol and/or other drug use during pregnancy is associated with adverse pregnancy and neonatal health outcomes. Population-level data can help determine the impacts of alcohol and other drug use in pregnancy on neonatal outcomes and generate high-quality evidence to inform public health policies and practices. Also, identification of maternal alcohol and other drug use through timely screening during antenatal consultation, and referral for support and treatment can facilitate optimal neonatal outcomes. While earlier research has directly examined the perceptions of pregnant women who used alcohol or other drugs and identified women's strategies for avoiding being identified as substance-users and their efforts to access substance use treatment programmes, less research has been conducted to determine the barriers and facilitators to screening and referral of substance-using pregnant women from the perspective of primary care workers (e.g., midwives) who provide clinical care and support.

This thesis by publication assessed the use of alcohol and other drugs in pregnancy and the short-term health outcomes of neonates and explored current midwives' practices regarding screening and referral of substance-using pregnant women. The thesis comprises two systematic reviews and two empirical articles. The first systematic review summarises the short-term health outcomes of newborns of substance-using women and their demographic characteristics in the Australian context. The second review is a global systematic review that was conducted as a gap analysis, identifying current screening practices. The first empirical study assessed the associations of substance use (opioid, cannabis, alcohol, stimulants, and polysubstance use – the use of two or more of the four substances) in pregnancy with neonatal outcomes, while a qualitative study was conducted to explore current screening practices employed by primary health practitioners, i.e., midwives, in antenatal settings.

The current research substantiates much of the existing literature in that alcohol and other drug use during pregnancy is more prevalent among women who are socioeconomically disadvantaged. The analysis of existing database records further demonstrated a significant association between the use of alcohol and other drugs in pregnancy and adverse neonatal outcomes including preterm birth and stillbirth. In addition, evidence from this research programme highlighted what midwives perceived to be barriers and facilitators in antenatal care settings to screening and referral of substance-using pregnant women. Identified barriers include lack of validated screening tool and non- or partial disclosure of substance use; and

factors such as midwifery continuity of care model and a woman-centred philosophy of care are considered facilitators.

Pregnancy is a time that women engage in health services, so it is an opportune time to link women into services. To minimise the adverse impacts of alcohol and/or other drug use in pregnancy - maximising both the health of mother and neonate - there is a need to promote timely screening and identification of maternal substance use, as well as referral to necessary interventions during antenatal consultation.

## **Statement of Authorship**

This thesis consists primarily of work by the author that has been submitted and published as described in the text. Except where reference is made in the text of the thesis, this thesis contains no material published elsewhere or extracted in whole or in part from a thesis accepted for the award of any other degree or diploma. No other person's work has been used without due acknowledgment in the main text of the thesis. This thesis has not been submitted for the award of any degree or diploma in any other tertiary institution.

This work was supported by a La Trobe University Postgraduate Research Scholarship and a La Trobe University Full-Fee Research Scholarship. All research procedures reported in this thesis were approved by the relevant Ethics Committees.

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Helen Oni

31 January 2021

## Author's Contribution to Publications

I am the primary author of all publications within this thesis. The inclusion of co-authors on the papers included in this thesis reflects that these papers are the result of active collaboration. As the lead author, most of the work relating to research design, data analysis and interpretation, manuscript drafting and manuscript editing was carried out by me, with the support of my supervisors: Dr M Mofi Islam, Dr Melissa Buultjens, and Professor Abdel-Latif Mohamed.

Chapter 3: Oni, H. T., Khan, M. N., Abdel-Latif, M., Buultjens, M., & Islam, M. M. (2019). Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review. *Journal of Obstetrics and Gynaecology Research*, 45(9), 1783-1795.

Chapter 5: Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2019). Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis. *Women and Birth*, 32(6), 479-486.

Oni HT led the development of these research papers, undertook all aspects of the systematic review, led the writing of the manuscripts, was responsible for all edits and revisions, and submitted the manuscripts to the journals for publication.

Khan MN and Islam MM conducted a meta-analysis included in the first review. In addition, Islam MM contributed to the development of the research question and review protocol.

Buultjens M, Abdel-Latif ME, and Islam MM contributed to initial review for article inclusion, assessment of included articles, initial manuscript drafting and to interpreting the qualitative synthesis.

All authors contributed to the intellectual content and revising of the final draft of the manuscript.

Chapter 6: Oni, H. T., Buultjens, M., Blandthorn, J., Davis, D., Abdel-latif, M., & Islam, M. M. (2020). Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience. *Midwifery*, 81, 102595.

Oni HT led the development of this research paper, developed interview guides and interviewed the participants, transcribed the interview records, analysed the data, led the writing of the manuscript, was responsible for all edits and revisions, and submitted the manuscript to the journal for publication.

Blandthorn J assisted in recruitment of the participants and contributed to initial manuscript drafting. Buultjens M, Abdel-latif ME, and Islam MM contributed to the development of the research question and analysis plan; and supervised the data analysis and initial manuscript drafting.

All authors contributed to the intellectual content and revising of the final draft of the manuscript.

Chapter 4: Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. Neonatal outcomes of infants born to pregnant women with substance use disorders: A multilevel analysis of linked data. The manuscript has been accepted for publication in Substance Use and Misuse Journal.

Oni HT led the development of this research paper, merged the datasets, developed the analysis plan, analysed the data, led the writing of the manuscript, was responsible for all edits and revisions, and submitted the manuscript to the journal for publication.

Islam MM contributed to the development of analysis plan, interpreting of the data and supervised the data analysis.

All authors contributed to development of the research question and initial manuscript drafting, to the intellectual content and revising of the final draft of the manuscript.

## **Research Dissemination**

### **Published manuscripts**

- Oni, H. T., Khan, M. N., Abdel-Latif, M., Buultjens, M., & Islam, M. M. (2019). Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review. *Journal of Obstetrics and Gynaecology Research*, 45(9), 1783-1795.
- Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2019). Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis. *Women and Birth*, 32(6), 479-486.
- Oni, H. T., Buultjens, M., Blandthorn, J., Davis, D., Abdel-Latif, M., & Islam, M. M. (2020). Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience. *Midwifery*, 81, 102595.

### **Manuscript accepted for publication**

- Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. Neonatal outcomes of infants born to pregnant women with substance use disorders: A multilevel analysis of linked data. This manuscript has been accepted for publication in Substance Use and Misuse Journal.

### **Conference abstract**

- Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. Short-term outcomes of newborn infants born to substance-using mothers in Australia Drug and Alcohol Review (2017), 36 (Suppl. 1), 4–73.



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## Structure of Thesis

This thesis contains chapters that may be read independently. Chapter 1 presents the background, problem statement, rationale, aim and objectives of the thesis. Chapter 2 summarises the methodological framework used for this study. Chapters 3,4, 5 and 6 are studies that have been published or submitted for publication in peer-reviewed journals. The pre-print of these manuscripts as originally submitted are included in this thesis. Readers are encouraged to view the final peer-reviewed manuscripts in the journal of publication except chapter 4 which is currently under revision.

Chapter 7 is a grand discussion and integration of all the chapters, including implications of the findings and direction for future research.

## Publication details

Chapter 3: Oni, H. T., Khan, M. N., Abdel-Latif, M., Buultjens, M., & Islam, M. M. (2019). Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review. *Journal of Obstetrics and Gynaecology Research*, 45(9), 1783-1795.

Chapter 4: Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. Neonatal outcomes of infants born to pregnant women with substance use disorders: A multilevel analysis of linked data (the manuscript has been accepted for publication in Substance Use and Misuse Journal).

Chapter 5: Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2019). Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis. *Women and Birth*, 32(6), 479-486.

Chapter 6: Oni, H. T., Buultjens, M., Davis, D., Abdel-Latif, M., & Islam, M. M. (2020). Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience. *Midwifery*, 81, 102595.

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## List of Abbreviations

ACM	Australian College of Midwives
ACR	Australian Coordinating Registry
ACT	Australian Capital Territory
AOR	Adjusted Odds Ratio
APDC	Admitted Patient Data Collection
AUDIT	Alcohol Use Disorders Identification Test
AUDIT-C	Alcohol Use Disorders Identification Test-Consumption
BMI	Body Mass Index
CHeReL	Centre for Health Record Linkage
CI	Confidence Interval
COD URF	Cause of Death Unit Record File
DHHS	Department of Health and Human Services
HEC	Human Ethics Committee
ICD-10-AM	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision
ICM	International Confederation of Midwives
LTUFFRS	La Trobe University Full-Fee Research Scholarship
LTUPRS	La Trobe University Postgraduate Research Scholarship
MeSH	Medical Subject Heading
MMAT	Mixed Methods Appraisal Tool
NAS	Neonatal Abstinence Syndrome
NICU	Neonatal Intensive Care Unit
NSDUH	National Survey on Drug Use and Health
NSW	New South Wales
OR	Odds Ratio
OD	Opioid Use Disorder
PDC	Perinatal Data Collection
PICO	Population, Intervention, Comparison and Outcomes
PPV	Positive predictive value
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
SCN	Special Care Nursery
SES	Socioeconomic Status

SEIFA	Socio-Economic Indexes for Areas
SURP-P	Substance Use Risk Profile – Pregnancy
TWEAK	Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down
UNIPRS	University of Newcastle Postgraduate Research Scholarship
USA	United States of America
WHO	World Health Organizatio

# **Chapter 1: Introduction**

## **1.1 Background**

This thesis focusses on the use of four substances in pregnancy (opioid, cannabis, alcohol, stimulants, and polysubstance use – the use of two or more of the four substances), hence the terms “substance use” and “alcohol and/or other drug use” will be used interchangeably in this document.

This chapter provides a broad background of alcohol and/or other drug use in pregnancy, the short-term health outcomes of neonates of substance-using mothers/women and the role of midwives during antenatal care. The problem statement and the rationale as well as the aim of this thesis are clearly presented.

### **1.1.1 Prevalence of substance use in pregnancy**

The prevalence of alcohol and/or other drug use in pregnancy varies considerably from country to country depending on the availability and accessibility of substance, data collection methods, the types of substances surveyed and social and environmental factors including judicial legislation (Abdel-Latif et al., 2013; Scott & Lust, 2010). Further, an underestimation in prevalence and extent of substance use often results from limitations of self-reporting, estimation, recollection and stigma (O'Connor et al., 2020; Tait et al., 2018). In many countries, data on the prevalence of substance use among pregnant women are not available. Where data are available, they often come from isolated studies using various methodologies, and the results are not readily comparable (Ministry of Health NSW, 2014; National Drug & Alcohol Research Centre, 2016).

Although the prevalence of substance use is significantly higher among non-pregnant women than pregnant women (Qato et al., 2020; Taplin et al., 2015), a considerable proportion of pregnant women continue to use alcohol and/or illicit drugs (Greenmyer et al., 2020; Terplan et al., 2012), with some data even suggesting the number of women using opioids and stimulants has significantly increased (Haight et al., 2018). In a study of pregnant women in New Zealand, one in five women reported that they had consumed alcohol in the last 12 months at some point during their most recent pregnancy (Ministry of Health, 2015b). Of these women, the majority reported risky drinking in the last 12 months. Likewise, using National Survey on Drug Use and Health (NSDUH) data from 2006 to 2014, a recent USA



study found that 5.1% of pregnant women were polysubstance users, of which 72.7% used two substances, 27.3% used three or more substances and 3% reported heavy or binge alcohol drinking (Qato et al., 2020). Another study in New York State, USA estimated the prevalence of cannabis use disorder in pregnancy to be 28.3%, followed by cocaine use disorder (27.4%) among women who were diagnosed with opioid use disorder (OUD) during pregnancy or at delivery (Shen et al., 2020). In Europe, an estimated 60,000 substance-using pregnant women are recorded yearly, with half being opioid users (Gyarmathy et al., 2009).

Similarly, in Australia, the extent of substance use in pregnancy is more prevalent than commonly realised. A prospective state-wide Neonatal Intensive Care Unit (NICU) survey found that between 2001 and 2003, perinatal substance use affected approximately 5.1% of births, of which 26.5% were affected by polysubstance use (Abdel-Latif et al., 2013). Additionally, out of 879 pregnant women identified in public hospitals as using substances in the state of New South Wales and the Australian Capital Territory, 46.8% used opioids, 23.0% amphetamines and 16.4% used polysubstance (Abdel-Latif et al., 2013). An estimated 1.4% of total births were adversely affected by substance use in 2004, and there was a significant regional difference in maternal substance use patterns between mothers from urban and rural areas (Abdel-Latif et al., 2013). An earlier analysis of 416,834 live births in New South Wales over a five-year period (1998–2002) found that 1974 (0.47%) of the delivery records had an opioid ICD-10-AM diagnosis, 552 had a stimulant ICD-10A-M diagnosis (0.13%), 2172 had a cannabis ICD-10-AM diagnosis (0.52%), and 342 alcohol ICD-10-AM diagnosis (0.08%) (Burns et al., 2006a, 2006b). In one study, 70% of alcohol-related diagnoses were discovered at delivery, and 30% in pregnancy (Burns et al., 2006a). The higher percentage of substance use discovery at delivery was attributed to inadequate screening and/or non-disclosure of substance use during antenatal care (Burns et al., 2006a).

### **1.1.2 The effects of alcohol and other drug use on pregnancy outcomes**

There is strong evidence that perinatal alcohol and other drug use negatively impacts pregnancy outcomes, yet the prevalence of alcohol and other drug use in pregnancy is still a major public health issue in maternity settings (Greenmyer et al., 2020; Nagarajan & Goodman, 2020; Umer et al., 2020). The adverse effects of drinking alcohol during pregnancy have been documented in the literature (DeVido et al., 2015; Waterman et al., 2013). For example, heavy alcohol consumption in pregnancy has been associated with a range of adverse birth outcomes, including small for gestational age (Bird et al., 2017; Burns

et al., 2006a), low birthweight (Bird et al., 2017; Umer et al., 2020), preterm birth (Umer et al., 2020), admission to Neonatal Intensive Care Unit and fetal alcohol syndrome (May et al., 2018). Perinatal alcohol consumption is further correlated with long-term effects in children such as cognitive and behavioural challenges, speech and language deficits (Fox et al., 2015; Green et al., 2014) and psychosocial disorders in adulthood (Rangmar et al., 2015). Although the evidence of adverse effects of low to moderate alcohol consumption in pregnancy may be inconclusive, any amount of alcohol is unsafe during pregnancy (Henderson et al., 2007; Lundsberg et al., 2015; O’Leary et al., 2009) .

Similar to alcohol use in pregnancy, the use of illicit drugs is associated with multiple health and social problems for mother-infant dyads (Blandthorn et al., 2011; Davie-Gray et al., 2013; Gibson et al., 1983; Giles et al., 1989; Kelly et al., 2000; Nagarajan & Goodman, 2020; Oats et al., 1984; Patel et al., 2013; Quinlivan & Evans, 2002; Young-Wolff et al., 2019; Zhai et al., 2020). For instance, cannabis use in pregnancy has been linked with negative effects on fetal growth and pregnancy outcomes such as preterm birth (Corsi et al., 2019), low birthweight, small for gestational age, and admission to the Neonatal Intensive Care Unit (Hayatbakhsh et al., 2012; Jaques et al., 2014).

Cocaine use in pregnancy has been associated with several risk factors, including preterm birth, low birthweight, and small for gestational age (Addis et al., 2001; Gouin et al., 2011). Similarly, studies have found significant associations between methamphetamine use in pregnancy and fetal loss (Brecht & Herbeck, 2014), developmental and behavioural defects (van Dyk et al., 2014) and intrauterine fetal death (Gorman et al., 2014). Substance use screening and psychosocial support for women during the antenatal period may minimise the perinatal complications related to substance use (Forray, 2016; Hughes, 2016).

Similarly, opioid misuse during pregnancy is correlated with a higher risk of low birthweight and respiratory problems in neonates, which may result in fetal death (Minozzi et al., 2013; Patrick et al., 2012). About 45% to 94% of infants exposed to opioids in utero, including methadone and buprenorphine, are likely to be diagnosed with neonatal abstinence syndrome (NAS) (Patrick et al., 2012). This medical condition causes irritability, feeding difficulties, tremors, hypertonia, emesis, loose stools, seizures, and respiratory distress in the neonates (Hudak & Tan, 2012).

Notably, the adverse consequences of substance use in pregnancy are often influenced by the quantity, frequency and type of substance use, polysubstance use (the use of more than one

substance) and comorbid conditions (Benningfield et al., 2010; Tuten et al., 2009). Moreover, pregnant women with substance use disorders are less likely to access healthcare and more likely to experience poor nutrition and domestic violence that can potentially exacerbate the negative effects of maternal alcohol and/or illicit drug use (Forray, 2016). The harmful health impacts of maternal substance use on pregnancy outcomes increase the utilisation of healthcare resources, which highlights the urgency of developing evidence-based pathways to care, enabling midwives and other primary care staff to provide the necessary support (Hudak & Tan, 2012; Patrick et al., 2012).

### **1.1.3 Substance use and antenatal care: the role of midwives**

Midwives have a long history of caring for pregnant women (Paluzzi et al., 2002; Rayment-Jones et al., 2020). They play a vital role in ensuring that women, their babies and families have a safe, health-promoting experience and access to high-quality antenatal care across the perinatal period (Lemola et al., 2020; Paluzzi et al., 2002; Rayment-Jones et al., 2020). The International Confederation of Midwives (ICM) set forth the scope of practice of the midwife, excerpted as follows:

The midwife is recognised as a responsible and accountable professional who works in partnership with women to give the necessary support, care and advice during pregnancy, labour and the postpartum period, to conduct births on the midwife's own responsibility and to provide care for the newborn and the infant. This care includes preventative measures, the promotion of normal birth, the detection of complications in mother and child, the accessing of medical care or other appropriate assistance and the carrying out of emergency measures.

The midwife has an important task in health counselling and education, not only for the woman, but also within the family and the community. This work should involve antenatal education and preparation for parenthood and may extend to women's health, sexual or reproductive health and child care (International Confederation of Midwives, 2017: p.1).

This passage highlights the important role midwives have in facilitating the health and well-being of the mother-infant dyad through assessment, prevention and education (Coles & Porter, 2008; Rayment-Jones et al., 2020).

In most countries, nurses and midwives are the largest group of health professionals and are often the first point of contact for many pregnant women in antenatal settings (Barton, 2020; World Health Organization, 2010). For example, in 2018, approximately 731,213 births occurred in the United Kingdom with care largely managed by midwives (Chief Nursing Officers of England et al., 2010; Office for National Statistics, 2019). Likewise, in Australia, 53% of midwives provide antenatal care and attend at least one birth as the primary midwife (Department of Health, 2019). Given the high rate of antenatal care attendance in developed countries, midwives are in the best position to screen and provide necessary referrals related to substance use (Taplin et al., 2015; World Health Organization, 2010). Midwives partner with women, families and other members of the multidisciplinary health team – for example, obstetricians, general practitioners (GPs), mental health specialists, psychologists, social workers, and alcohol and other drug (AOD) counsellors to fulfil the health and social care needs of a pregnant woman and promote optimum perinatal outcomes for women who use a substance in pregnancy (Arpa, 2017; Chief Nursing Officers of England et al., 2010; World Health Organization, 2010, 2014).

In Australia, midwives are key providers of antenatal care (Arrish et al., 2016). They work alongside other colleagues to provide care for childbearing women throughout pregnancy, birth and the early postpartum period (Australian College of Midwives, 2018). The Australian College of Midwives (ACM) acknowledges midwifery as a woman-centred profession, which is holistic and takes into consideration each woman's social, emotional, physical, spiritual and cultural needs and expectations as specified by the woman herself (Australian College of Midwives, 2004). Midwives have the capacity to engage and build relationships with pregnant women who use substances, and support them in making informed decisions to promote prevention and harm minimisation, and to positively impact their health and the well-being of their babies (Arrish et al., 2016; Australian College of Midwives, 2004).

#### **1.1.4 Screening for alcohol and other drug during pregnancy**

As part of supporting pregnant women and facilitating healthy outcomes, it is important to complete a full examination that incorporates evidence-based diagnostic and pregnancy screening, including for substance use. Given that individuals, families and communities have

become more vulnerable to substance use, WHO and other public health organisations across the globe advocate for the screening of all pregnant women for substance use and offering brief interventions in primary health care settings for substance-using pregnant women (Chang et al., 2019; Greenmyer et al., 2020; World Health Organization, 2010). In 2014, global guidelines providing evidence-based recommendations for the identification and management of substance use disorders in pregnancy were developed. The guidelines aim to enable health-care practitioners, including midwives, to apply scientific principles of public health approaches when dealing with pregnant women who use substances (World Health Organization, 2014). The guidelines highlighted the importance of screening and brief intervention, including referring women who use substances during pregnancy for further specialist support services (World Health Organization, 2014). Despite this, no uniform screening tool or policy around management of women and pathway to care exists in practice.

Screening practices remain inconsistent although various screening tools exist across healthcare settings (Taplin et al., 2015). Internationally, the Alcohol Use Disorders Identification Test (AUDIT) was developed as a screening tool to detect hazardous and harmful alcohol consumption (Baggio & Iglesias, 2020; Moehring et al., 2019). AUDIT and other screening tools such as TWEAK (Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down) have been evaluated and modified to be suitable for screening alcohol use in pregnancy. In recent years, other screening tools –NIDA Quick Screen-ASSIST (Modified Alcohol, Smoking and Substance Involvement Screening Test) (Chang et al., 2019), Substance Use Risk Profile - Pregnancy (SURP-P) scale (Coleman-Cowger et al., 2019; Yonkers et al., 2010) and 4P's Plus – have also been introduced in primary health care settings for detection of unsafe substance use in pregnancy (Coleman-Cowger et al., 2019).

In Australia, to facilitate screening and management of substance use in pregnancy, the 'National Clinical Guidelines for the Management of Drug Use During Pregnancy, Birth and the Early Development Years of the Newborn' was endorsed in 2005 and subsequently revised by NSW Health in 2014 as 'Clinical guidelines: Substance Use During Pregnancy Birth and the Postnatal Period' (Ministry of Health NSW, 2014; New South Wales Department of Health, 2006). These guidelines are intended for use by all healthcare workers caring for substance-using pregnant women to promote harm minimisation (New South Wales Department of Health, 2006). The guidelines strongly recommend universal screening

of pregnant women for substance use and, if necessary, referral to specialist assessments and help, such as a drug and alcohol specialist, in addition to midwifery care (Ministry of Health NSW, 2014). In 2008, a validated screening tool, Alcohol Use Disorders Identification Test-C (AUDIT-C) was first introduced into public antenatal services across states and territories in Australia (National Drug & Alcohol Research Centre, 2016; Seib et al., 2012). It is a shortened version of the full AUDIT instrument, comprised of three of the ten AUDIT items. AUDIT-C allows consistency in data collection across various antenatal settings and early identification of substance use in pregnant women. The brief nature of AUDIT-C saves time and enables primary healthcare providers to detect hazardous alcohol use in pregnancy and provide early intervention if deemed necessary (National Drug & Alcohol Research Centre, 2016; Seib et al., 2012). Currently, there is no validated screening tool for illicit drug use in pregnancy, however the ASSIST v3 could potentially identify alcohol and drug use in pregnancy (Breen et al., 2014). The positive result of ASSIST v3 needs to be double confirmed by further investigation. In recent years, substance use questions are included in the standard initial antenatal assessment and subsequently repeated at each perinatal assessment (Burns et al., 2016). Simple questions about quantity and frequency of substance use are deemed appropriate for screening, with more validated in-depth questions for women who are identified to be using substance(s) (Burns et al., 2016). Despite this, screening practices in antenatal settings is limited.

## **1.2 Problem Statement**

The use of alcohol and/or other drugs among pregnant women is one of the most complex public health issues in maternity care (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). The latest statistics in Australia suggest a similar proportion (25%) of pregnant women continue to use substances, such as alcohol and marijuana, before and during pregnancy (Australian Institute of Health and Welfare, 2017b). Further, it is estimated that one in four pregnant women continue to drink alcohol through pregnancy while a further 1.8% use illicit drugs (Australian Institute of Health and Welfare, 2017b).

Maternal substance use presents significant health risks for women and their offspring (Gouin et al., 2011; Greenmyer et al., 2020; McGrory et al., 2020; Popova et al., 2017; Scott & Lust, 2010; Young-Wolff et al., 2019). Potential biopsychosocial risk can include abnormalities of the central nervous system (Hwang et al., 2017), facial abnormalities, impaired intellectual

development and behavioural disorders and growth defects e.g. preterm birth, low birthweight, and small for gestational age (Riley et al., 2011). With both short- and long-term health consequences, maternal substance use is an important public health priority (Greenmyer et al., 2020; Nagarajan & Goodman, 2020).

The harmful effects of alcohol and other drug use in pregnancy can be minimised through early identification and referral for intervention during antenatal care (Forray, 2016; National Drug & Alcohol Research Centre, 2016). As most pregnant women access regular healthcare at this time, the childbearing period is a good opportunity to screen and provide support to maximise ongoing health outcomes for mother and baby (Bogenschutz et al., 2011; Greenmyer et al., 2020). Midwives are in a position to provide screening and detect substance use in pregnancy, facilitate referral for specialist support, promote harm minimisation and encourage behaviour change (Greenmyer et al., 2020; Miles et al., 2014; Miles et al., 2010). However, little is known about current midwifery practices, including screening routines, referrals, management and pathways to effective care in Australia.

### **1.3 Rationale for the Study**

The impact of alcohol and other drug use on pregnant women and their newborn varies considerably from country to country due to a range of factors such as types and amount of substance use, population and socio-economic status, level of support and care during pregnancy, race and ethnicity (Scott & Lust, 2010). A systematic review of the available evidence in an Australian context may provide an evidence-base of newborn health outcomes resulting from substance use during pregnancy and inform the care process in the Australian context.

Additionally, determining the consequences of substance use in pregnancy on women and neonates is crucial for planning interventions in Australia and implementation and evaluation of appropriate services (Chang et al., 2019). However, there is limited research around maternal substance use and associated harm to newborn babies, mainly due to the intrinsic complexity of accessing quality data. Amidst this paucity and complexity, routinely collected population level data and record linkage offer an opportunity to study the relationship between the exposure and outcome variables. Data linkage involves bringing together datasets from different sources that relate to the same individual (Holman et al., 1999). The few data linkage studies conducted in Australia so far examine issues such as mortality rate

among opiate and amphetamine users (Bartu et al., 2004) and the effect of maternal alcohol consumption on neonates (O'Leary et al., 2012). In 2006, Burns and colleagues used linked data over a 5-year period (1998–2002) to examine the association of maternal alcohol, opioids, stimulants and cannabis use with neonatal outcomes *namely*, small for gestational age, prematurity, admission to special care nursery and neonatal intensive care unit, APGAR score at 5-minutes and length of hospital stay (Burns et al., 2006a, 2006b). However, given the rapid changes in maternal substance use trends over the years and the need to promote prevention and harm minimisation of substance use in pregnancy through early diagnosis and intervention (Burns et al., 2016; Taplin et al., 2015), there is a need for up-to-date research to support sustained policy and practices that meet the biopsychosocial needs of childbearing women.

To reduce harm from substance use, exploring barriers to screening and seeking evidence-based practices for midwives is crucial for early identification of maternal substance use, which can facilitate optimal health outcomes for women and their offspring. Universal screening of pregnant women for substance use is imperative; however, as presented earlier, pregnant women who use substances are not consistently identified which can lead to several harmful maternal and fetal consequences (Burns et al., 2016; Ko et al., 2019). Early detection of substance use facilitates opportunities for early intervention and prevention of adverse perinatal outcomes for both current and future pregnancies (Greenmyer et al., 2020).

Although midwives in primary care settings play a major role in the routine screening of pregnant women for substance use, the literature shows inconsistencies in screening practices (Crawford-Williams et al., 2015; McLeod et al., 2003; Wangberg, 2015). While existing research has identified obstacles that substance-using women encounter when negotiating prenatal care (Stone, 2015a), less research has been conducted from the perspective of midwives who provide direct clinical care and support pregnant women.

#### **1.4 Aim of the Study**

This study will ascertain the short-term health outcomes of infants born to substance-using women and provide an epidemiological picture of this problem, as well as examine the barriers and facilitators experienced by midwives in antenatal settings to screening and referring substance-using women.



## **1.5 Specific Objectives**

By using a range of methodological approaches, this thesis aims to:

- examine the maternal demographic characteristics and short-term health outcomes (e.g. preterm birth, perinatal death) among neonates of mothers who use alcohol and/or other drugs during pregnancy in the Australian context;
- examine the neonatal outcomes of women with substance-related disorders admission during pregnancy in recent years;
- conduct a systematic review that identifies barriers in maternity care settings to screening for substance use during pregnancy, from the perspectives of healthcare professionals to inform further study; and
- identify the barriers and facilitators to screening and referral of substance-using pregnant women from the midwives' perspective in Victoria, Australia.

## **Chapter 2: Methods**

### **2.1 Preface**

The previous chapter provided an introduction to the research topic and established the context of the thesis. It also summarised the research problem, which is the focus of this thesis. This chapter outlines the methods used in this thesis. This thesis adopted a mixed-methods design. It should be noted here that starting from section 2.3 all descriptions in this chapter are a summarised version of the methods described in the individual studies presented in chapters 3-6.

### **2.2 Mixed-Methods Research Design**

Health, social and behavioural science research often involves the investigation of complex phenomena that may require mixed-methods designs that combine both quantitative and qualitative approaches into the research methodology of a single study or multiphase study. (Fetters et al., 2013; Tashakkori et al., 1998). A mixed-methods study enables collection and analysis of both quantitative and qualitative data in a single study and involves the integration of the analyses in the process of research (Creswell et al., 2003; Lund, 2012). The qualitative and quantitative approaches may be used concurrently or sequentially and the integration may be comprehensive or restricted (Lund, 2012). Figure 2.1 presents the components of this thesis.

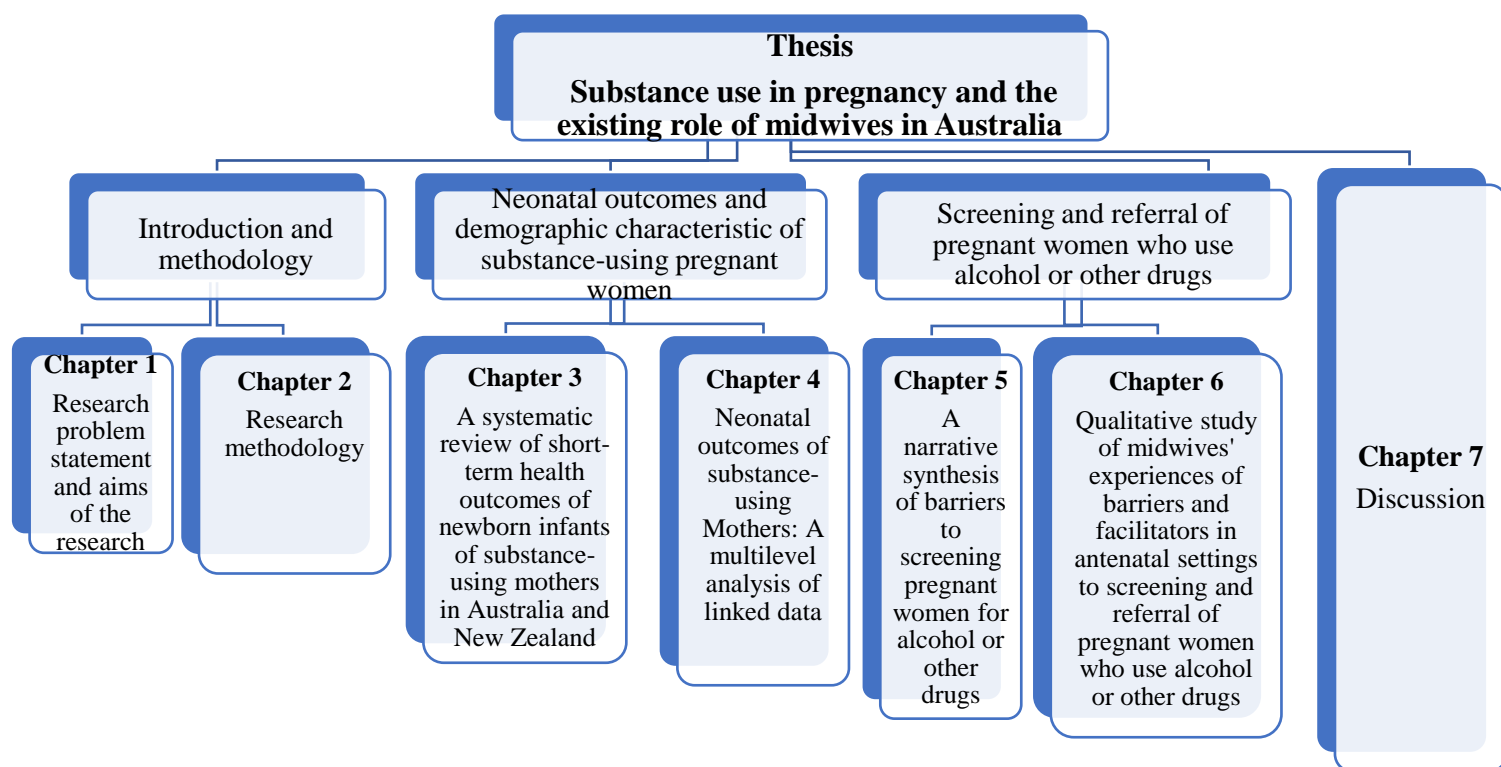


Figure 2. 1: Components of the thesis

Firstly, a systematic review of neonate health outcomes was conducted to determine the extent of the problem. This then led to specifically hone-in on local data in NSW to provide up-to-date research and correlate these research findings with previous literature. The findings showed there remains a significant public health problem and gap in the screening of pregnant women who use substances, so a review on screening was completed. Finally, an empirical study of midwives in Victoria was conducted to understand current practice in order to inform future policy and practice. Each of these components was addressed separately using appropriate but varied designs:

- Study 1 is a systematic review of maternal demographic characteristics and short-term health outcomes (e.g. preterm birth, perinatal death) among neonates of mothers who use substance(s) during pregnancy in the Australian context.
- Study 2 is a quantitative study of linked data that examined the neonatal outcomes of women with substance-related disorders admission/s during pregnancy from January 2007 to December 2016.

- Study 3 is a systematic review conducted to inform the qualitative study. The review identifies barriers to screening in maternity care settings for substance use during pregnancy, from the perspectives of healthcare professionals.
- Study 4 is a qualitative study that explored the barriers and facilitators to screening and referral of substance-using pregnant women from the midwives' perspective in Australia.

## **2.3 Systematic Reviews to Inform Research**

Study 1 and 3 are two separate systematic reviews. A systematic review is defined as a review using systematic methods to collect secondary data, critically appraise research studies, and synthesise or summarise evidence qualitatively or quantitatively (Khan et al., 2003; Tawfik et al., 2019). The systematic reviews used the following four steps:

1. formulation of a clear research question/objective
2. identification of relevant studies
3. quality appraisal of eligible studies
4. data extraction and synthesis.

### **2.3.1 Step 1: Clearly formulated research objectives**

The main objectives of the first systematic review were to determine the short-term health outcomes of newborn infants and the socio-demographic characteristics of substance-using mothers in an Australian context. However, New Zealand literature was included because both countries have similar healthcare systems (Bourgueil et al., 2009; The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). The objective of the second literature review was to identify barriers to screening in maternity care settings for substance use during pregnancy, from the perspectives of healthcare professionals.

### **2.3.2 Step 2: Identifying relevant studies included in both systematic reviews**

**Search strategy:** In both studies, a comprehensive search was undertaken in electronic databases include CINAHL, Cochrane Library, MEDLINE Ovid, PsycARTICLES, EMBASE Ovid, PsycINFO, Web of Science and Google Scholar using different combinations of keywords for available literature relevant to the studies objectives. The search was conducted in English using both Medical Subjects Headings (MeSH) and keywords such as 'substance use', 'pregnancy', 'Australia', 'New Zealand' 'marijuana' 'buprenorphine' 'methadone',

‘cannabis’ and ‘ICE’ were used for study one. For study three, the MeSH and keywords included ‘health professional’, ‘prenatal’, ‘midwives’ etc. With the use of Boolean operators, keywords were combined e.g. ‘substance abuse\*’ OR substance use, ‘pregnancy’ OR pregn\*. All keywords were used to search for literature with additional limitation of ‘newborn infants’ OR ‘newborns’ OR ‘neonates’. Additionally, some relevant literature was identified through the reference lists of included articles.

**Study selection:** Relevant studies were selected based on the inclusion and exclusion criteria. The selection was done following two steps in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Liberati et al., 2009). In the first step, papers were shortlisted by screening the titles and abstracts independently by researchers. Studies that were unclear about relevance and eligibility, based on titles or abstracts, were included in the next stage of screening. The second step involved full text screening for eligibility. Few articles referred to other publications for clarification on material and methodology; those publications were retrieved and reviewed (Lumley et al., 1985; Patel et al., 2013; Walpole et al., 1991).

### **2.3.3 Step 3: Assessing the quality of studies**

In both reviews, a quality assessment was conducted using the Mixed Methods Appraisal Tool (MMAT) – Version 2011, which is a comprehensive and reliable tool for appraisal of quantitative, qualitative and mixed-method studies (Pace et al., 2012; Pluye et al., 2009). In both studies, the methodological quality assessment of all eligible studies was performed independently by two researchers. Studies were assessed and scored between the range of 25% (1/4 criteria met) to 100% (4/4 criteria met) based on MMAT criteria. The studies were categorized as low (25%), moderate (50%), good (75%) and high quality (100%).

### **2.3.4 Step 4: Data extraction and synthesis**

Data were extracted independently by the two researchers. The information extracted in both studies included authors, year of publication, study location, study design, study population and sample size. In study 1, information such as type of maternal substance use, reported short-term outcome of newborn infants, available demographic profile of substance using mothers, and recommended interventions were also extracted. In study 3, information related to barriers to screening in maternity care settings for substance use during pregnancy was extracted. In both reviews, the retrieved studies were heterogenous in terms of study design,

sampling, methods and outcome measures. As a result, a narrative synthesis (Barnett-Page & Thomas, 2009; Popay et al., 2006) was adopted to synthesise and summarise extracted data from the eligible studies. In study 1, a meta-analytical technique was used for integrating the findings of a subset of studies that offered a similar set of data.

## **2.4 Study 2: Multilevel Logistic Regression of Linked Data**

This is a quantitative retrospective study that analysed secondary data from New South Wales (NSW). Data have already been collected by the data custodians as part of their routine data collection procedure.

The aim of this component was to examine the associations of substance (opioids, cannabis, stimulants, alcohol and polysubstance) use disorders in pregnancy and neonatal outcomes while taking into consideration certain maternal characteristics and co-morbidities such as pre-eclampsia, gestational hypertension maternal age, health insurance and antenatal care attendance and socio-Economic Indexes for Areas (SEIFA): the Index of Relative Socio-Economic Advantage and Disadvantage (IRSAD) score as confounders.

### **2.4.1 Data linkage**

With the help of the Centre for Health Record Linkage (**CHeReL**) the following three major population level datasets were linked (the full details of the datasets are presented in chapter 4):

1. NSW Perinatal Data Collection (NSW PDC)
2. NSW Admitted Patient Data Collection (APDC)
3. Cause of Death Unit Record File (COD URF)

### **2.4.2 Description of the study cohort**

This study comprised all women who had a birth recorded on the Midwives Notification System in New South Wales from January 2007 to December 2016.

### **2.4.3 Outcome and exposure variables for regression models**

#### **2.4.3.1 Outcome variables**

The outcome variables for multilevel logistic regression analysis include preterm birth (gestational age <37 weeks), Apgar score at 1-minute and 5-minutes, low birthweight

(birthweight <2500g), admission to Special Care Nursery (SCN) or Neonatal Intensive Care (NICU), stillbirth, and neonatal death.

#### **2.4.3.2 Exposure Variables**

The exposure variables include opioid, cannabis, stimulant, alcohol and polysubstance use (the use of two or more of the four substances) from 2007 to 2016. Pregnancies were identified positive for substance-use when at least one hospital admission for women during pregnancy, or at delivery, had at least one opioid-, cannabis-, stimulant-, alcohol- or two or more of the four substance group (polysubstance)-related ICD-10-AM diagnostic code. To determine the presence of substance-related ICD-10-AM code, all ICD-10-AM diagnoses for each mother were examined.

#### **2.4.5 Analysis of data**

Data cleaning and all statistical tests analysis were performed using STATA software, version 15 (StataCorp, 2017). The data were analysed using a multilevel logistic regression model. Multilevel structured data with binary outcomes are common in population and public health research (Larsen & Merlo, 2005). In such research, multilevel logistic regression models allow one to account for the effect of clustering of subjects within clusters of higher-level units when estimating the effect of the exposure variables on outcome variables (Austin & Merlo, 2017).

#### **2.4.6 Ethical considerations**

This component of the study is approved by the NSW National Ethics committee approval (reference number: HREC/18/CIPHS/6) and by the University Human Ethics Committee.

### **2.5 Study 4: Qualitative Study**

This study was informed by the findings of study 3. This study adopted an exploratory qualitative research design (Brink & Wood, 1998). In-depth interviews were conducted to elicit information concerning barriers and facilitators to screening, and referral of pregnant women who use substances from the perspective of the midwives working in antenatal settings. In this study, barriers and facilitators were defined as any organisational, provider or patient-level factors that prevent or promote screening and referral of women who use substances in pregnancy (Johnson et al., 2010).

### **2.5.1 Study population and sampling**

The study population consisted of Victorian midwives, who are currently practicing within Victoria, the second most populated state in Australia (Population Australia, 2020b).

A convenience sample of six publicly funded health facilities (two metropolitan hospitals, two regional hospitals and two remote/rural health centres) that provide antenatal services were invited to participate. An email invitation along with the study proposal was sent to the maternity healthcare managers in both metropolitan, regional and rural maternity care settings in Victoria. Addressed to maternity healthcare managers, email invitations were sent for further distribution among staff seeking midwives' interest in participation. Eighteen midwives were interviewed of which 12 worked in outpatient clinics with relatively low-risk pregnant women. The majority of the subset who worked in antenatal clinics were relatively less experienced in screening and providing referral of pregnant women who use substances. These midwives are involved in screening women at their first antenatal visit and in referring them for further support or specialised care when necessary. The remaining six midwives were working in specialised units such as those midwives who provide one-on-one antenatal education with a specific focus on substance use.

### **2.5.2 Data collection**

Face-to-face interviews were conducted with 13 midwives who were residing around metropolitan areas and telephone interviews with the remaining five residing in regional areas. A semi-structured interview guide (Appendix D) was developed with minor modifications after the first few interviews to incorporate additional information from the field notes. Interviews took 30 to 45 minutes and narratives were recorded with participants' consent and transcribed verbatim by the first author. All participants were informed that they would remain anonymous and no facility name would be mentioned in the report. The interviews covered a broad range of questions relating to barriers and facilitators experienced by midwives in screening and offering referrals to pregnant women who use substance. Data saturation was achieved after 13 interviews.

### **2.5.3 Analysis of the data**

The NVIVO QSR International Qualitative Analysis software (Version 12) for Windows was used to facilitate the coding process and generate themes. Interview transcripts were analysed



using thematic analysis based on the guidelines outlined in qualitative methodology literature (Aronson, 1995; Attride-Stirling, 2001; Braun & Clarke, 2006; Braun et al., 2014). For clarity, the analysis steps are as follows:

#### ***2.5.3.1 Step 1: Familiarisation with the data***

This is a common step in all qualitative data analysis (Braun et al., 2014). The researcher was immersed in the transcription by listening to each audio recording three times and ensured that all the recordings were captured on transcripts accurately. To become familiar with the data content, each transcript was read a number of times, items of potential interest were highlighted, and memos were taken for references.

#### ***2.5.3.2 Step 2: Coding***

This step involved systematic coding of the data (Aronson, 1995). Codes were used to summarise and label the contents of each transcript that is potentially relevant to answering the research questions. At this stage, some portions of the data were allocated more than one code. For instance one of the participants stated ‘I think that having a more clearer screening tool of like what questions we should be asking, how to ask the questions in a way that would elicit the best possible truthfully answers’, this portion was coded as ‘having clearer screening tool’ and ‘training on how to use the tool’. After the first codes were generated, the researcher read through each transcript again to modify existing codes by incorporating new items and generating new codes.

#### ***2.5.3.3 Step 3: Search for themes***

A theme, as described by Braun and Clarke (2006), ‘captures something important about the data in relation to the research question and represents some level of patterned response or meaning within the data set’. The coded data was reviewed independently by two researchers. The themes and subthemes were generated by clustering codes that share similarity to coherently reveal meaningful patterns in the data. The relationship between themes was explored to give a complete picture of the data.

#### ***2.5.3.4 Step 4: Review potential themes***

At this stage, the generated themes were reviewed by the researchers to ensure quality (Braun & Clarke, 2006). Certain themes and codes were discarded, and some were relocated so that it meaningfully captures the relevant data. The frequency of occurrence of each of the theme

within the data set was noted to ascertain the strength of each theme. The clusters were categorised to answer the research questions.

#### **2.5.3.5 Step 5: Define and name themes**

At this point, the scope of each theme was defined (Braun et al., 2014). The researchers also drew extracts that clearly explained each theme across data to show the coverage of the theme. To strengthen the validity of the analysis, the data were also peer reviewed independently to compare agreements and disagreements regarding themes identified and to assist in reviewing the researcher's own judgements about the data and the process of drawing conclusions.

#### **2.5.3.6 Step 6: Writing report**

Sentences from the transcripts were extracted to provide evidence that supported each theme within the categories. The final analysis of the selected extracts was related back to the research questions and the relevant literature, which led to the production of a final report of the analysis (Braun et al., 2014).

### **2.5.4 Quality and rigour of the qualitative study**

Qualitative study is best evaluated for its rigour, commonly referred to as trustworthiness (Plummer-D'Amato, 2008). Trustworthiness is a degree of confidence in data, interpretation, and methods used to ensure the quality of a study (Connelly, 2016; Polit & Beck, 2009). As outlined by Lincoln and Guba (1985) and accepted by many qualitative researchers, trustworthiness is based on four criteria: dependability, credibility, transferability and confirmability (Lincoln & Guba, 1985; Plummer-D'Amato, 2008). The following steps were taken to enhance the trustworthiness of the data collection and the process of analysis of this study:

**Credibility or internal validity** refers to the extent to which the study findings truly represent the perspectives of the participants (Plummer-D'Amato, 2008). One of the strategies identified to ensure credibility include prolonged engagement with participants (Plummer-D'Amato, 2008). In the current study, the researcher spent time with each participant during the data collection process, which allowed time for participants to express their perspectives.

**Transferability or external validity** refers to whether the results of a the study can be applied to other similar settings (Polit & Beck, 2009). To promote transferability, the

researcher must provide detailed descriptions of the study sample and data (Plummer-D'Amato, 2008). In the present study, detailed information about study population, including the research settings, participants and research background were provided.

**Confirmability** denotes that the study findings and its interpretation are and are not based on the researcher's imagination, but clearly linked to the data (Liamputtong, 2013). To enhance confirmability, during interviews the researcher used an interview guide to conduct all interviews for consistency. The researcher was also mindful to observe and clarify rather than dictate the direction of an interview. Generated themes were reviewed independently by two researchers to ensure that they reflected the data.

**Dependability** or reliability denotes consistency of the interpretations of the data (Plummer-D'Amato, 2008). To enhance dependability, coding and categorising of themes during data analysis were done by two researchers independently. Themes identified for relevancy and congruency were reviewed and compared with the accounts of other documented literature.

#### **2.5.5 Ethical considerations**

The study was approved by the La Trobe University Human Ethics Committee (Approval number: HEC18095). A written copy of the participant information sheet and a description of the study were given to each midwife and informed consent was obtained. The voluntary nature of participation, confidentiality and anonymity, and the freedom to withdraw at any point in the study were made clear to the midwives.

#### **2.6 Conclusion**

This chapter has provided a description of the methods employed across the research programme. Incorporating systematic reviews in the research enabled a thorough understanding of the topic, including a gap analysis of previous research. These evidence-base foundational studies enabled for robust empirical research. The following four chapters present the results of each component of this study.

## **Chapter 3: Short-Term Health Outcomes of Newborn Infants of Substance-Using Mothers in Australia and New Zealand: A Systematic Review**

### **3.1 Preface**

The impact of substance use in pregnancy on neonatal outcomes varies from one setting to another due to local variation in: types and amount of substance use, population and their socio-economic status, level of support and care during pregnancy, race and ethnicity. To attain a complete picture of adverse health outcomes of newborns of substance-using mothers, I synthesised the literature on this topic in the context of Australia and New Zealand. The specific aims of this chapter are to synthesise the available evidence on (i) the short-term impact of substance use on newborns, and (ii) the likely socio-demographic characteristics of substance-using mothers.

This chapter presents a peer-reviewed published systematic review. The pre-print of the manuscript as originally submitted are included in this document. Readers are encouraged to view the final peer-reviewed manuscripts in the journal of publication:

Oni, H. T., Khan, M. N., Abdel-Latif, M., Buultjens, M., & Islam, M. M. (2019). Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review. *Journal of Obstetrics and Gynaecology Research*, 45(9), 1783-1795.

### 3.2 Abstract

**Aim:** Substance use is not unusual among women of childbearing age. Pregnant women who use a substance and the consequent impacts on a newborn vary across studies and settings.

We reviewed New Zealand and Australian literature to examine the short-term health outcomes of newborns of substance-using mothers and their demographic characteristics.

**Materials and Methods:** Five medical/nursing databases and google scholar were searched in April 2017. In total, 35 studies were included in the systematic review, of which 6 were meta-analysed. Studies were considered eligible if they described outcomes of newborn(s) of substance-using mothers. Mixed Methods Appraisal Tool was used for quality assessment of candidate studies. Relevant data were extracted and analysed using narrative synthesis. Based on data availability, a subset of studies was included in a meta-analysis. **Results:** Although findings of individual studies vary, there is some evidence that the infants born to substance-using mothers were likely to be born preterm, to have low birthweight and low Apgar score, to be small-for-gestational age and required admission to neonatal intensive care unit. The likelihood of adverse health outcomes was much higher for newborns of polysubstance-using mothers, than newborns of mothers using a single substance. Pregnant women who use illicit substance(s) are predominantly socially disadvantaged, in their twenties and/or of Aboriginal descent. **Conclusions:** Infants of substance-using mothers suffer a range of adverse health outcomes. Multidisciplinary and integrated approach of services that ensure supportive social determinants may result in a better outcome for newborn and positive behavioural change among mothers.

**Keywords:** Substance abuse; Medical problems in pregnancy; Neonatology

### **3.3 Introduction**

The use of illicit substance(s) and/or alcohol is not unusual among women of childbearing age (Scott & Lust, 2010). The adverse health outcomes of perinatal substance use not only affect the mother-infant dyad but can also have considerable socio-economic impacts on society at large (Collins & Lapsley, 2008; Hoffman & Goldfrank, 1990). According to the National Drug Strategy Household Survey 2016 one in three pregnant women consumed alcohol (Australian Institute of Health and Welfare, 2017b) and a substantial proportion of women with a history of substance use continued using even after they were aware of their pregnancy (Australian Institute of Health and Welfare, 2017b). Similarly, New Zealand Health Survey found one in six pregnant women consumed alcohol and more than two-thirds reported past-year risky drinking (Ministry of Health, 2015a). Previous studies point out the negative consequences of substance use during pregnancy such as perinatal obstetric complications, neonatal morbidity and mortality (Brown et al., 2016; Ellwood et al., 1987; Kelly et al., 2000; O'Leary et al., 2010; Oats et al., 1984; Richardson et al., 2001). Findings also suggest that the newborns of substance-using mothers may experience long-term neuro-developmental disorder, which may negatively affect their quality of life (Abdel-Latif et al., 2013; Behnke & Eyler, 1993). Getting a clear overview may help healthcare providers in antenatal settings to improve screening and treatment of pregnant women who use substances (i.e., alcohol or other drugs) (Abdel-Latif et al., 2007).

Substance use is often correlated with chaotic lifestyles and/or psychosocial disadvantages such as homelessness, social isolation, domestic violence and mental illnesses (Kipke et al., 1997; Martin et al., 1996; Oei et al., 2010; Oei et al., 2012). Socio-economic disadvantages may influence the likelihood of substance use (Davie-Gray et al., 2013; Martin et al., 1996). This association is concerning, given that a considerable proportion of women experience disadvantages (Australian Institute of Health and Welfare, 2017a) and those who use substance(s) are significantly less likely to receive adequate prenatal care than women who do not use (Maupin et al., 2004). Therefore, along with getting a clear overview of current evidence regarding possible neonatal outcomes, understanding the likely demographic characteristics of substance-using women are crucial for policy makers to design and implement appropriate health care and other related services such as housing and employment support and rehabilitation for childbearing women (Blandthorn et al., 2011).

The evidence concerning the impact of maternal substance use on a newborn varies considerably in the international literature (Abdel-Latif et al., 2013; Bell et al., 2014; Burns et al., 2006b; Henderson et al., 2007; Riddell et al., 2008; Scott & Lust, 2010). This heterogeneity is largely due to a range of factors that influence the health outcomes of a newborn – including local variation in: types and amount of substance use, population and socio-economic status, level of support and care during pregnancy, race and ethnicity. Thus, it is difficult to attain an appropriate picture of adverse health outcomes of newborns of substance-using mothers unless country or region-specific literature is reviewed. Given that Australia and New Zealand are similar in many ways, we endeavoured to synthesise the literature on this topic in these two countries' context. Also, a scoping review on this topic in Australia and New Zealand context suggests there were mainly two categories of literature: one that examined the short-term health outcomes and the other that examined the long-term health outcomes. Studies of latter type examined a diverse set of health outcomes with a varied definition of long-term. Moreover, the literature on long-term is limited with little or no data available on some variables and on the effect of some substances (Behnke et al., 2013). Thus, we focused on short-term health outcomes only. Therefore, this study aims to synthesise the available evidence on (i) the short-term impact of substance use on newborns (first 28 days afterbirth), and (ii) the socio-demographic characteristics of substance-using mothers.

### **3.4 Materials and Methods**

#### **3.4.1 Search strategy**

A comprehensive search was undertaken in Medline Ovid, PsycINFO Ovid, Web of Science, Embase Ovid, PubMed and Google Scholar. The search was conducted in English Language using key words and Medical Subjects Headings (MeSH), using Boolean operators. We also searched conference abstracts and reference list of the included articles.

#### **3.4.2 Study selection**

Studies were selected based on the inclusion and exclusion criteria outlined below:

##### ***Inclusion criteria:***

- Studies conducted in Australia and New Zealand;

- Articles with a primary focus on short-term outcomes (the first 28 days after birth) of newborn infants of substance-using mothers; and
- Articles with well-defined objectives, methods and findings.

***Exclusion criteria:***

- Studies where the focus was on long-term outcomes of infants/children born of substance-using mothers or infants above 28 days of age; and
- Studies with a primary focus on perinatal smoking only or caffeine consumption.

The selection was completed following two-steps in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Figure 3.1) (Liberati et al., 2009). During the first step, the first and last authors independently short-listed the papers by screening the titles and abstracts. Studies found to be unclear in their relevance or eligibility were included for the next stage of screening. The second step involved full-text screening for eligibility (Figure 3.1).



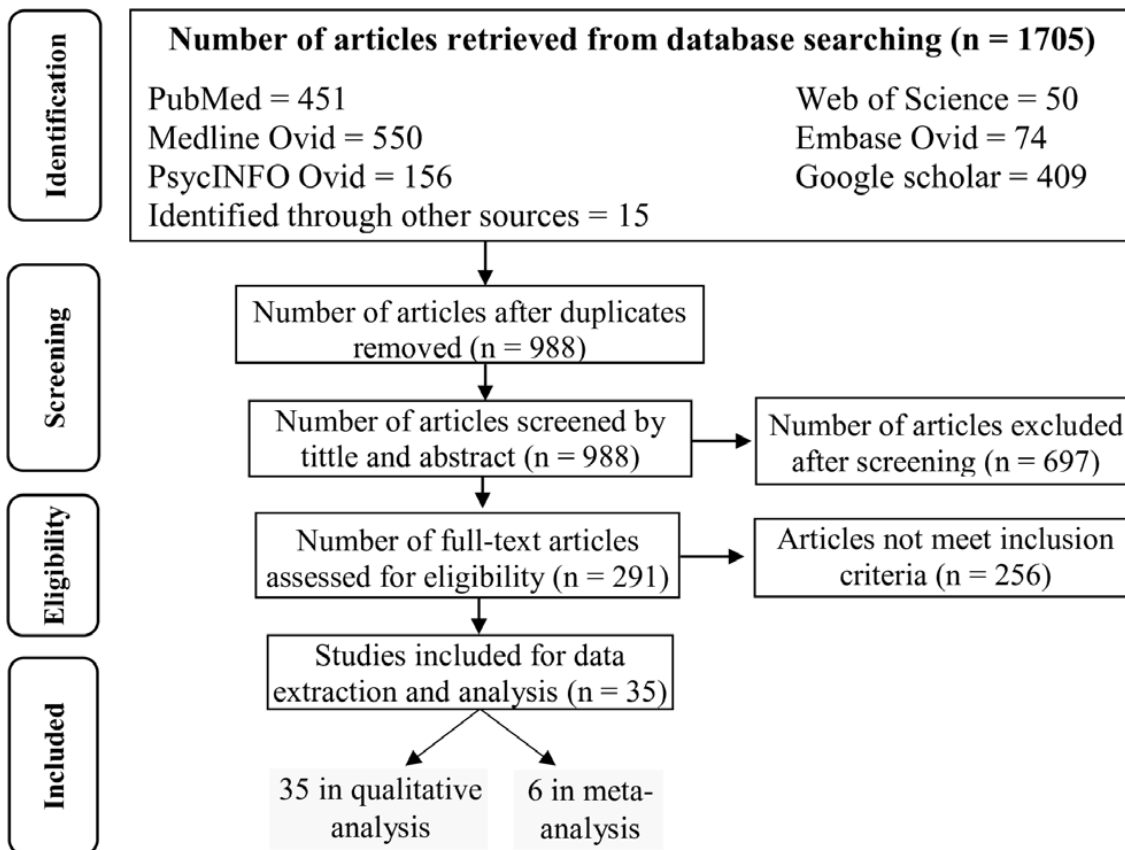


Figure 3. 1: PRISMA flow chart outlines the procedure for identifying papers.

### 3.4.3 Quality assessment

Quality assessment was performed by the first and last authors using the Mixed Methods Appraisal Tool (MMAT) – Version 2011, which is a comprehensive and reliable tool for appraisal of quantitative, qualitative, and mixed-method studies (Pace et al., 2012; Pluye et al., 2009). Briefly, MMAT consists of two screening criteria applied to all study types, four other criteria applied to qualitative and quantitative studies, and three criteria for mixed methods studies. Given that all the reviewed studies were of quantitative design, the four MMAT methodological quality questions for assessing quantitative study were used to determine the quality of the individual study. The questions are: (i) is the sampling strategy relevant to address the quantitative research question?, (ii) is the sample representative of the population under study?, (iii) are measurements appropriate?, and (iv) is there an acceptable response rate (Pace et al., 2012)? Studies were assessed and scored between the range of 25% (1/4 criteria met) and 100% (4/4 criteria met) based on MMAT criteria and categorized as having low-average (25%), average (50%), good quality (75%) and high quality (100%). Differences about the quality were resolved by discussion. Of the 35 included studies, two were of low-average quality (Ellwood et al., 1987; Gibson et al., 1983), 18 were of average

quality (Abdel-Latif et al., 2007; Bartu et al., 2012; Bell & Lumley, 1989; Blandthorn et al., 2011; Brown et al., 2016; Counsell et al., 1994; Davie-Gray et al., 2013; Giles et al., 1989; LaGasse et al., 2011b; Lumley et al., 1985; McLeod et al., 2002; Oats et al., 1984; Patel et al., 2013; Srikartika & O'Leary, 2015; Tetstall et al., 2009; Thomas, 1995; Thompson et al., 1994b; Walpole et al., 1991; Wright et al., 1998), and 15 were of good quality (Abdel-Latif et al., 2013; Bird et al., 2017; Bonello et al., 2014; Brown et al., 2016; Burns & Mattick, 2007; Burns et al., 2006a, 2006b; Hayatbakhsh et al., 2012; Kelly et al., 2000; Kennare et al., 2005; Ludlow et al., 2004; O'Leary et al., 2009; O'Leary et al., 2013b; O'Leary et al., 2012).

### 3.4.4 Data extraction and synthesis

The information extracted included the year of publication, study location, study design, study population, sample size, type of maternal substance use, reported short-term outcome(s) of infants and demographic profile of substance-using mothers.

The retrieved studies were heterogenous in terms of study-design, sampling, methods, and outcome measures. Only a few quantitative studies were found suitable for meta-analysis. As a result, we adopted both qualitative and quantitative approaches to analysis. Narrative synthesis was used for qualitative synthesis. Narrative synthesis can include findings from both qualitative and quantitative method studies (Barnett-Page & Thomas, 2009; Popay et al., 2006). Quantitative synthesis was conducted using meta-analysis. Of all the outcomes, quantitative data suitable for meta-analysis were available only for preterm birth and small-for-gestational age in a subset of five and six individual studies, respectively. The remaining outcomes were described in only two or fewer individual studies. As a result, we conducted meta-analysis only for preterm birth and small-for-gestational age. The studies that mentioned an effect size for these two outcomes described alcohol and/or several drugs as the exposure variable. Thus, assessing the effect of individual drugs on these outcomes was not possible; instead effect of *any substance use* was considered the feasible option. Accordingly, if a study had described the effect size of four different drugs, we estimated the pooled effect size using the *Mantel-Haenszel* method and used that in meta-analysis. We used either fixed or random effects model to pool the effect size. The model was selected based on the heterogeneity assessment ( $I^2$ ). When the test heterogeneity was moderate (50%) or high (75%), the pooled estimates of odds ratio were computed by using the random effects model (Higgins et al., 2003). STATA (version 15) was used for this analysis. Studies were weighted

to control the differences in sample size. The mean effect size was presented using forest plot.

### **3.5 Results**

#### **3.5.1 Study characteristic**

The total peer-reviewed articles found eligible were 35 (Table 3.1), 28 were based on studies conducted in Australia (ten in New South Wales, seven in Western Australia, four in Victoria, two in South Australia, one in Queensland, one in Tasmania, one in Australian obstetric metropolitan hospitals and study setting was not specified in the remaining two studies (Blandthorn et al., 2011; Ellwood et al., 1987)) and seven were based on studies conducted in New Zealand (Bird et al., 2017; Counsell et al., 1994; Davie-Gray et al., 2013; LaGasse et al., 2011a; McLeod et al., 2002; Thompson et al., 1994a). All the studies have comparison group. Most articles were published between 2000 and 2016. Some studies focused on multiple while others focused on single substance use. However, studies that focused on single substance use ultimately discovered that most participants used polysubstance (i.e., more than one substance) (Table 3.1) (Brown et al., 2016; Ellwood et al., 1987; Hayatbakhsh et al., 2012). Articles were mostly based on quantitative studies on secondary data.

Table 3. 1: Short-term outcomes of newborn infants of substance-using mothers

<b>Author (year of publication)</b>	<b>Study setting</b>	<b>Study design</b>	<b>Study population/sample size</b>	<b>Type of substance used</b>	<b>Reported short-term outcomes of newborn infants</b>	<b>Demographic profile of substance-using mothers</b>
Abdel-Latif et al (2013)	Australian Capital Territory; and New South Wales, Australia	Retrospective state-wide, multicentre audit (limited to public hospitals)	Of 62 682 confinements, 879 cases of substance-exposed infants were identified.	Opiate; Methadone; Amphetamines; Ecstasy; Polydrug	Preterm birth (< 32 weeks); low birthweight (< 2500g); neonatal abstinence syndrome; congenital heart disease; gastroschisis; down's syndrome; necrotizing enterocolitis	Exposed mothers were more likely to be younger than non-exposed mothers.
Abdel-Latif et al (2007)	New South Wales, Australia	Prospective, state-wide study	310 (exposed infants) cases versus 5810 control group.	Marijuana; Cocaine; Amphetamine; Heroin; Benzodiazepine; Opioids; Polydrug	Low gestational age; low birthweight, head-circumference; preterm birth; mortality in 22-26 weeks of gestation; prolonged hospitalization.	Exposed mothers were more likely to be younger and of Aboriginal origin than non-users.
Bartu et al (2012)	Western Australia	Prospective study	Maternal and cord serum samples were collected from 10 maternal-infant pairs at delivery.	Buprenorphine	Low birthweight; gestational age at delivery; Apgar score; neonatal resuscitation; admission to neonatal intensive care unit; neonatal abstinence; preterm birth	The majority of substance-using mothers were in their twenties compared to non-users.
Bell et al (1989)	Victoria, Australia	Audit	1786 alcohol exposed pregnancies were compared with 954 non-exposed pregnancies.	Cigarette; Alcohol	Low birthweight; preterm birth; perinatal mortality	Older women were more likely to be drinkers than younger women.
Bird et al (2017)	New Zealand's child cohort	Linked-data study	A cohort of 6822 pregnant women resided within a geographically	Alcohol	Small for gestational age	N/A

			defined region (control group was not clearly specified).			
Blandthorn et al (2011)	Victoria, Australia	Retrospective audit	The neonatal outcomes of 98 women on buprenorphine and methadone from September 2005 to December 2006 were identified by the hospital pharmacy department (control group was not clearly specified)	Buprenorphine; Methadone; Heroin; Tobacco; Alcohol; Amphetamines; Benzodiazepines; Morphine; Cannabis	Low birthweight; preterm birth; jaundice; infection; poor weight gain/weight loss; poor feeding and respiratory distress syndrome; neonatal abstinence syndrome; small for gestational age	The median age of the women on methadone was 29 years.
Bonello et al (2014)	New South Wales, Australia	Retrospective cohort	945 primiparous women diagnosed of mental and behavioral disorders due to substance use versus 13 112 control group	Opioids; Alcohol; Cannabinoids; Polydrug	Low birthweight; preterm birth; admission to special care nursery or neonatal intensive care unit	Most substance-using mothers were between the ages of 20 to 24 years.
Brown et al (2016)	South Australia	Cross-sectional, population-based survey	174 cases of Aboriginal and/or Torres Strait Islander pregnant women using cannabis versus 158 control group	Cannabis; Tobacco	Low birthweight; small for gestational age; preterm birth	The use of cannabis was higher among mothers who began childbearing at a younger age, had lower levels of education, were unemployed or studying during

						pregnancy and experiencing stressful events and social health issues during pregnancy.
Burns et al (2007)	New South Wales, Australia	Population linked data study	2941 live births to women actively on methadone at delivery. The study compares the maternal and neonatal characteristics of neonates born to mothers on methadone who do (n=796) and do not (n=2145) subsequently receive a diagnosis of NAS	Methadone	Neonatal abstinence syndrome	Mothers of neonates with a NAS diagnosis were younger and more likely to be Indigenous Australians.
Burns et al (2006)	New South Wales, Australia	Linked data audit	Of 416834 delivery records, 4698 cases of opioids, stimulants and cannabis cases were identified	Opioid; Stimulants (not specified); Cannabis	Premature; admission to neonatal intensive care unit and/or special care nursery; low Apgar score	Illicit substance-using mothers were more likely to be younger, of Indigenous descent, Australian-born, widowed and public insured.
Burns et al (2006)	New South Wales, Australia	Linked data audit	Of 416834 delivery records, 342 cases of alcohol were identified	Alcohol	Small for gestational age; preterm birth; admission to special care nursery; low Apgar score	Substance-using women were mostly unmarried, were Indigenous and had no private health insurance.

Counsell et al (1994)	Birth cohort from across New Zealand	Longitudinal study	Of 4265 pregnant women, 1791 of alcohol consumption in pregnancy were identified	Alcohol	N/A	Pregnant women consuming alcohol tended to be older, had higher educational qualifications, lower parity and were of a higher socioeconomic status group or were classified as European or Maori.
Davie-Gray et al (2013)	Christchurch, New Zealand	Longitudinal study	81 methadone-maintained (MM) and 107 comparison women and their infants	Cannabis; Stimulant; Benzodiazepines; Opiate	N/A	Substance-using women were six times more likely to be welfare dependent and three times more likely to have no formal educational qualifications.
Ellwood et al (1987)	New South Wales, Australia	Retrospective Analysis	174 substance abusers were compared with similar data obtained from randomly selected public antenatal clinic patients who delivered during the same period (number not specified)	Methadone; Tobacco; Benzodiazepines; Alcohol	Preterm birth; small for gestational age; perinatal death	The substance-using women were white Caucasian Australian nationals, with 12% non-Australian nationals, only one of whom was non-white.

Gibson et al (1983)	Victoria, Australia	Prospective study	Of 7,301 births, 4934 were either exposed alcohol, cannabis and/or tobacco	Alcohol; Cannabis; Tobacco	Prematurity; intrauterine growth retardation; low Apgar score; perinatal death; congenital abnormalities	N/A
Giles et al (1989)	New South Wales, Australia	Prospective study	84 cases of substance(s) users were compared with a group of 52 women who were non-drug using	Narcotics; Methadone; Heroin	Low birthweight; Perinatal mortality; Small for gestational age; Preterm birth	N/A
Hayatbakhsh et al (2012)	Queensland, Australia	Retrospective self-report data	Birth outcomes associated with cannabis use (n= 24,874) before and during pregnancy between 2000 and 2006.	Cannabis	Low birthweight; admission to neonatal intensive care unit; small for gestational age; preterm birth	Cannabis use was more common among women who were younger, had lower levels of education and were single and Indigenous.
Kelly et al (2000)	Victoria, Australia	Cohort study	Ninety-six infants born to Chemical Dependency Unit mothers were compared with a control group of 200 infant/mother pairs.	Methadone; Marijuana; Amphetamines; Cocaine Benzodiazepines; Heroin	Birthweight; Gestational age; Admission to special care nursery	The mean age of control and exposed mothers were similar (27.4 vs 29 years).
Kennare et al (2005)	South Australia	Cohort study	Substance use was reported by women in 707 of 89 080 confinements	Marijuana; Methadone; Amphetamines; Heroin; Polydrug	Preterm birth; small for gestation age; congenital abnormalities; nursery stay longer than 7 days; neonatal death	Substance-using mothers were more likely to be single, Indigenous and of lower socio-economic status.



LaGasse et al (2011)	Infants born at Auckland City Hospital, North Shore Hospital, and Waitakere Hospital, New Zealand	Prospective longitudinal study	A cohort 85 exposed and 95 comparison infants	Marijuana; Tobacco; Methamphetamine; Alcohol	Neurobehavioral effects such as central nervous system stress; lower arousal and excitability	Mothers in the exposed group were of lower SES, less likely to have a partner and more likely to have their first prenatal visit during the second trimester compared to their respective comparison groups.
Ludlow et al (2004)	Western Australia	Retrospective audit	91 opiate- and 50 amphetamine-exposed infants were compared with the 25 291 deliveries infants	Amphetamine; Heroin; Methadone; Alcohol; Benzodiazepines; Tobacco	Preterm birth; low birthweight; small for gestational age; admission to special care nursery; low Apgar score; resuscitation	Most substance-using women were younger and were Aboriginal.
Lumley et al (1985)	Tasmania, Australia	State-wide birth survey	Of 3948, a total of 2172 pregnant women were either drinking and/or smoking in pregnancy	Alcohol; Tobacco	Low birthweight; congenital malformations; low Apgar score	Light drinkers (3-6 glasses/week) were more than 4 times common in professional households.
McLeod et al (2002)	Wellington City, New Zealand	Cross-sectional survey	Factors influencing alcohol consumption during pregnancy and after giving birth in a cohort of 665 pregnant women	Alcohol	N/A	Women who were socio-economically deprived or those who were smokers were less likely to report having consumed alcohol
O'Leary et al (2013)	Western Australia	Cohort study	The exposed group (n = 21 841) versus 56	Alcohol	At risk of sudden infant death syndrome and perinatal death	Compared to the control group, exposed group

			054 comparison group.			mothers were more likely to be of younger (<20 years of age), were Aboriginal, were separated or never married.
O'Leary et al. (2012)	Western Australia	A population-based cohort study linked to birth information on the Western Australian Midwives Notification System	Exposed group (n=23 573) versus comparison group (n= 84 364)	Alcohol	Cerebral palsy	N/A
O'Leary et al (2009)	Western Australia	Before and after study	A sample size of 4719 compared with data available for all births in WA between 1995 and 1997 (the exact number was not specified)	Alcohol	Small for gestational age; preterm birth	N/A
Oat et al (1984)	Victoria, Australia	Case study	Of 80,950 confinements, 45 cases narcotic addiction were identified	Narcotic (details not mentioned)	Fetal growth retardation; premature birth	The mean maternal age of substance users was 23.5 years.
Patel et al (2013)	New South Wales and the	Retrospective record review	A total cases of 1412 NSW and ACT women were	Buprenorphine; Heroin; Benzodiazepines	Birthweight; preterm birth	The mean maternal age of substance users was 28 years.

	Australian Capital Territory		identified as having used one or more drugs of dependency in 2004 and 2007. The entire cohort was divided into three groups and comparisons were made between the groups			
Quinlivan et al (2002)	Three obstetric hospitals, Australia (state not mentioned)	Prospective cohort study	A total of 93 pregnant women were identified as drug users versus 363 non-drug users	Marijuana; Multidrug and solvents; Heroin; Amphetamines; Ecstasy	Birthweight; preterm birth	In comparison to the no-drug group, participants using marijuana and on multidrug were significantly more likely to be socially isolated, homeless or victims of domestic violence.
Richardson et al (2001)	New South Wales, Australia	Audit	Of 6817 live births during the five-year study period (1995-1999), 47 pregnant women were identified as substance users	Methadone; Marijuana; Benzodiazepines; Heroin	Preterm birth; admission to special care nurseries; neonatal abstinence syndrome	Median (range) age of substance-using women was 29 years.
Srikartika et al (2015)	Western Australia	Population-based cohort (data linkage, 1983-2007)	Exposed group (non-Aboriginal n = 13 807; Aboriginal n = 9766) versus the	Alcohol	Preterm birth; small for gestational age; low Apgar score	Exposed mothers were more likely to have never married or separated.

			control group (non-Aboriginal n = 40 148; Aboriginal n = 20 643)			
Tetstall et al (2009)	New South Wales, Australia	Retrospective cohort study	A comparison between 232 metropolitan and 67 rural infants born to mothers maintained on methadone throughout pregnancy for the treatment of opiate dependency, between January 2000 and December 2006	Methadone; Tobacco; Alcohol; Polydrug	Low neonatal abstinence syndrome	N/A
Thompson et al (1994)	11 health districts in New Zealand	Case-control study	Risk factors for small for gestational age of 1800 infants selected randomly	Marijuana; Tobacco	Small for gestational age	N/A
Walpole et al (1991)	Western Australia	Cohort study	From the initial sample of 2002, a subsample of 665 pregnant women, stratified on level of alcohol intake, was drawn and compared with those who were not selected	Alcohol	Tonus associated with birthweight	N/A
Wright et al (1998)	Randomly selected babies from	Case-control study	Risk factors for preterm birth of 1800 infants selected randomly	Marijuana; Alcohol; Tobacco	Preterm birth	N/A

	across New Zealand					
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Table 3. 2: Short-term outcomes of newborn infants associated with maternal substance use in Australia and New Zealand

Short-term outcomes of newborns	Common substance used in pregnancy				
	Opioids	Cannabis	Stimulants	Alcohol †	Polysubstance
Preterm birth < 37 weeks	+	+	+	+	+
Low birthweight < 2500g	+	+	+	+	+
Neonatal Abstinence Syndrome	?	?	?	?	+
Perinatal death	?	?	?	+	?
Admission to neonatal intensive care unit or special care nursery	+	+	+	+	+
Small for gestational age < 10 percentile	+	+	+	+	+
Low Apgar score at 5 minutes < 7	+	+	+	+	+
Congenital Anomalies	?	?	?	+	?

Note. +: reported an association between the particular substance and the neonatal outcome(s); ?: Level of association was not clearly reported. † Neonatal outcomes were only associated with heavy alcohol consumption in pregnancy or when the mothers were admitted due to alcohol-related ICD-10-AM diagnosis.

### 3.5.1 Short-term outcomes among newborns: findings from narrative synthesis

#### 3.5.2.1 Preterm birth / prematurity

Preterm birth refers to birth that occurs less than 37 “completed” weeks of gestation (Bell & Lumley, 1989; Bonello et al., 2014; Burns et al., 2006a; Gibson et al., 1983; Hayatbakhsh et al., 2012). Sixteen studies mentioned an association between substance use during pregnancy and preterm birth (Abdel-Latif et al., 2007; Abdel-Latif et al., 2013; Bonello et al., 2014; Burns et al., 2006a, 2006b; Ellwood et al., 1987; Gibson et al., 1983; Giles et al., 1989; Hayatbakhsh et al., 2012; Kelly et al., 2000; Kennare et al., 2005; Ludlow et al., 2004; O’Leary et al., 2009; Oats et al., 1984; Srikartika & O’Leary, 2015). The association was found significant with most of the drugs included in the studies (Table 3.2). Gestational polysubstance use may double the risk of preterm birth (Abdel-Latif et al., 2007; Abdel-Latif et al., 2013). However, babies born to substance-using mothers who were on buprenorphine or methadone treatment (Patel et al., 2013), and/or whose pregnancies were planned and

could access good antenatal care were unlikely to be premature (Quinlivan & Evans, 2002). Delayed methadone treatment may not avert the risk of preterm birth (Burns et al., 2007).

### **3.5.2.2 Low birthweight**

This refers to neonate weight of less than 2500g at birth primarily caused by premature birth (i.e. before 37 weeks of pregnancy) (Gibson et al., 1983; Oats et al., 1984). Nine studies reported exposure of newborn infants to single or polysubstance use in pregnancy increased the possibility of low birthweight (Table 3.2) (Abdel-Latif et al., 2007; Abdel-Latif et al., 2013; Bell & Lumley, 1989; Bonello et al., 2014; Brown et al., 2016; Gibson et al., 1983; Hayatbakhsh et al., 2012; Ludlow et al., 2004; Lumley et al., 1985). The use of cannabis, opiate or heavy alcohol consumption was significantly associated with low birthweight (Hayatbakhsh et al., 2012; Ludlow et al., 2004). There was insufficient evidence of an association between low-level gestational alcohol consumption and neonates' low birthweight (Lumley et al., 1985; Walpole et al., 1991). Neonates born to women on methadone or buprenorphine maintenance treatment were likely to be of an average weight (Kelly et al., 2000; Patel et al., 2013). Similarly, babies born to mothers on long-term methadone have a higher weight than babies born to mothers using heroin (Giles et al., 1989).

### **3.5.2.3 Neonatal abstinence syndrome**

Four studies found more infants of substance-using mothers were diagnosed with neonatal abstinence syndrome than infants of mothers who did not use substance (Abdel-Latif et al., 2013; Blandthorn et al., 2011; Burns et al., 2007; Richardson et al., 2001). An audit conducted in a chemical dependency unit in a hospital in Melbourne found more neonatal problems requiring specialized medical and nursing expertise, compared with control infants (Kelly et al., 2000). Polysubstance use was found to be a significant factor for neonatal abstinence syndrome (Bartu et al., 2012; Richardson et al., 2001).

### **3.5.2.4 Perinatal death**

This refers to a stillbirth or death that occurs within 28 or 30 days of birth (Gibson et al., 1983). Although perinatal death was reported to be one of the outcomes of newborn infants of substance-using mothers in three studies, no statistical association was reported between the two variables (Bell & Lumley, 1989; Ellwood et al., 1987; Oats et al., 1984). Of note, perinatal death of the neonates was mostly associated with preterm birth. For instance, a study of 45 substance-using pregnant women observed only one perinatal death; the infant

was stillborn at 21 weeks of gestation and weighed 400g (Oats et al., 1984). Similarly, a significant difference of neonatal mortality was observed between 22 and 26 weeks of gestation (12.8% vs. 38.5%) in a prospective state-wide study (Abdel-Latif et al., 2013).

### ***3.5.2.5 Small-for-gestational age/intrauterine growth retardation***

Small-for-gestational age refers to a neonate below the tenth centile of birthweight standard.(Dobbins et al., 2012) Significant association between small-for-gestational age and single/polysubstance use in pregnancy was reported by 12 studies in Australia and two studies in New Zealand (Brown et al., 2016; Burns et al., 2006a; Ellwood et al., 1987; Gibson et al., 1983; Giles et al., 1989; Hayatbakhsh et al., 2012; Kennare et al., 2005; Ludlow et al., 2004; O'Leary et al., 2009; Oats et al., 1984; Srikartika & O'Leary, 2015; Wright et al., 1998), of which 12 were large audit studies and one was a cohort study of 96 infants of drug dependent mothers (Kelly et al., 2000). Three studies examined the relationship between small-for-gestational age and alcohol consumption (Gibson et al., 1983; Lumley et al., 1985; O'Leary et al., 2009). When smoking was taken into consideration the association became insignificant in one study (O'Leary et al., 2009). Another study found insignificant association with alcohol consumption; however, this finding was limited as only a small number of women reported heavy consumption (Gibson et al., 1983).

### ***3.5.2.6 Low Apgar score***

Apgar score below 7 at 5 minutes of neonates exposed to gestational substance use was reported in four papers (Burns et al., 2006a, 2006b; Ludlow et al., 2004; Srikartika & O'Leary, 2015). A data linkage study of 416,834 deliveries in New South Wales found a significant association between Apgar score <7 at 5 minutes and exposure to opioids, stimulants or cannabis (Burns et al., 2006b). The percentage (5.6%) of alcohol exposed infants presented with low Apgar score was higher than that of non-exposed infants (1.6%).(Burns et al., 2006a) A significant difference was found in low Apgar score between infants of amphetamine-using mothers and non-users (Ludlow et al., 2004). A New Zealand study found a significant association between neonatal exposure to methamphetamine and neurobehavioral effects such as central nervous system stress and lower arousal and excitability, which contributed to low Apgar score at birth (LaGasse et al., 2011a).



### **3.5.2.7 Admission to neonatal intensive care unit and/or special care nursery**

Significant associations between maternal substance use and admission of neonates to either neonatal intensive care unit or special nurseries were reported in eight studies.(Bonello et al., 2014; Burns & Mattick, 2007; Burns et al., 2006a, 2006b; Hayatbakhsh et al., 2012; Kennare et al., 2005; Ludlow et al., 2004; Richardson et al., 2001). Opioid-exposed babies were six times; cannabinoids or polysubstance exposed babies were two and four times more likely to be admitted to these facilities, respectively (Bonello et al., 2014). Two studies reported the median length of stay in the neonatal intensive care unit and/or special care nursery for the neonates of opioids-, stimulants- and cannabis-using mothers – 8 days for opioids, 5 days for stimulants and 3 days for cannabis (Burns et al., 2006b; Hayatbakhsh et al., 2012).

### **3.5.2.8 Congenital anomalies**

Congenital anomalies were reported by three studies, of which two found no significant association between maternal substance use and congenital anomalies (Abdel-Latif et al., 2013; Lumley et al., 1985). However, a study conducted in Western Australia suggested that heavy alcohol consumption in pregnancy was an indirect cause of postnatally acquired cerebral palsy, and a direct cause of perinatal acquired cerebral palsy (O'Leary et al., 2012). Other conditions such as congenital heart diseases, Down's syndrome and neonatal infections were mentioned but not significantly associated with gestational substance use. Other less common but equally noteworthy medical conditions resulting from substance-use in pregnancy included gastroschisis, necrotizing enterocolitis, retinopathy of prematurity and patent ductus arteriosus and chronic lung disease (Abdel-Latif et al., 2007; Abdel-Latif et al., 2013).

### **3.5.3 Demographic characteristics of substance-using mothers**

The mean age of substance-using mothers varied from early to late twenties. Although some of the studies did not specify mothers' age, they clearly pointed out that substance use in pregnancy was more common among younger women (Abdel-Latif et al., 2007; Bell & Lumley, 1989; Brown et al., 2016; Burns et al., 2006b; Ludlow et al., 2004). In addition, substance-use was disproportionately high among the mothers of Aboriginal descent in Australia (Abdel-Latif et al., 2007; Abdel-Latif et al., 2013; Burns & Mattick, 2007; Burns et al., 2006a, 2006b; Hayatbakhsh et al., 2012; Kennare et al., 2005; Ludlow et al., 2004; O'Leary et al., 2013a; Quinlivan & Evans, 2002; Tetstall et al., 2009). those who were single

or separated (Abdel-Latif et al., 2007; Burns et al., 2006b; Davie-Gray et al., 2013; Kennare et al., 2005; LaGasse et al., 2011a; Srikartika & O'Leary, 2015), unemployed or studying during pregnancy, of low socio-economic or educational status (Brown et al., 2016; Burns et al., 2006a, 2006b; Davie-Gray et al., 2013; Hayatbakhsh et al., 2012; Lumley et al., 1985; McLeod et al., 2002); socially isolated, or homeless. A subset of mothers was found to be victims of domestic violence (Brown et al., 2016; Quinlivan & Evans, 2002). Only one study, which was conducted in New Zealand, found a significantly positive association between alcohol consumption in pregnancy and women with higher educational and socio-economic status (Counsell et al., 1994).

### **3.5.4 Findings from meta-analysis**

Pooled odds ratio was computed for two outcomes, *namely* preterm birth and small-for-gestational age. The association between alcohol and/or other drug use during pregnancy and preterm birth was mentioned in five studies (Bonello et al., 2014; Brown et al., 2016; Hayatbakhsh et al., 2011; Kennare et al., 2005; Srikartika & O'Leary, 2015), totaling 160247 participants. All five studies were of acceptable quality. However, there was significant heterogeneity in effect sizes ( $I^2 = 72\%$ ,  $p < 0.01$ ). As a result, we used random effect meta-analysis. Alcohol or other drug use during pregnancy was significantly related with preterm birth (OR = 2.02, 95%CI = 1.52-2.69) (Figure 3.2). Six studies could be included in the meta-analysis for small-for-gestational age (Brown et al., 2016; Burns et al., 2006a, 2006b; Hayatbakhsh et al., 2011; Kennare et al., 2005; Srikartika & O'Leary, 2015). All six articles were of acceptable quality and totalling 561,105 participants. However, in this case we did not find any evidence of heterogeneity ( $I^2 < 50\%$ ). Therefore, we summarized study findings by using fixed effect model (Figure 3.3). The pooled odds ratio was 1.92 (95%CI 1.80-2.05).

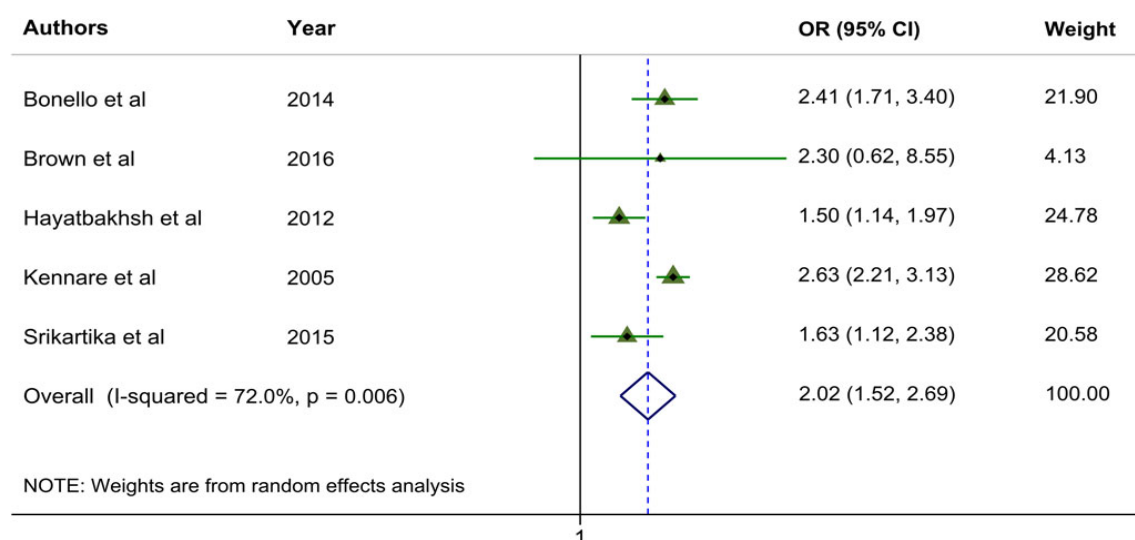


Figure 3. 2: Forest plot showing the odds ratio between substance use and preterm birth. Pooled odds ratio is shown using the diamond at the bottom

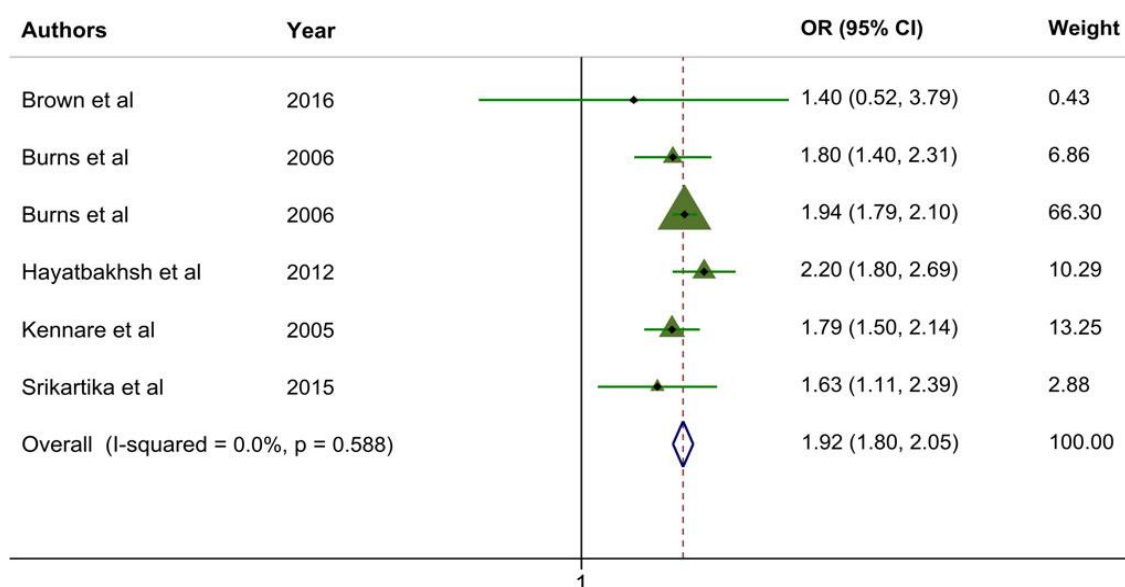


Figure 3. 3: Forest plot showing the odds ratio between substance use and small for gestational age. Pooled odds ratio is shown using the diamond at the bottom.

### 3.6 Discussion

The results of this review suggest that infants born to substance-using mothers were more likely to be premature, small-for-gestational age, of low birthweight and low Apgar score. Consequently, most of the neonates were admitted to neonatal intensive care unit or special care nursery. The prevalence of morbidity among exposed babies was higher than that of unexposed babies (Addis et al., 2001; Behnke et al., 2013; Forray & Foster, 2015; Huizink, 2014; Metz & Stickrath, 2015; Scott & Lust, 2010). There was a possible dose-effect

relationship between alcohol consumption during pregnancy and adverse clinical outcomes of infants (Henderson et al., 2007; Patra et al., 2011). Heavy alcohol consumption during pregnancy increased the risk of low birthweight, small-for-gestational age and preterm birth (Patra et al., 2011). However, a significant association between low-moderate gestational alcohol consumption and adverse neonatal outcomes was unconvincing (Henderson et al., 2007). Another observation is that at the population level, the likelihood of adverse health outcomes was much higher for newborns of polysubstance-using mothers, than newborns of mothers using a single substance. Substance use was more prevalent among the women who were socio-economically disadvantaged than those who were not.

Polysubstance use was common among the substance-using mothers. As a result, it was difficult for some of the studies to determine the effect(s) of single drug (Brown et al., 2016; Burns et al., 2007; Metz & Stickrath, 2015). In addition, type of substances, amount, frequency and dose consumed, point and duration of exposure – all are important factors in determining the health outcome of newborns. Lack of disclosure and under-reporting of substance use-related information – mainly due to social stigma and legal ramification – made the endeavour further challenging. As a result, limited information was available about the effect of any individual substance and specific type of substance on infants' health. Despite all these complexities, our findings provide some evidence – both from qualitative and quantitative analysis – and identify the most prevalent adverse health outcomes of infants of mothers who used substance during pregnancy in Australia and New Zealand context.

Methadone and buprenorphine are drugs of choice for treating opiate addiction in pregnancy (Blandthorn et al., 2011; Burns et al., 2010; Burns et al., 2007). This treatment had been found to effectively improve the neonatal outcomes of substance-dependent mothers (Jones et al., 2012a; Jones et al., 2012b). Consistently, the evidence resulting from this review illustrated that early commencement and adherence to methadone or buprenorphine treatment may reduce the adverse effects of illicit substance use during pregnancy (Bartu et al., 2012; Burns et al., 2007), however these babies exposed to both methadone and buprenorphine may experience neonatal abstinence syndrome (Wouldes & Woodward, 2010).

The majority of the included studies found that most substance-using mothers were of single marital status or separated, unemployed, low socio-economic status with low level of education, homeless, victims of domestic violence and/or socially isolated (Abdel-Latif et al., 2007; Bonello et al., 2014; Brown et al., 2016; Burns et al., 2006a, 2006b; O'Leary et al.,

2013a; O'Leary et al., 2009; Oats et al., 1984; Walpole et al., 1991). While such factors are not new in the literature, social determinants of health can dramatically influence health outcomes and are an essential consideration when adopting preventative approaches to care (Little et al., 2005). A favourable set of social determinants of health such as ongoing support for employment and stable housing may contribute to reducing the impact of adverse health outcomes on newborns (Abdel-Latif et al., 2013; Davie-Gray et al., 2013; Quinlivan & Evans, 2002). The study findings highlight not only the need for holistic and multidisciplinary care (Srikartika & O'Leary, 2015), which requires an integrated team approach of healthcare and other professionals – such as, general practitioners, obstetricians, midwives, mental health specialists and social workers (Davie-Gray et al., 2013; Poulton & West, 1993; Richardson et al., 2001). Also, to further facilitate a favourable set of social determinants of health, ongoing support for employment, stable housing and parenting education are needed (Abdel-Latif et al., 2013; Davie-Gray et al., 2013; Quinlivan & Evans, 2002).

Our study adds value to the literature in that the findings indicate strong associations across a range of health outcomes of the infants of mothers who used substance during pregnancy in Australia and New Zealand. It may be difficult to have an appropriate picture of health outcomes of infants of substance-using mothers unless a country or region-specific literature is considered, as there is variation in drug use – both in terms of type and quantity across countries and regions. Moreover, the ultimate health outcomes are influenced not only by the teratogenic effect of drugs but also by a range of host factors such as socio-economic condition, nutrition, healthcare and comorbid psychiatric illnesses. For instance, some studies in the USA found intrauterine substance exposure to be a significant risk factor for sudden infant death syndrome (Fares et al., 1997; Ward et al., 1990). However, a study conducted in New Zealand found no such association (Galland et al., 2013). Given that we have included papers from two similar countries, the effect of variation in many of these contextual and socio-economic factors is less likely to change our results substantially. Our review also found some gaps in the existing literature. One of such gaps is the effect of detoxification during pregnancy. Assessment of only a limited number of conditions is another gap. Particularly, literature around the neurological aspects of the newborn is very limited. Furthermore, the extent to which adverse neighbourhood exposures might confound or modify the effect of substance use on birth outcomes has not been adequately explored.

Our study has some limitations. Firstly, heterogeneity in study design and limitations of individual studies might have some impacts on our synthesis. Secondly, our findings might have been affected by publication bias, as studies with significant results were more likely to have been published. Thirdly, the papers included were not evenly distributed across geographical locations. Also, the meta-analysis was possible only for two outcomes. Finally, in some papers, statistical associations were not clearly mentioned; rather findings were described using words such as “common”, hence subjective interpretations of the results were required. Although a comprehensive search was conducted to ensure that all the relevant papers were included in this review, it is possible that the search missed a few.

In summary, the preponderance of the evidence suggests that infants born to substance-using mothers – whether they used a single drug or polysubstance – are more likely at risk of adverse outcomes such as preterm birth, low birthweight, small-for-gestational age, low Apgar score, and admission to neonatal intensive care unit or special care nursery. Further research is needed to understand the dose effect of specific substance on these health outcomes. Pregnant women who use illicit substance were most likely to be in their twenties, of Aboriginal origin, and/or low socio-economic status. Early screening by healthcare providers in antenatal settings using validated screening tools with culturally sensitive support is required. Access to timely antenatal care is essential, as well as individualized treatment plans and ongoing monitoring during pregnancy to improve perinatal health outcomes.

### **3.7 Acknowledgements**

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### **3.8 Disclosure**

There are no conflicts of interest to disclose.

## Chapter 4: Neonatal Outcomes of Infants Born to Pregnant Women with Substance Use Disorders: A Multilevel Analysis of Linked Data

### 4.1 Preface

Although the previous chapter highlights the adverse impacts of substance use on neonatal health outcomes, only a few studies have used population-level data. Linkage of population-level data is a valuable opportunity for combining detailed individual-level information from different sources.

In this chapter, the term “*substance use disorders*” refers to “*alcohol and other drug use disorders*”. The population-level linked data is examined to answer research questions that require a large sample size and comprehensive data on a hard-to-reach population (pregnant women with substance use disorder(s)) and generate evidence with a high level of external validity, necessary for evidence-based policy development. The purpose of this chapter is to examine the associations of substance use disorder(s) (namely: Opioids, cannabis, stimulants, alcohol and polysubstance) in pregnancy and neonatal outcomes (preterm birth, low Apgar score at 1-minute and 5-minutes, low birthweight, admission to special care nursery or neonatal intensive care unit, stillborn, and neonatal death) using a linked data over a 10-year period while taking into consideration maternal characteristics such as maternal age, health insurance and antenatal care attendance and socio-Economic Indexes for Areas (SEIFA) score and co-morbidities such as pre-eclampsia, gestational hypertension score as confounders.

This chapter is an accepted version of a manuscript submitted to a journal for publication.

Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. Neonatal outcomes of infants born to pregnant women with substance use disorders: A multilevel analysis of linked data

## 4.2 Abstract

**Objective:** This study examines the associations of substance use disorders in pregnancy with a set of neonatal outcomes. **Methods:** This is a quantitative retrospective study. Three linked datasets of a 10-year period (2007-2016) from New South Wales, Australia, were examined. Pregnant women were identified positive for substance use disorders when at least one hospital admission during pregnancy or delivery had opioid-, or cannabis-, or stimulant-, or alcohol- or two or more of the four substance groups- related ICD-10-AM diagnostic code. As there was a hierarchical structure in the dataset, the adjusted odds ratio (AOR) was estimated using multilevel logistic regression. **Findings:** Of the 622,640 birth records, 1677 (0.27%) women had opioid-related, 1857 (0.30%) had cannabis-related, 552 (0.09%) had stimulant-related, 595 (0.10%) had alcohol-related and 591 (0.09%) had polysubstance-related ICD-10-AM diagnostic codes. There were significant relationships between opioid use in pregnancy and neonatal health outcomes including preterm birth (AOR 3.2; 95% CI 2.8, 3.7) and admission to the neonatal intensive care unit (NICU) (AOR 10.0; 95% CI 8.8, 11.3). Substance use disorders due to cannabis, stimulants, alcohol or polysubstance were significantly associated with preterm birth, low birthweight, low APGAR score and admission to NICU. Also, alcohol and polysubstance use disorders in pregnancy were found to be significantly associated with stillbirth. **Conclusion:** Results demonstrate that substance use disorders in pregnancy are associated with an increased risk of adverse neonatal outcomes. Early identification of substance use disorders through screening and adherence to pharmacotherapy and other psychosocial interventions could improve neonatal outcomes.

**Keywords:** Substance use disorder; pregnant women; neonatal health; linked data; multilevel regression



## 4.3 Introduction

### Introduction

Substance use disorders in pregnancy continue to represent a complex public health issue, increasing the burden of illness and health costs globally (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). Although the rates of substance use disorders are lower in pregnant women than in non-pregnant women, a substantial subgroup continues to report alcohol and/or illicit drug use in Australia (Burns et al., 2016). According to the latest National Drug Strategy Household Survey, around 81% of pregnant women in Australia report monthly alcohol consumption and 1.8% continue using an illicit drug after confirmation of their pregnancy (Australian Institute of Health and Welfare, 2017b). Maternal substance use disorders may cause adverse perinatal outcomes such as small for gestational age (Bird et al., 2017; Sriartika & O'Leary, 2015), low birthweight (Bailey et al., 2020; O'Leary et al., 2010), preterm birth (Bailey et al., 2020; Bonello et al., 2014; Umer et al., 2020), birth defects (O'Leary et al., 2012) and may require admission to the neonatal intensive care unit (Bailey et al., 2020; Burns et al., 2006a). In addition to the clinical outcomes, there are numerous legal, psychosocial, and financial problems that can negatively impact the health and wellbeing of pregnant women and their newborns (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018).

Although the consequences of substance use disorders can be severe, it is often difficult to have an estimate of the harm, largely due to limited health-system screening and thus limited records to assess. There is also a limitation associated with the generalisability of findings owing to frequent non- or partial-disclosure of substance use in pregnancy (Oni et al., 2020b). Amidst these limitations, data linkage offers an opportunity to study the relationship between the exposure and outcome variables to produce a reliable estimate of neonatal outcomes of pregnant women with substance use disorders. Data linkage involves bringing together datasets from different sources relating to the same individual (Holman et al., 1999). In Australia, a handful of studies used data linkage to examine issues such as hazardous death among opiate and amphetamine users (Bartu et al., 2004) and the impact of maternal alcohol consumption on neonates (O'Leary et al., 2012). Burns et al. (2006) used linked data over a 5-year period (1998–2002) to examine the association of maternal alcohol, opioids, stimulants and cannabis use with perinatal outcomes namely, small for gestational age, preterm birth, admission to special care nursery and neonatal intensive care unit, APGAR score at 5-

minutes and length of hospital stay. Although these studies offer some useful information, results are now more than a decade old (Burns et al., 2006a, 2006b).

In recent years, however, the issue of maternal substance use disorders has gained further attention due to growing evidence of the adverse effects on perinatal outcomes (The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). In Australia, legislation, policies and guidelines have been put in place to promote harm minimisation of substance use disorders in pregnancy and improve outcomes for both mothers and children through early diagnosis and interventions (Burns et al., 2016; Taplin et al., 2015). Given the rapid changes in maternal substance use disorder trends over the years, there is a need for further research to advance the evidence-base (Chou et al., 2015; World Health Organization, 2015). This study aims to examine the associations of substance use disorders (opioids, cannabis, stimulants, alcohol and polysubstance) in pregnancy and a set of neonatal outcomes (preterm birth, low Apgar score at 1-minute and 5-minutes, low birthweight, admission to special care nursery or neonatal intensive care unit, stillborn, and neonatal death) using a linked data over a 10-year period.

## **4.4 Methods**

### **4.4.1 Data linkage**

With the help of the Centre for Health Record Linkage (**CHeReL**) the following three major population level datasets were linked (Figure 4.1):

1. NSW Perinatal Data Collection (NSW PDC)
2. NSW Admitted Patient Data Collection (APDC)
3. Cause of Death Unit Record File (COD URF)

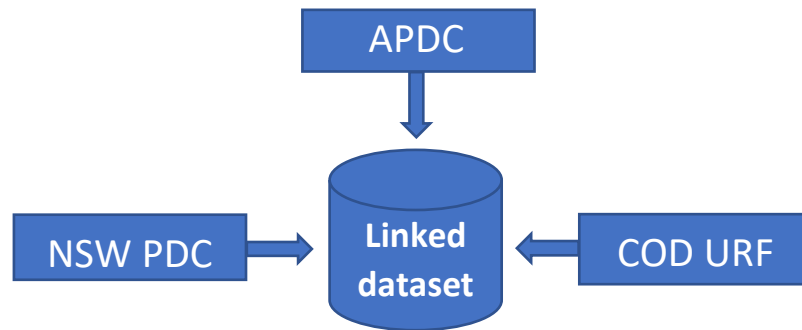


Figure 4. 1: Data linkage flowchart

Data of pregnancy women and outcomes of pregnancy were linked using some primary identifiers (e.g. mother and baby’s date of birth, country of birth, postcodes, medical record number, names, hospital of birth). A probabilistic matching technique was applied for linking the individual’s data for the 10-year period from 2007 to 2016. After linkage, all unique identifiers were deleted for confidentiality reasons and supplied to my research team as de-identified datasets.

#### 4.4.2 Description of datasets

This is a quantitative retrospective study using linked data from New South Wales (NSW), the most populous state in Australia with a total area of 800,642 km<sup>2</sup> and covering 10.4% of Australia. Around 7.9 million people currently reside in NSW, with a population density of 8.6 people per kilometre (Population Australia, 2020a). The study examined linked data of the following three datasets: NSW Perinatal Data Collection (PDC), NSW Admitted Patient Data Collection (APDC) and Cause of Death Unit Record File (COD URF) data for the 10-year period from 2007 to 2016. The study also used Socio-Economic Indexes for Areas (SEIFA) as a proxy to the socio-economic status of the participants. The details of these datasets are given below:

***The NSW Perinatal Data Collection*** was formerly known as the Midwives Data Collection. It is a population-based database covering all births in public and private hospitals as well as homebirths in NSW. The data encompasses details about live births and stillbirths greater than 20 weeks gestation or at least 400 grams weight at birth. It provides demographic, medical and obstetric information on women and details of labour, delivery, and condition of each baby at birth (Centre for Health Record Linkage, 2020b).

***The NSW Admitted Patient Data Collection (APDC)***, previously known as NSW Inpatient Statistics Collection (ISC) is a record of all admitted patient services provided by NSW Public Hospitals, Public Psychiatric Hospitals, Public Multi-Purpose Services, Private Hospitals, and Private Day Procedures Centres. Public hospital APDC data shows episodes of care of each patient. An episode of care ends when a patient is discharged, transferred, has died or became a different “type” of patient within the same period of stay. For private hospitals, each APDC record represents a complete hospital stay (Centre for Health Record Linkage, 2020a). The APDC data also consists of patient demographics, diagnosis and procedures pertaining to each patient admission. Each diagnosis and procedure is recorded by following the Australian Modification of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, (ICD-10-AM) (National Centre for Classification in Health, 2017). For each patient in Australia, every diagnosis or medical condition, procedure and treatment are allocated different ICD-10-AM codes. A patient can have more than one ICD-10-AM code during a hospital stay.

***The Cause of Death Unit Record File (COD URF)*** data consists of records of deaths registered from 2007 onwards by the Centre for Epidemiology and Evidence and coded cause of death data from the Australian Coordinating Registry (ACR). The data are based on the year of registration of the death, rather than the year of death, and coded according to the ICD-10 International Version rather than the ICD-10 AM used in Australian hospitals.

***Socio-Economic Indexes for Areas (SEIFA)*** data was obtained from the Australian Bureau of Statistics (ABS). SEIFA summarises information about the economic and social conditions of people and households within an area, including both relative advantage and disadvantage measures (Australian Bureau of Statistics, 2011). It is derived from population and housing information collected in the five-yearly national census. SEIFA consist four indexes, each referring to the general population: (i) the Index of Relative Socio-economic Disadvantage (IRSD); (ii) the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD); (iii) the Index of Education and Occupation (IEO); and (iv) the Index of Economic Resources (IER). The indexes indicate the average socio-economic characteristics of the people, families, and households living in the area. Some common uses of SEIFA include: Determining areas that require funding and services; identifying new business opportunities; and assisting research into the relationship between socio-economic disadvantage and various outcomes (Australian Bureau of Statistics, 2011).

In this study, *the Index of Relative Socio-Economic Advantage and Disadvantage* (IRSAD) 2011 by Local Government Area (LGA) was used for analysis. The IRSAD summarises variables that indicate either relative advantage or disadvantage. This index ranks areas on a continuum from most disadvantaged to most advantaged. An area with a high score on this index has a relatively high incidence of advantage and a relatively low incidence of disadvantage. A low IRSAD score indicates greater disadvantage and lack of advantage and a high score indicates a relative lack of disadvantage and greater advantage (Australian Bureau of Statistics, 2011). For the purpose of this study, the IRSAD was divided into quintiles (i.e., five equal groups) based on maternal LGA during pregnancy.

There was a hierarchical or clustered structure in the dataset, the pregnant women were residing in 152 LGAs within New South Wales. LGA is considered a group-level confounding variable, as geographical variation in populations and social environments can influence substance use. Also, geographical variation in the availability and accessibility of healthcare services can influence healthcare-seeking behaviours. Thus, it is important that geographical location is taken into consideration to estimate the harm associated with substance use disorders.

#### **4.4.3 Coding for substance use disorders and its quality**

In the APDC dataset, substance use during pregnancy was coded with the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). It is an expanded version of the World Health Organization's ICD-10 and developed with assistance from clinicians, health information managers and clinical coders to ensure that the classification is current and appropriate for Australian clinical practice and has been in use since 1998 (Henderson et al., 2006). So far, several studies have found high sensitivity and positive predictive value (PPV) of ICD-10-AM. For instance, the accuracy of site-specific cancer in APDC diagnostic codes ranged from 80-95% (Stavrou et al., 2012). Similarly, another study reported good-to-excellent coding quality of ICD-10-AM and a high agreement between hospital codes and auditor codes for principle diagnosis and principle procedure (Henderson et al., 2006).

#### **4.4.4 Inclusion Criteria**

In this study, only women with a record of admission – irrespective of exposure status – for pregnancy-related issues between 2007 and 2016 were included in the analysis. Women were

identified as with substance use disorder(s) based on opioid-, or cannabis- or stimulants- or alcohol-related ICD-10-AM diagnostic codes during admission in pregnancy or at delivery. Pregnant women without substance use codes (i.e., no ICD-10-AM codes for cannabis, opioids, stimulants, alcohol, sedatives or hypnotics, hallucinogens, volatile solvents, multiple drug use) were classified as ‘non-substance users’ as illustrated in Table 4.1. To determine the presence of substance-related ICD-10-AM code, all ICD-10-AM diagnoses for each pregnant woman were examined.

Table 4. 1: ICD-10-AM codes used to classify maternal substance use disorders and non-substance use.

<b>Opioids</b>	F11.0–11.9	Mental and behavioural disorders due to use of opioids
	T40.0	Poisoning by Opium
	T40.1	Poisoning by heroin
	T40.2	Poisoning by other opioids
	T40.3	Poisoning by methadone
	T40.4	Poisoning by other synthetic narcotics
	T40.6	Poisoning by other and unspecified narcotics
<b>Cannabis</b>	F12.0–12.9	Mental and behavioural disorders due to use of cannabinoids
	T40.7	Poisoning by Cannabis (derivatives)
<b>Stimulants</b>	F14.0–14.9	Mental and behavioural disorders due to cocaine
	F15.0–15.9	Mental and behavioural disorders due to use of other stimulants (including caffeine)
	T40.5	Poisoning by cocaine
	T43.6	Poisoning by psychostimulants with potential for use disorder (excludes cocaine)
<b>Alcohol</b>	F10.0-10.9	Mental and behavioural disorders due to use of alcohol
	O35.4	Maternal care for (suspected) damage to fetus from alcohol

	T51.0-51.9	Toxic effect of alcohol
	X45	Accidental poisoning by and exposure to alcohol
	X65	Intentional self-poisoning by and exposure to alcohol
	Y15	Poisoning by and exposure to alcohol, undetermined intent
<b>Polysubstance</b>		Having two or more of the four substance use disorders
<b>Non-substance users</b>		These are pregnant women without substance use disorders including: cannabis ICD-10-AM; stimulants ICD-10-AM; alcohol ICD-10-AM; sedatives or hypnotics ICD-10-AM (F13), hallucinogens ICD-10-AM (F16, T40.8, T40.9), volatile solvents ICD-10-AM (F18), multiple drug use ICD-10-AM (F19, O35.5)

N.B. The diagnostic guidelines for identification and classification of the psychoactive substance use disorder may be made based on self-report data, objective analysis of specimens of urine, blood and/or other evidence such as presence of drug samples in the patient's possession, clinical signs and symptoms and/or reports from informed third parties (World Health Organization, 1992). However, evidence of substance use is sought from more than one source before clinical diagnosis is made (World Health Organization, 1992).

#### 4.4.5 Data analysis

The APDC, PDC and COD URF datasets were merged using the unique identification number assigned to each record, to enable all maternal records to be grouped together. Of the total observations, 2,401,001 matched, and 793,478 did not match and were dropped. To arrive at final cohort size, only women who were admitted - irrespective of exposure status - within conception date and delivery date were included in the study. Of the total 1,205,115 observations that met the inclusion criteria, 451,245 duplicates were deleted, and 753,870

observations were further screened for multiple birth records, including the birth of twins. Finally, the cohort was restricted to one birth per woman irrespective of exposure status to arrive at the final number of observations (622,640) included in the analysis (Fig. 4.2).

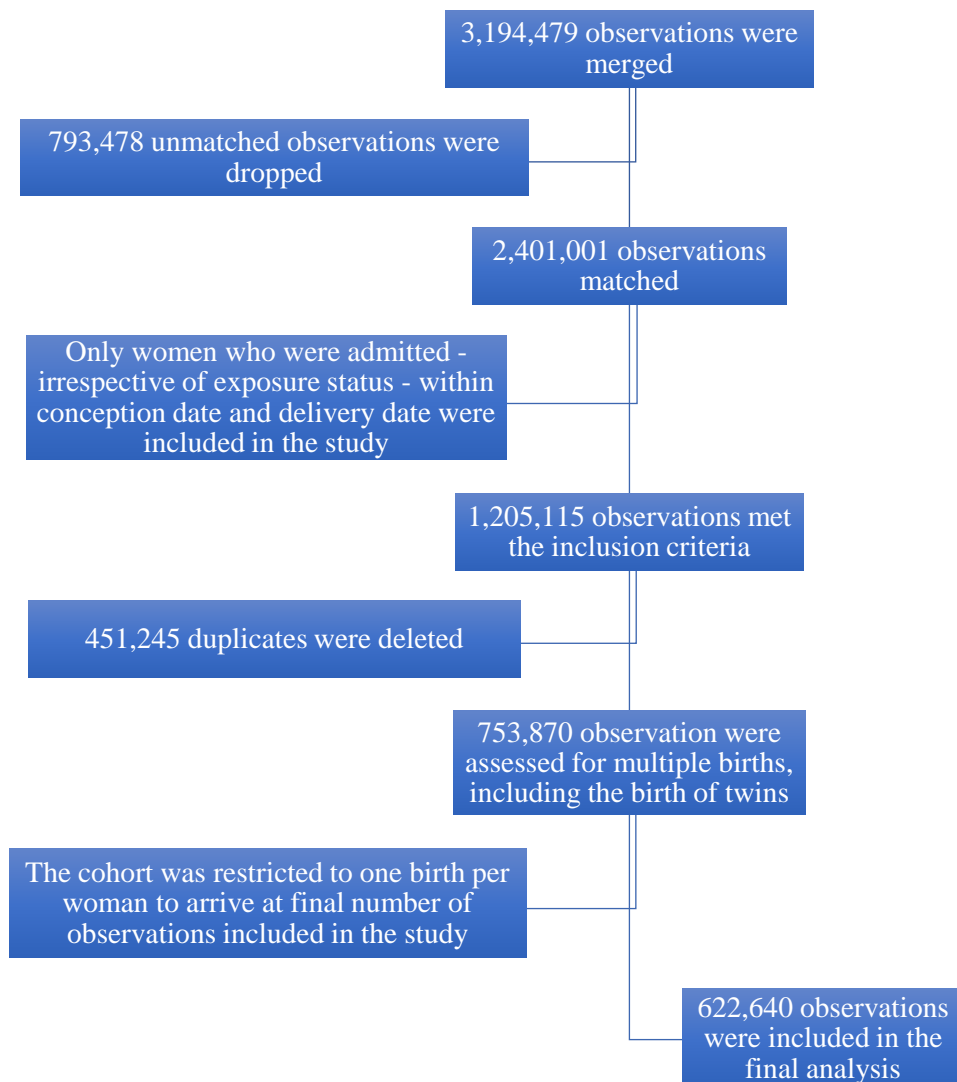


Figure 4.2: Data cleaning and merging process

To explore the association between the neonatal outcomes and substance use disorders through multilevel regression, maternal substance-related diagnosis was coded into a binary variable (yes/no). Descriptive statistics were used to examine the sociodemographic and obstetric characteristics of the women.

**Multilevel analysis for clustered data:** If the structure of data in a population is hierarchical, a sample from such a population can be viewed as a clustered sample. A cluster sample often introduces multilevel correlation between the dependent and independent variables that can



have implications for model parameter estimates. As such, the use of single-level statistical models may not draw precise inferences and conclusions (Merlo et al., 2016). The multilevel regression analysis considers the variations due to a hierarchical structure in the data. It allows the simultaneous examination of the effects of group-level (cluster) and individual-level variables on individual-level outcomes while accounting for the non-independence of observations within groups (Khan & Shaw, 2011).

As there is a hierarchical structure in the dataset (e.g. women nested within Local Government Areas), we used multilevel logistic regression to examine the odds between neonatal outcomes of infants born to pregnant women with substance use disorders and that of women without substance use disorders during pregnancy. At level 1, the model was adjusted for individual confounding variables including maternal age group, smoking (1–10, 10 or more cigarettes per day), substance use disorders (opioids ICD-10AM yes/no; cannabis ICD-10AM yes/no; stimulants ICD-10AM yes/no; alcohol ICD-10AM yes/no, multidrug ICD-10AM yes/no), indigenous status (yes/no), Medicare health insurance (yes/no), antenatal care attendance, the plurality of birth and SEIFA:IRSAD score. Also, maternal co-morbidities including pre-eclampsia, gestational hypertension, chronic/pre-existing hypertension, chronic/ pre-existing diabetes and gestational diabetes were adjusted for at level 1. At level 2, the model was adjusted for 152 LGAs. Statistically significant results ( $p < 0.001$ ) in this test implied that the multilevel mixed-effect models were preferable for modelling this data. In addition, a sensitivity test was performed using two other durations to determine any significant difference in neonatal outcomes and durations of substance use in pregnancy, namely (i) between one year before conception and 4 weeks after delivery and (ii) between 4 weeks before conception and 4 weeks after delivery. The analysis was performed using STATA software, version 15 (StataCorp, 2017).

#### **4.4.6 Ethics approval**

This study was approved by the NSW Department of Health Ethics Committee (reference number: HREC/18/CIPHS/6) and La Trobe University Human Ethics Committee.

### **4.5 Results**

In this study, a total of 622,640 eligible records were extracted from the merged dataset. Of these records, 1677 (0.27%) pregnant women had opioid-related, 1857 (0.30%) had cannabis-related, 552 (0.09%) had stimulant-related, 595 (0.10%) had alcohol-related and 591 (0.09%)

had polysubstance-related ICD-10-AM diagnostic codes. Overall, cannabis was the leading cause of substance use disorder in pregnancy, followed by opioids and alcohol (Table 4.2). Pregnant women with a substance use disorder were less likely to be married and more likely to smoke one to ten cigarettes per day in pregnancy than women without substance use disorder-related diagnosis. As shown in Table 4.2, higher percentages of pregnant women with substance use disorders lived in LGAs with low SEIFA: IRSAD scores and lower percentages of this group lived in LGAs with high SEIFA: IRSAD scores compared to pregnant women without substance use disorder(s). Among the Indigenous women in the sample, 4.6% (911/19675) reported substance use disorders during pregnancy compared to 0.5% (3105/595629) non-Indigenous wom

Table 4. 2: Maternal demographic characteristics of pregnant women with and without a substance use disorder-related ICD-10-AM code: n=622, 640 (univariable association)

Maternal characteristic	Opioids n = 1677		Cannabis n = 1856		Stimulants n = 552		Alcohol n = 595		Polysubstance n = 591		Non-substance users n = 618,571	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Age (year)												
<=20	45	2.7	352	19.0	52	9.4	59	9.9	64	10.8	28 862	4.7
21-30	767	45.7	935	50.4	252	45.7	244	41.0	265	44.8	264 906	42.8
31-40	813	48.5	530	28.6	230	41.7	267	44.9	244	41.3	304 459	49.2
41-50	52	3.1	39	2.1	18	3.3	25	4.2	18	0.0	20 198	3.3
Marital status												
Married (including de facto)	701	35.1	556	30.1	127	23.1	161	27.1	145	24.7	500 861	81.6
Never married	109	55.0	1169	63.2	363	66.0	361	60.8	389	66.2	90 224	14.7
Widowed	14	0.7	9	0.5	6	1.1	6	1.0	5	0.9	698	0.1
Divorced	39	2.0	28	1.5	16	2.9	15	2.5	8	1.4	5 043	0.8
Separated	107	5.4	66	3.6	26	4.7	36	6.1	31	5.3	8 370	1.4

Indigenous status	<b>357</b>	<b>21.5</b>	<b>455</b>	<b>24.8</b>	<b>116</b>	<b>21.5</b>	<b>166</b>	<b>28.5</b>	<b>157</b>	<b>27.1</b>	18 764	3.1
Health insurance on admission (Medicare)	<b>1 506</b>	<b>99.1</b>	<b>1 718</b>	<b>98.9</b>	<b>499</b>	<b>98.4</b>	<b>520</b>	<b>95.9</b>	<b>533</b>	<b>99.3</b>	475 364	82.6
Public hospital admission	<b>1 613</b>	<b>96.8</b>	<b>1 781</b>	<b>96.6</b>	<b>525</b>	<b>95.5</b>	<b>550</b>	<b>94.3</b>	<b>573</b>	<b>97.5</b>	443 870	76.0
Cigarettes per day in pregnancy												
1-10 per day	<b>640</b>	<b>40.7</b>	<b>818</b>	<b>46.2</b>	<b>234</b>	<b>44.7</b>	<b>192</b>	<b>33.9</b>	<b>241</b>	<b>43.0</b>	31 290	5.1
>10 per day	<b>526</b>	<b>33.4</b>	<b>520</b>	<b>29.4</b>	<b>179</b>	<b>34.2</b>	<b>181</b>	<b>31.9</b>	<b>219</b>	<b>39.1</b>	13 542	2.2
Plurality of birth												
Singleton	1 646	98.2	1 826	98.3	543	98.4	590	99.2	582	98.5	606 136	98.2
Twins	30	1.8	31	1.7	9	1.6	5	1.4	9	1.5	11 222	1.8
Triplets	1	0.1	0	0.0	0	0.0	0	0.0	0	0.0	192	0.0
Socio-Economic Indexes for Areas (SEIFA): IRSAD score												
1	<b>474</b>	<b>29.2</b>	<b>658</b>	<b>36.3</b>	<b>153</b>	<b>28.9</b>	<b>191</b>	<b>33.3</b>	<b>184</b>	<b>32.6</b>	120 575	19.9
2	<b>388</b>	<b>24.0</b>	<b>394</b>	<b>21.7</b>	<b>115</b>	<b>12.7</b>	<b>112</b>	<b>19.5</b>	<b>115</b>	<b>20.4</b>	135 971	22.4
3	<b>346</b>	<b>21.4</b>	<b>463</b>	<b>25.5</b>	<b>134</b>	<b>25.3</b>	<b>108</b>	<b>18.2</b>	<b>141</b>	<b>25.0</b>	109 653	18.1
4	<b>310</b>	<b>19.2</b>	<b>218</b>	<b>12.0</b>	<b>94</b>	<b>17.7</b>	<b>96</b>	<b>16.7</b>	<b>92</b>	<b>16.3</b>	119 909	19.8
5	<b>101</b>	<b>6.2</b>	<b>81</b>	<b>4.5</b>	<b>34</b>	<b>6.4</b>	<b>67</b>	<b>11.7</b>	<b>33</b>	<b>5.8</b>	119 980	19.8

N.B.: A low SEIFA: IRSAD score indicates greater disadvantage and lack of advantage and a high score indicates a relative lack of disadvantage and greater advantage (Australian Bureau of Statistics, 2011). For the purpose of this study, the SEIFA was divided into quintiles (i.e., five equal groups). The bold numbers are statistically significant ( $p<0.05$ ). Cell numbers may not add to totals where there is missing data.

As presented in table 4.3, a higher percentage is noted in the administration of general anaesthetic and incident of fetal distress among pregnant women with substance use disorders compared to pregnant women without substance use disorders. Also, a higher percentage of pregnant women with substance use disorders were transferred after delivery compared to women without substance use disorders.

Table 4. 3: Obstetric characteristic of births to women with or without a substance use disorder-related ICD-10-AM code, n=622, 640 (univariable association)

<b>Obstetric characteristic</b>	<b>Opioids</b>		<b>Cannabis</b>		<b>Stimulants</b>		<b>Alcohol</b>		<b>Polysubstance</b>		<b>Non- substance users</b>	
	<b>n = 1677</b>		<b>n = 1856</b>		<b>n = 552</b>		<b>n = 595</b>		<b>n = 591</b>		<b>n = 618,571</b>	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Previous pregnancy >20 weeks gestation	<b>1 209</b>	<b>72.2</b>	<b>1 054</b>	<b>56.8</b>	<b>390</b>	<b>70.8</b>	<b>376</b>	<b>63.2</b>	<b>403</b>	<b>68.2</b>	321 572	52.0
Type of delivery												
Normal vaginal	<b>980</b>	<b>58.4</b>	<b>1 250</b>	<b>82.0</b>	<b>347</b>	<b>62.9</b>	<b>351</b>	<b>59.0</b>	<b>373</b>	<b>63.1</b>	338 185	54.7
Forceps	<b>50</b>	<b>3.0</b>	<b>48</b>	<b>2.6</b>	<b>19</b>	<b>3.4</b>	<b>23</b>	<b>3.8</b>	<b>20</b>	<b>3.4</b>	28 749	4.7
Vacuum extraction	<b>75</b>	<b>4.5</b>	<b>79</b>	<b>4.3</b>	<b>19</b>	<b>3.4</b>	<b>31</b>	<b>5.2</b>	<b>22</b>	<b>3.7</b>	46 380	7.5
Vaginal breech	<b>28</b>	<b>1.7</b>	<b>19</b>	<b>1.0</b>	<b>4</b>	<b>0.7</b>	<b>6</b>	<b>1.0</b>	<b>9</b>	<b>1.5</b>	2 679	0.4
Caesarean section	<b>543</b>	<b>32.4</b>	<b>460</b>	<b>24.8</b>	<b>163</b>	<b>29.5</b>	<b>184</b>	<b>30.9</b>	<b>167</b>	<b>28.3</b>	202 450	32.7
Pre-eclampsia	<b>25</b>	<b>1.5</b>	<b>33</b>	<b>1.8</b>	<b>9</b>	<b>1.6</b>	<b>8</b>	<b>1.3</b>	<b>8</b>	<b>1.4</b>	11 590	1.9
Gestational hypertension	<b>42</b>	<b>2.5</b>	<b>35</b>	<b>1.9</b>	<b>15</b>	<b>2.7</b>	<b>24</b>	<b>4.0</b>	<b>13</b>	<b>2.2</b>	25 239	4.1
Chronic/pre-existing hypertension	<b>11</b>	<b>0.7</b>	<b>6</b>	<b>0.3</b>	<b>4</b>	<b>0.7</b>	<b>4</b>	<b>0.7</b>	<b>1</b>	<b>0.2</b>	5 283	0.9
Chronic/ pre-existing diabetes	<b>11</b>	<b>0.7</b>	<b>17</b>	<b>1.0</b>	<b>5</b>	<b>1.1</b>	<b>9</b>	<b>1.7</b>	<b>4</b>	<b>0.8</b>	5 122	0.9
Gestational diabetes	<b>45</b>	<b>2.9</b>	<b>54</b>	<b>3.2</b>	<b>15</b>	<b>3.3</b>	<b>31</b>	<b>5.7</b>	<b>31</b>	<b>2.9</b>	36 998	6.8
Analgesia for labour												
Nitrous oxide	<b>785</b>	<b>56.7</b>	<b>1 018</b>	<b>62.0</b>	<b>227</b>	<b>57.6</b>	<b>305</b>	<b>60.8</b>	<b>305</b>	<b>59.1</b>	268 843	53.6

Systemic opioids	270	19.5	<b>438</b>	<b>26.7</b>	102	21.2	<b>125</b>	<b>24.9</b>	<b>114</b>	<b>22.2</b>	92 146	18.4
Spinal	13	0.9	7	0.4	2	0.4	4	0.8	2	0.4	3 581	0.7
Epidural/caudal	<b>324</b>	<b>23.4</b>	<b>324</b>	<b>19.8</b>	<b>115</b>	<b>23.9</b>	<b>137</b>	<b>27.3</b>	125	24.2	157 878	31.5
Anaesthesia for delivery												
Local to perineum	<b>217</b>	<b>12.9</b>	<b>338</b>	<b>18.2</b>	<b>69</b>	<b>12.5</b>	<b>84</b>	<b>14.1</b>	<b>77</b>	<b>13.0</b>	162 834	26.3
Pudendal	<b>10</b>	<b>0.6</b>	<b>11</b>	<b>0.6</b>	<b>2</b>	<b>0.4</b>	<b>3</b>	<b>0.5</b>	<b>3</b>	<b>0.5</b>	5 269	0.9
General anaesthetic	<b>187</b>	<b>11.2</b>	<b>148</b>	<b>8.0</b>	<b>66</b>	<b>12.0</b>	<b>57</b>	<b>9.6</b>	<b>64</b>	<b>10.8</b>	23 163	3.7
Main indication for Caesarean section												
Failure to progress	<b>85</b>	<b>3.7</b>	<b>69</b>	<b>3.7</b>	<b>27</b>	<b>4.9</b>	<b>30</b>	<b>5.0</b>	<b>28</b>	<b>4.7</b>	38 109	6.2
Fetal distress	<b>123</b>	<b>7.3</b>	<b>138</b>	<b>7.4</b>	<b>33</b>	<b>6.0</b>	<b>45</b>	<b>7.6</b>	<b>48</b>	<b>8.1</b>	26 460	4.3
Post-partum haemorrhage requiring blood transfusion	32	1.9	34	1.8	10	1.8	<b>12</b>	<b>2.0</b>	<b>11</b>	<b>1.9</b>	8 175	1.3
Antenatal care attendance	<b>1 572</b>	<b>94.1</b>	<b>1 778</b>	<b>96.1</b>	<b>505</b>	<b>92.2</b>	<b>564</b>	<b>95.3</b>	<b>550</b>	93.5	612 084	99.1
Mother's discharge status												
Discharged	<b>1 609</b>	<b>96.0</b>	<b>1 788</b>	<b>96.3</b>	<b>528</b>	<b>905.7</b>	<b>567</b>	<b>95.3</b>	<b>558</b>	<b>94.4</b>	607 250	98.2
Transferred	<b>66</b>	<b>4.0</b>	<b>67</b>	<b>3.6</b>	<b>21</b>	<b>3.8</b>	<b>26</b>	<b>4.4</b>	<b>31</b>	<b>5.2</b>	11 001	1.8

N.B. The bold numbers are statistically significant ( $p < 0.05$ ). Cell numbers may not add to totals where there is missing data

#### **4.5.1 Neonatal outcomes of infants born to women with substance use disorders in pregnancy compared to the infants born to women without substance use disorders**

The results of the multilevel logistic regression examining the neonatal outcomes and maternal substance use disorders are presented in Table 4.4. The information in this table reveals that neonates of women with opioids-relates substance use disorder in pregnancy are more likely to be of preterm birth (adjusted OR (AOR) 3.2, 95% CI 2.8, 3.7), low birthweight (AOR 3.0, 95% CI 2.6, 3.5), at a higher risk of being admitted to a special care nursery or neonatal intensive care unit (AOR 10.0, 95% CI 8.8, 11.3). Opioid-exposed neonates are also more likely to be born with low APGAR Score <7 at 1 (AOR 1.7, 95% CI 1.4,2.0) and 5 (AOR 2.5, 95% CI 1.9, 3.2) minutes respectively compared to neonates of pregnant women without substance use disorders. Similarly, exposure to cannabis places neonates at greater risk of being born premature (AOR 2.6, 95% CI 2.2, 3.0), with low birthweight (AOR 3.6, 95% CI 3.0, 4.1) and admitted to special care nursery or neonatal intensive care unit (AOR 3.6, 95% CI 3.3, 4.1). Stimulants, alcohol and polysubstance use disorders in pregnancy were significantly associated with low APGAR score, low birthweight and admission to special care nursery or neonatal intensive care unit. Only alcohol and polysubstance use disorders in pregnancy are significantly associated with stillbirth (Table 4.4).

The findings of the sensitivity analysis across the three periods for substance use were consistent. Slight variations for some substances (stimulants, alcohol and polysubstance), were noted, explained by the variation in time of use. For instance, the associations of opioids use disorder in pregnancy and neonatal outcomes, including preterm birth, low Apgar score, low birthweight and admission to neonatal intensive care unit, are consistent. Likewise, findings demonstrated that cannabis use disorder is consistently associated with preterm birth, low birthweight and admission to the neonatal intensive care unit. However, the association of stimulants, alcohol and polysubstance use disorders in pregnancy with the neonatal outcomes slightly varied across the different durations of substance use in pregnancy.



Table 4. 4: Odds ratios, and 95% confidence intervals of neonatal outcomes of women with substance use ICD-10AM diagnosis during pregnancy, controlling for covariates

Substance use in pregnancy	Neonatal Outcomes						
	Preterm birth (gestational age <37 weeks)	Apgar score <7 at 1-minute	Apgar score <7 at 5-minute	Birth weight <2500g	Admission to Special Care Nursery or Neonatal Intensive Care	Stillbirth	Neonatal death
Cannabis (n = 1857)	<b>2.6(2.2-3.0)</b>	1.0(0.8-1.2)	<b>1.5(1.1-2.0)</b>	<b>3.6(3.0-4.1)</b>	<b>3.6(3.3-4.1)</b>	1.2(0.7-2.1)	1.3(0.6-3.0)
Opioids (n = 1677)	<b>3.2(2.8-3.7)</b>	<b>1.7(1.4-2.0)</b>	<b>2.5(1.9-3.2)</b>	<b>3.0(2.6-3.5)</b>	<b>10.0(8.8-11.3)</b>	1.4(0.9-2.4)	1.8(0.8-3.8)
Alcohol (n = 595)	<b>1.9(1.4-2.6)</b>	<b>2.3(1.7-3.0)</b>	<b>2.6(1.6-4.1)</b>	<b>3.1(2.3-4.2)</b>	<b>3.9(3.2-4.8)</b>	<b>2.3(1.2-4.6)</b>	1.5(0.4-6.2)
Stimulants (n = 552)	<b>1.5(1.0-2.4)</b>	<b>1.7(1.1-2.7)</b>	<b>1.9(1.0-3.6)</b>	1.5(1.0-2.3)	<b>6.2(5.0-7.7)</b>	1.7(0.8-4.0)	1.6(0.4-6.5)
Polysubstance (n=591)	<b>3.2(2.5-4.2)</b>	1.2(0.9-1.7)	<b>1.8(1.1-2.9)</b>	<b>3.5(2.7-4.5)</b>	<b>6.9(5.7-8.5)</b>	<b>2.0(1.0-4.1)</b>	1.4(0.3-5.6)

N.B. The bold numbers are statistically significant ( $p < 0.05$ ). Values are adjusted odds ratios (AOR) with 95% confidence interval (CI).

- The reference group for all the substance groups reflected in the table is non-substance users (n= 618,571).
- When cannabis was the exposure variable, the model was adjusted for other substances, namely: opioids ICD-10-AM yes/no; stimulants ICD-10-AM yes/no; alcohol ICD-10-AM yes/no) and other drugs (sedatives or hypnotics ICD-10A-M yes/no, hallucinogens ICD-10-AM yes/no, volatile solvents ICD-10-AM yes/no, multiple drug use ICD-10-AM yes/no). A similar approach was followed in model building for opioids, alcohol, stimulants and polysubstance exposure.

## 4.6 Discussion

This study examined the associations between maternal substance use disorders and neonatal outcomes using an Australian linked dataset over a 10-year period. Findings demonstrated significant associations between substance use disorders in pregnancy and an increased risk

of adverse outcomes of neonates including preterm birth, low birthweight, low APGAR score, admission to neonatal to special care nursery or neonatal intensive care unit, and stillbirth. Compared with the non-substance-using women, a high percentage of pregnant women who use substances in pregnancy were heavy smokers (>10 per day).

The findings of this study suggest that a higher percentage of Indigenous women suffered substance use disorders during pregnancy compared to non-Indigenous women. Also, substance use is more prevalent among pregnant women residing in LGAs with relatively low SEIFA: IRSAD scores indicating greater disadvantage and lack of advantages. These observations are consistent with the findings of the previous studies (Abdel-Latif et al., 2013; Hayatbakhsh et al., 2012) and emphasise the influence/impact of sociodemographic variables, particularly ethnicity and individual socioeconomic status, on health behaviours. The findings highlight the importance of understanding pregnant women's unique circumstances, especially the probable impact of sociodemographic status on pregnancy and neonatal outcomes. There should be more collaborative effort between services to avoid disjunct in the care process across the life course. This would further increase continuity of care whilst enabling cost-effective access to culturally sensitive support through existing services. Also, early screening by healthcare professionals in antenatal settings using validated screening tools and access to timely and targeted antenatal care for all women with substance use disorders in pregnancy is essential.

A marked increase was noted in the incident of fetal distress among women with substance use disorders in pregnancy compared to non-substance-using women. Also, there was a significant increase in the administration of general anaesthetic to women who use substances in pregnancy. This may in-part be due to high rates of fetal distress leading to emergency Caesarean section (Zgheib et al., 2017). Substance-exposed pregnancies are often treated as high-risk pregnancies and the exposed foetus can present with conditions such as fetal distress during delivery (Eldridge et al., 2018). The management of intrapartum fetal distress in the Western world including Australia, USA, Canada and New Zealand involves the improvement of fetal oxygenation in expectation of an emergency Caesarean section or vaginally assisted birth (Bullens et al., 2016). Given that fetal distress is associated with increased rates of severe neonatal and maternal morbidity (Bullens et al., 2016; Buultjens et al., 2013), more studies are required to establish the relationship between substance use in pregnancy and fetal distress.

Results show that cannabis use disorder is the most common in pregnancy, followed by opioids and alcohol use disorders. Our study found a significant association between maternal cannabis use and preterm birth, low birthweight and admission to special care nursery. Maternal cannabis use is concerning given the growing evidence of risk, i.e, adverse effects on neonatal outcomes (Corsi et al., 2019; Hayatbakhsh et al., 2012; Oh et al., 2017). The main psychoactive ingredient of cannabis, Delta-9-tetrahydrocannabinol (THC), has been found to rapidly cross the placenta membrane and binds to cannabinoid (CB) receptors of the fetal endogenous cannabinoid signalling system (ECSS) and alters neurodevelopment which could result in neonatal morbidity (Metz et al., 2017). With increasing cannabis use in pregnancy, there is a need for standardised routine screening of all pregnant women accompanied by education of adverse maternal and neonatal health outcomes across pregnancy and birth.

Maternal opioid use is significantly associated with adverse neonatal outcomes including preterm birth, low APGAR score at 1- and 5-minutes, low gestational age and admission to neonatal intensive care units. Even after adjusting for smoking, the admission rate of opioid exposed neonates to special care nursery or neonatal intensive care unit is ten times higher than that of non-exposed neonates. Admission to NICU or special care nursery observed in the study could be for neonatal abstinence syndrome (NAS) assessment and/or for NAS pharmacotherapy for infants who need it. Exposure of neonates to opioids in utero is significantly associated with neonatal abstinence syndrome, which is a withdrawal syndrome characterized by tremors, irritability, poor feeding, respiratory distress, and seizures, all of which develop shortly after birth (Ryan et al., 2019; Winkelman et al., 2018). Neonates with neonatal abstinence syndrome have longer hospital stays, higher rates of readmission, and are more likely than nonopioid-exposed neonates to require care in the neonatal intensive care unit for management of their symptoms (Eldridge et al., 2018; McCarthy et al., 2017; Winkelman et al., 2018). Moreover, opioids use can result in fetal hypoxia – a condition that causes reduction in oxygen levels to fetal tissues and vital organs owing to decreased blood flow to the placenta (Ayres-de-Campos, 2017), and consequently, stillbirth and neonatal death. This highlights the importance of early detection, and intervention such as methadone or buprenorphine maintenance therapy coupled with appropriate counselling, family therapy, nutritional education, and other medical and psychosocial supports for pregnant women using opioids (Reddy et al., 2017).

The findings of this study are largely consistent with those reported in the earlier research (Burns et al., 2006a; O’Leary et al., 2009; Srikartika & O’Leary, 2015). Some slight differences that we observed could be attributed to a range of factors, for instance, data of different periods, our relatively good quality data of recent time, multilevel regression that previous studies did not use, etc. Also, in some previous studies, the duration of substance use was not clearly outlined (Burns et al., 2006a, 2006b).

Although studies have failed to establish a safe (or unsafe) dose, timing, and frequency of alcohol consumption in pregnancy (Burns et al., 2016), evidence is strong that alcohol consumption during pregnancy increases the risk of several deleterious consequences for both mother and baby (Forray, 2016; Popova et al., 2017). Therefore, not drinking is recommended as the safest option for pregnant women (Burns et al., 2016; National Health and Medical Research Council, 2009) and this recommendation deserves to be promoted vigorously through effective public health interventions.

Exposure to stimulants in utero may result in a low APGAR score, low birthweight and admission to NICU even after controlling for covariates such as maternal age and other substance use disorders. Neonates with prenatal exposure to stimulants could present with withdrawal symptoms including jitteriness, drowsiness, respiratory distress and most likely need care at the neonatal intensive care unit (Smid et al., 2019). Currently, there is no approved pharmacotherapy for stimulant-use disorder especially in pregnancy; however psychosocial treatments such as motivational incentives – a behaviour therapy-based intervention that provides tangible incentives to patients in treatment for substance use disorders based on objective indicators of drug abstinence – appear to be a useful treatment (Smid et al., 2019).

Our results for polysubstance use in pregnancy are mixed – elevated for some outcomes and insignificant for others. These results are likely to be influenced by the frequency of use and other residual confounders. However, it is reasonable to assert that polysubstance use has higher adverse effects on the wellbeing of women and their neonates. Improved access to healthcare and assistance with appropriate treatment for addiction are crucial for pregnant women with polysubstance use disorder (Ordean et al., 2017).

In conclusion, the findings of this study offer up-to-date information that suggests substance use in pregnancy is associated with several deleterious effects in neonates, namely preterm birth, low birthweight, low APGAR score stillbirth and neonatal death. Findings also suggest

that the neonates of women who use substances in pregnancy are at higher risk of admission to neonatal to special care nursery or neonatal intensive care unit. These adverse health effects can be avoided if effective prevention and well-timed medical care or intervention are offered to the target group. Although a limited set of treatment options is currently available for women who use substances in pregnancy, early identification and triage, including multidisciplinary/interdisciplinary care may reduce the burden substantially.

#### **4.7 Strength and Limitation**

In this study, we were able to use linked data to answer research questions that require large samples of a hard-to-reach population and generate evidence that has substantial public health importance. Although the utility of data linkage may be compromised by sub-optimal or linkage errors where records cannot be linked or are linked together incorrectly (Harron et al., 2017), a recent study suggested high accuracy and efficiency of the national linkage in Australia (Boyd et al., 2015). In addition, unlike previous studies, this study took into consideration geographical variability as a confounder and used multilevel regression to address the group-level confounding. We also conducted sensitivity test.

The study also has some limitations. There is a possibility of ICD-10-AM misclassification and an increased likelihood of substance use not being identified or recorded, especially when there is no negative pregnancy outcome, which could underestimate the prevalence of substance use and associated adverse health outcomes. However, studies have reported high sensitivity and positive predictive value (PPV) of ICD-10-AM administrative data in Australia (Henderson et al., 2006; Stavrou et al., 2012). Another limitation of this study is that the frequency and quantity of substance use during pregnancy could not be determined using ICD-10-AM diagnostic codes. Although the regression models were adjusted for several confounding variables, some important covariates such as maternal body mass index (BMI) and nutritional status, duration of pregnancy and other psychosocial issues like domestic violence and homelessness were missing in the datasets. ‘Ecological fallacy’ is another limitation, as not everybody living an LGA are similar although they have the same SEIFA: IRSAD score. Finally, non-substance-using group was defined by a limited set of substances. It is possible that a small subset of women was using other (mostly uncommon) drugs and was still identified as non-substance-using women. However, this subset is unlikely to bring any significant change in the results.

#### **4.8 Acknowledgements**

We would like to express our genuine appreciation and thanks to the data custodians for granting us permission to use their datasets. Special thanks to Dr Barbara Gleeson for helping us with supplying information and reading materials regarding the Australian Modification of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, (ICD-10-AM) codes. The first author is supported by La Trobe University Postgraduate Research Scholarship for her doctoral research.

#### **4.9 Declaration of Interest Statement**

None declared.

## **Chapter 5: Barriers to Screening Pregnant Women for Alcohol or Other Drugs: A Narrative Synthesis**

### **5.1 Preface**

There is evidence in the first two chapters that substance use in pregnancy adversely impact pregnancy and neonatal outcomes. Therefore, early detection of maternal substance use during routine antenatal screening and referral of pregnant women who use substances for necessary pharmacotherapy and psychosocial support are crucial to reduce harms of mother-infant dyad.

This study aims to identify barriers in antenatal care settings to screening pregnant women for alcohol or other drugs, from the perspectives of healthcare professionals. The systematic review is conducted to inform the empirical qualitative study presented in the next chapter.

This chapter presents a peer-reviewed published systematic review. The pre-print of the manuscript as originally submitted are included in this document. Readers are encouraged to view the final peer-reviewed manuscripts in the journal of publication:

Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2019).

Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis. *Women and Birth*, 32(6), 479-486.

## 5.2 Abstract

**Background:** Maternal alcohol or other drug use during pregnancy is associated with a range of adverse health outcomes for mothers and their unborn child. The antenatal period presents an opportunity for health professionals to offer routine screening for alcohol or other drugs, to then provide intervention and referral for treatment and/or specialised support services. However, literature indicates that limited screening practices currently exist in maternity care settings. **Aim:** To identify barriers to screening pregnant women for alcohol or other drugs in maternity care settings, from the perspectives of healthcare professionals. **Methods:** A comprehensive literature search was conducted in October 2017 to identify relevant studies. Seven databases that index health and social sciences literature, and google scholar, were searched. Eligible articles were subjected to critical appraisal. Extracted data from the eligible studies were synthesised using narrative synthesis. **Findings:** Nine studies were eligible for this review. The review identified seven key barriers to screening for alcohol or other drugs in pregnancy, *namely* competing priorities and time constraint; lack of adequate screening skills and clear protocol; relationship between healthcare providers and pregnant women; healthcare providers' perceptions; under-reporting or none/false disclosure; inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy; and concerns about guilt and anxiety. **Conclusions:** The narrative review revealed a range of barriers to screening for alcohol or other drugs in pregnancy. Further research in minimising the barriers is required to establish women-centred, evidence-base screening practices.

**Keywords:** Alcohol, drugs, screening, pregnant women, healthcare providers, barriers.



### 5.3 Statement of Significance

**Problem:** Alcohol or other drug use during pregnancy is a serious public health concern due to adverse impacts on the developing fetus and maternal health. **What is already known:** Health professionals play a major role in the routine screening, counselling, and referral of substance-using pregnant women for treatment and/or specialised support services. However, literature suggests that many do not prioritise screening in antenatal care. **What this paper adds:** To our knowledge, this is the first review that systematically summarises studies on the barriers to screening women during pregnancy regarding alcohol or other drug use in maternity care settings from the healthcare providers' perspectives.

### 5.3 Background

Maternal alcohol or other drug use is associated with adverse neonatal/child outcomes, including fetal alcohol syndrome, and an increased risk of spontaneous abortion, stillbirth, low birthweight, prematurity, congenital anomalies (Abdel-Latif et al., 2007; Burns et al., 2006b). Further, there is a potential lifelong biopsychosocial effect on infants of mothers who use alcohol or other drugs in pregnancy (Abdel-Latif et al., 2007; Burns et al., 2006a; World Health Organization, 2014). The use of alcohol or other drugs can also impair a woman's role as a parent, partner or spouse, and is correlated with domestic violence, thus can create an unsafe environment for the physical, mental and emotional development of children (World Health Organization, 2014). As the evidence suggests, in Australia no statistically significant difference was identified in the proportion of pregnant women abstaining from alcohol between 2013 (53%) and 2016 (56%) (Australian Institute of Health and Welfare, 2016). The recent estimate shows about 1 in 4 pregnant women consumed a similar amount of alcohol before and after they were aware of their pregnancy (Australian Institute of Health and Welfare, 2016). Estimates from the National Survey on Drug Use and Health – USA show among women who are pregnant, 16.4 % continue to smoke; 11.6 % and 4.5 %, respectively, are current alcohol and binge drinkers; and 5.1 % use illegal drug(s) (Substance Abuse and Mental Health Services Administration, 2017). Although some women stop using these substances during pregnancy, many continue to use (Australian Institute of Health and Welfare, 2017b).

In recent years, clinical practice guidelines have been developed to facilitate early detection of alcohol or other drug use, and provide interventions and specialist support (Hussein Rassool & Oyefeso, 1993; World Health Organization, 2014). To date, administration of brief screening tools (e.g., Drug Abuse Screening Test 10, and Alcohol Use Disorders Identification Test – Consumption (AUDIT-C)) have been considered the most efficient method to detect alcohol or other drug use (Morse et al., 2000). To this effect, it is considered best-practice to screen every pregnant woman routinely, using a recommended validated tool such as AUDIT-C (National Drug & Alcohol Research Centre, 2016; World Health Organization, 2010), and refer for treatment and/or specialised support services afterward – if deemed necessary.

Screening and interventions to reduce the risks of alcohol or other drug exposed pregnancy can be initiated during routine antenatal care (National Drug & Alcohol Research Centre,

2016). Although health professionals in maternity care settings can play a major role in screening, counselling and referral to specialised care, literature shows that many do not make this part of their antenatal consultation practices (Crawford-Williams et al., 2015; McLeod et al., 2003; Wangberg, 2015). While existing research has identified obstacles that women who use alcohol or other drugs in pregnancy encounter when negotiating antenatal care (Stone, 2015b), little research has been conducted from the perspectives of primary care workers (e.g., midwives who provide clinical care and support to pregnant women). Therefore, this review aims to identify barriers to screening pregnant women for alcohol or other drugs in maternity care settings, from the perspectives of healthcare professionals.

## **5.4 Methods**

A comprehensive literature search was conducted in October 2017 to identify studies that reported on barriers to routine screening pregnant women for alcohol or other drugs in primary care settings, from the perspectives of healthcare professionals. Studies were identified by searching comprehensive electronic databases, CINAHL, Cochrane Library, MEDLINE Ovid, PsycARTICLES, EMBASE Ovid, PsycINFO, Web of Science and Google Scholar using different combinations of keywords. These databases were selected because they comprise extensive maternity related literature. Population, Intervention, Comparison and Outcomes (PICO) approach (Liberati et al., 2009) was used to generate groups of medical subject heading (MeSH) search terms and keywords: (1) population: primary healthcare professionals, (2) intervention: alcohol or other drug use in pregnancy, (3) comparison: not applicable, (4) outcomes: barriers to screening for alcohol or other drugs in pregnancy. A further search was conducted by scanning the reference lists of all relevant articles. The keywords used are presented in Table 5.1.

Of note, due to the scarcity of studies addressing the aim of this literature review and to maximise our chances of retrieving all relevant articles, year of publication limitation was not imposed. Boolean operators “OR”, “AND”, and “NOT” were used to include, restrict, and eliminate search terms, respectively.

Table 5. 1: Search strategy for the review

Population		Exposure	Outcomes
Concept 1	Concept 2		
<ul style="list-style-type: none"> <li>• Health professionals</li> <li>• Midwives/midw*</li> <li>• Health care workers</li> <li>• Nurses</li> <li>• Doctors</li> <li>• General practitioners</li> <li>• Obstetric health care workers/staff</li> <li>• Health care providers</li> <li>• Obstetrician/Obste*</li> <li>• Social workers</li> </ul>	<ul style="list-style-type: none"> <li>• Pregnant wom?n</li> <li>• Pregnancy Expectant</li> <li>• Mothers</li> <li>• Expectant mother*</li> <li>• Expectant wom?n</li> <li>• Antenatal</li> <li>• Perinatal</li> <li>• Prenatal</li> </ul>	<ul style="list-style-type: none"> <li>• Substance-related disorders</li> <li>• Alcohol-related disorders</li> <li>• Alcoholism</li> <li>• Alcohol</li> <li>• Marijuana</li> <li>• Cannabis</li> <li>• Heroin</li> <li>• Cocaine</li> <li>• Stimulants</li> <li>• Illicit drug abuse/use/misuse/addicts/abus*</li> <li>• Drug abuse</li> <li>• Pregnant drug users</li> </ul>	<ul style="list-style-type: none"> <li>• Barriers to screening</li> <li>• Screening for alcohol</li> <li>• Screening for drug use</li> <li>• Interventions for alcohol or other drug use</li> <li>• Management of alcohol or other drug use</li> <li>• Perinatal health care delivery</li> <li>• Antenatal health care practices</li> <li>• Primary health care delivery</li> <li>• Perception</li> <li>• Stigma/stigm*</li> </ul>

(\* or ? for truncation)

#### 5.4.1 Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) articles that report the results of an empirical study; (2) articles written in English and clearly address the aim of this study; (3) studies focusing on health care providers' perceived barriers to screening for alcohol or other drug use in pregnancy.

Conversely, the excluded studies were those with a primary focus on healthcare providers' perceived barriers to drug treatment in pregnancy such as methadone and buprenorphine; studies focussing on health care professionals' perceived barriers to screening and interventions for non-pregnant women who use alcohol or other drugs. Further, studies were excluded if they had a primary focus on medical students, smoking or tobacco use in pregnancy, and those conducted in developing countries. This is due to the availability and accessibility of antenatal care in these countries that differ socially, culturally, politically and historically from developed countries such as Australia, United States of America, and

Canada. Finally, books, book chapters, review articles and commentaries, as well as abstracts with no full-text were also excluded.

#### 5.4.2 Study selection and quality appraisal

Two authors (HO and MB) independently screened titles and abstracts of all retrieved studies to assess for eligibility. Full-text articles were retrieved if eligibility could not be determined from the title or abstract (Figure 5.1). Due to a relatively small number of documents found on this topic, the authors decided to include both qualitative and quantitative studies that address the aim of the review. Narrative synthesis was used as a method of synthesizing findings of individual studies. Narrative synthesis can synthesise findings from both qualitative and quantitative method studies (Barnett-Page & Thomas, 2009; Popay et al., 2006).

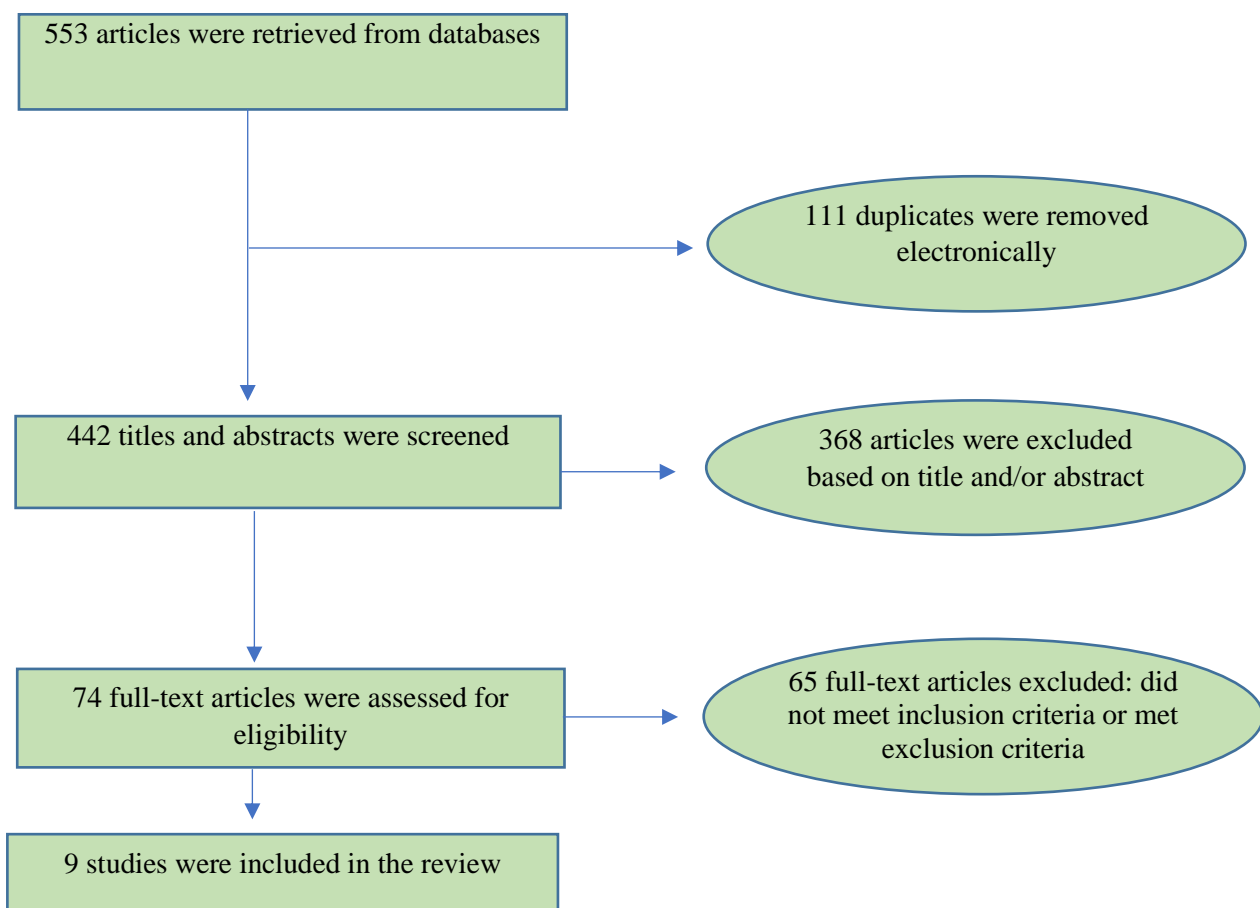


Figure 5. 1: Flow diagram of the study selection

Quality appraisal of the eligible studies was conducted using the Mixed Methods Appraisal Tool 2011 Version (MMAT).(Pluye et al., 2011) This tool has been designed to assess the methodological quality of qualitative, quantitative and mixed-design studies for systematic mixed study reviews.(Pluye et al., 2009; Pluye et al., 2011) It consists of two screening criteria applied to all study types, and four other criteria applied to qualitative and quantitative studies, and three criteria for mixed methods studies. For qualitative and quantitative studies, the score is computed by the number of criteria met. For mixed methods research studies, the premise is that the overall quality of a combination cannot exceed the quality of its weakest component. Thus, the overall quality score is the lowest score of the study components. The score is 25% when qualitative=1 or quantitative=1 or mixed method=0; 50% when qualitative=2 or quantitative=2 or mixed method=1; 75% when qualitative=3 or quantitative=3 or mixed method=2; and it is 100% when qualitative=4 and quantitative=4 and mixed method=3. Details of grading criteria are shown in Table 5.2.

Table 5. 2: Mixed Methods Appraisal Tool (MMAT) – Version 2011 indicators

Screening questions for all study types	Qualitative study	Quantitative descriptive study	Mixed methods study
<ul style="list-style-type: none"> <li>• Are there clear qualitative or quantitative or mixed methods research questions or objectives?</li> <li>• Does the collected data address the research questions?</li> </ul>	<ul style="list-style-type: none"> <li>• The sources of collected data relevant to address the research question.</li> <li>• The process for data analysing is relevant to address the research question.</li> <li>• Appropriate consideration given to how findings relate to the context of the study.</li> </ul>	<ul style="list-style-type: none"> <li>• The sampling strategy is relevant to address the research question.</li> <li>• The sample represented the population under study.</li> <li>• Measurements are appropriate (clear origin or validity is known, or standard instrument).</li> <li>• Acceptable response rate (60% or above).</li> </ul>	<ul style="list-style-type: none"> <li>• The mixed methods research design is relevant to address the qualitative and quantitative research questions.</li> <li>• The integration of qualitative and quantitative data is relevant to address the research question.</li> <li>• Appropriate consideration is given to the limitations associated with this integration.</li> </ul>

- 
- Appropriate consideration given to how findings relate to researchers' influence.
- 

Note: studies were of acceptable quality when the first two screening questions for all study types and at least one of the other indicators were met. This table is adapted from Pluye et al. (2011).

### **5.4.3 Data extraction and analysis**

Two authors (HO, MB) collected data and assessed the appropriateness of the studies. All citations were independently reviewed by HO and MB. Titles and abstracts were screened during October 2017 and full texts were obtained for all articles that met the criteria. HO and MB independently assessed the research articles (November 2017) for potential selection, performance, and attrition bias.

The analysis process involved answering the objectives of this review. Given the heterogeneity of the studies in terms of methods, sampling, design and measures, a narrative synthesis (Barnett-Page & Thomas, 2009; Popay et al., 2006) was adopted to synthesise and summarise extracted data from the eligible studies.

## **5.5 Results**

### **5.5.1 Description of the eligible studies**

A total of 553 articles were identified during the search process. After removing the duplicates (n=111), titles and abstracts were screened for 442 documents. Finally, 74 full texts were reviewed., of which nine publications met the inclusion criteria of this review (Figure 5.1). As outlined in Table 5.3, most of the studies were of qualitative design (n=6) in which semi-structured interview, in-depth interview and focus group discussions were used for data collection, and thematic analysis was performed for data synthesis. Two studies were of quantitative design in which data were collected using questionnaire and the results were presented in percentages. Two studies were conducted in the United States of America (Holland et al., 2016a; Taylor et al., 2007), two in Scotland (Doi et al., 2014; Doi et al., 2015)

and one each from Australia (France et al., 2010), France (Gerardin et al., 2011), the Netherlands (van der Wulp et al., 2013), Norway (Wangberg, 2015), and New Zealand (Wouldes, 2009). The two studies from Scotland outlined the findings of a larger study – but described two different aspects.

The participants of the studies included various healthcare professionals in maternity settings including midwives, obstetricians, paediatricians, nurses and general practitioners (Table 5.3). Five studies focused on alcohol screening and brief interventions (Doi et al., 2014; Doi et al., 2015; France et al., 2010; van der Wulp et al., 2013; Wangberg, 2015), one aimed to evaluate practices of detection and care for pregnant women who use cannabis (Gerardin et al., 2011), one focused on perinatal marijuana use (Holland et al., 2016a) and the remaining two studies focused on maternal alcohol or other drug use (Taylor et al., 2007; Wouldes, 2009).



Table 5 3: Key findings of the studies reporting barriers to screening of pregnant women for alcohol or other drugs, from the perspective of primary healthcare professionals.

<b>Authors</b>	<b>Country</b>	<b>Study aims</b>	<b>Study design</b>	<b>Sample size</b>	<b>Barriers and conclusions</b>	<b>MMA T score</b>
Doi et al (2014)	Scotland	To explore how midwives' skills, knowledge and attitudes to alcohol consumption during pregnancy influence their practice.	Qualitative study.  Thematic analysis.	21 healthcare workers:  15 midwives,  6 midwifery team leaders.	<ul style="list-style-type: none"> <li>• Competing workload priorities.</li> <li>• Difficulty in converting different types of alcoholic drinks into standard unit.</li> <li>• Social stigmatisation of alcohol use among pregnant women.</li> <li>• Insufficient rapport between the health care providers and the pregnant women.</li> </ul>	75%
Doi et al (2015)	Scotland	To use realist evaluation to describe how and in what circumstances screening and alcohol brief interventions work in routine antenatal care.	Qualitative study.  Thematic analysis.	36 participants:  4 policy implementation officers,  17 pregnant women, and 15 midwives.	<ul style="list-style-type: none"> <li>• Inadequate rapport with pregnant women at the first antenatal consultation.</li> <li>• Competing priorities at the first antenatal appointment due to time constraints.</li> </ul>	75%
France et al (2010)	Australia	To identify the barriers that health professionals encounter in addressing alcohol use during pregnancy and to elucidate the	Qualitative study.  Thematic analysis.	53 health professionals:  17 aboriginal health workers,  10 allied health professionals,	<ul style="list-style-type: none"> <li>• Perception that most women do not drink much alcohol during pregnancy.</li> <li>• Perception that pregnant women know not to drink.</li> <li>• Perception that women who drink at high-risk levels during pregnancy have other contextual issues that need to be addressed.</li> </ul>	100%

		strategies they use to overcome them.		14 nurses, and 12 physicians (7 general practitioners, 2 obstetricians, and 3 paediatricians)	<ul style="list-style-type: none"> <li>• Competing priorities during antenatal consultation.</li> <li>• Lack of time due to huge burden of consultation.</li> <li>• Perception that asking about alcohol could add to a woman's anxiety or guilt.</li> <li>• Perception that asking about alcohol could appear judgmental.</li> <li>• Lack of skills and resources to support women.</li> </ul>	
Gerardin et al (2011)	France	To evaluate practices of detection and care for pregnant women who use cannabis.	Quantitative study. Descriptive analysis.	382 healthcare professionals: 200 general practitioners, 55 gynaecologists 69 midwives, and 58 obstetricians.	<ul style="list-style-type: none"> <li>• Lack of information about the risks of cannabis use during pregnancy.</li> <li>• Lack of means to inform and take care of these women.</li> </ul>	75%
Holland et al (2016)	USA	To identify obstetric care providers' attitudes, beliefs and counselling practices regarding marijuana use during pregnancy.	Qualitative study. Thematic analysis.	51 obstetric care providers.	<ul style="list-style-type: none"> <li>• Perception that marijuana use is not dangerous as other illicit drug use in pregnancy.</li> <li>• Lack of definitive evidence regarding potential risks related to perinatal marijuana use.</li> <li>• Limited time to spend with substance-using pregnant women.</li> </ul>	75%

Taylor et al (2007)	USA	To identify effective strategies for influencing and improving screening and referral of pregnant women for violence and substance abuse (alcohol, drugs and tobacco).	Qualitative study.  Thematic analysis	8 physicians who practice obstetric care.	<ul style="list-style-type: none"> <li>• Difficulty in identifying, influencing behavioural change, and referring women who use alcohol or other drugs.</li> <li>• Presence of family members during prenatal visits.</li> <li>• Women's fear of reprisal from child protective services.</li> </ul>	75%
van der Wulp et al (2013)	Netherlands	To explore the advice Dutch midwives give and the information Dutch pregnant women and partners of pregnant women receive about alcohol consumption in pregnancy.	Qualitative study.  Content analysis.	10 midwives.	<ul style="list-style-type: none"> <li>• Lack of good screening skills.</li> <li>• Concern about confronting clients and obtaining truthful information about clients' alcohol use.</li> <li>• Inadequate skills and insufficient knowledge about the consequences of antenatal alcohol use.</li> </ul>	75%

Wangberg et al (2015)	Norway	To assess midwives' perceived barriers to current screening and brief intervention for alcohol use in pregnancy	Quantitative (A questionnaire with some open-ended questions on barriers to screening)  Descriptive analysis.	103 registered municipal midwives.	<ul style="list-style-type: none"> <li>• Low perceived competency on brief intervention.</li> <li>• Difficulty in discussing alcohol use with women of diverse ethnicity.</li> <li>• Time constraints.</li> <li>• Lack of organizational support.</li> </ul>	75%
Woulde et al (2009)	New Zealand	To identify potential barriers to screening and effectively managing the care of women who report alcohol, tobacco and other drug use.	Quantitative study.  Descriptive analysis.	241 health professionals: two-thirds were midwives who provided antenatal and other postnatal care to mothers and their babies.	<ul style="list-style-type: none"> <li>• Inadequate rapport with the women.</li> <li>• Perception about women's ethnicity, cultural or socio-economic background.</li> <li>• Lack of clear procedure in the clinical environment for managing women who use alcohol or other drugs.</li> <li>• Presence of a family member during the antenatal consultation.</li> </ul>	75%

### **5.5.2 Methodological quality of the eligible studies**

All nine studies were deemed of high quality. All of the studies answered the first two questions and fulfilled at least three quality criteria of MMAT. Of the six qualitative studies, one met all the criteria (100%) and the remaining studies met three (75%) of the four criteria. Of the three quantitative studies, all met three (75%) criteria (Table 5.3).

### **5.5.3 Barriers to screening pregnant women for alcohol or other drugs**

The nine studies included in this review examined research from seven countries, a total of 869 health professionals, surrounding barriers to screening women for alcohol or other drug use during pregnancy. Although the included papers differed in their approach to exploring the barriers to screening pregnant women, the findings were summarised in seven cluster themes: (i) competing priorities and time constraint; (ii) lack of adequate screening skills and clear protocol for managing women who use alcohol or other drugs in pregnancy; (iii) relationship between healthcare providers and pregnant women; (iv) healthcare providers' perceptions of alcohol or other drug use by pregnant women; (v) under-reporting or none/false disclosure; (vi) inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy; and (vii) concerns about guilt and anxiety.

#### ***5.5.3.1 Competing priorities and time constraint***

Competing priorities and time constraint were highlighted as barriers in five articles (Doi et al., 2014; Doi et al., 2015; France et al., 2010; Holland et al., 2016a; Wangberg, 2015). In four of the articles (Doi et al., 2014; Doi et al., 2015; France et al., 2010; Wangberg, 2015) the health care professionals indicated that due to competing workload priorities and time constraint during the antenatal visit, alcohol screening remained a low priority for them. Below is an illustrative quote from a health professional in an included study:

*“We’ve got to do domestic violence, alcohol use, smoking, you know and all the stuff. If somebody says I smoke then we have to give them all the literature, the DVD, arrange for referrals. So you can imagine, alcohol is only one of the aspects and sadly it is not the most important one because there is not a lot of evidence there that we have a lot of children who have fetal alcohol syndrome” (25, p7) (Doi et al., 2014).*

Another study on perinatal marijuana use found that providers often waived asking their clients about marijuana use and conserved time to address other issues thought more important (Holland et al., 2016a).

#### **5.5.3.2 *Lack of adequate skills and clear protocol for screening pregnant women who use alcohol or other drugs***

In six articles (France et al., 2010; Gerardin et al., 2011; Taylor et al., 2007; van der Wulp et al., 2013; Wangberg, 2015; Woulides, 2009) a lack of skills and clear protocol for screening women who use alcohol or other drugs in pregnancy were identified as barriers to screening. Two studies (Taylor et al., 2007; Woulides, 2009) found that health care professionals were reluctant to screen pregnant women for alcohol or other drug use due to inadequate skill or resources for ongoing management (Taylor et al., 2007; Woulides, 2009). In three studies (France et al., 2010; Gerardin et al., 2011; van der Wulp et al., 2013) a lack of clear protocol and resources to support women were described as the main barriers (France et al., 2010; Gerardin et al., 2011; van der Wulp et al., 2013). Below is an illustrative quote from a health professional in one of the studies:

*“Maybe it would be easier (to ask a client about their alcohol consumption) if you knew what to do if the question was answered. If you were well resourced, knew how to facilitate it, give the right information, in the right way” (27, p1482) (France et al., 2010).*

*“Not enough training. Use of screening tools not decided on from management/on a system level” (13, p188) (Wangberg, 2015).*

#### **5.5.3.3 *Relationship between healthcare providers and pregnant women***

In three studies (Doi et al., 2014; Doi et al., 2015; Woulides, 2009) some of the maternity care workers felt that the rapport between them and the pregnant women was not sufficient enough to establish a trusting relationship. Therefore, these providers were uncomfortable in addressing maternal alcohol or other drug use, especially at the first antenatal consultation. Below is an illustrative quote from a health professional in one of the studies:

*“The other thing that makes it difficult is that at booking you have only just met the person. So, you are already asking a lot of personal questions. You probably haven’t ever met her before and then you are required to take action whether it will be for alcohol or gender-based violence. It is very difficult but I don’t know when the good time will be, you know.*

*Because by the time you have met her for three or four times, she is already well on in her pregnancy. And that is the longest appointment that you have so that is the most time you have with somebody” (25, p6) (Doi et al., 2014).*

Existing literature regards the relationship between healthcare providers and their clients as being critical for eliciting information about alcohol or other drug use. Two different studies conducted in New Zealand and Scotland found that building rapport with women during their first antenatal visit was central to disclosure of substance use and thus perinatal outcomes (Doi et al., 2015; Woulides, 2009).

#### ***5.3.3.4 Healthcare providers’ perceptions of alcohol or other drug use by pregnant women***

Three studies (France et al., 2010; Holland et al., 2016a; Woulides, 2009) reported on some perceptions held by maternity healthcare workers that act as barriers to effective screening and interventions for alcohol or other drug use. Some common perceptions were that most women did not drink much alcohol during pregnancy; pregnant women knew not to drink; and asking about alcohol could appear judgmental (France et al., 2010). Below is an illustrative quote from a health professional of one of the eligible studies:

*“Most of my patients are pretty well-informed. Well that’s how it seems... but I haven’t formally asked them about how much they’re drinking, which I probably should do” (27, p1480) (France et al., 2010).*

Not too dissimilarly, another study focusing on perinatal marijuana use found that healthcare providers did not recognize marijuana as dangerous as other illicit drug use in pregnancy (Holland et al., 2016a). Finally, clinicians’ perceptions played a substantial role in effective care as evidence shows that often some pregnant women were assumed to be at “no” or “low” risk for alcohol, tobacco and other drug use because of their ethnic, culture and/or socio-economic background (Woulides, 2009).

#### ***5.5.3.5 Under-reporting or none/false disclosure***

Health professionals in maternity care settings identified none or false disclosure – not truthfully disclosing the quantity of alcohol or other drug use – as one of the barriers to effective screening and provision of interventions in pregnancy. In three studies (Doi et al., 2014; Doi et al., 2015; Taylor et al., 2007). healthcare providers perceived this as a barrier

due to various factors. For instance, one study (Taylor et al., 2007) found the presence of family members during antenatal visits and clients' fear of reprisal from child protection services created a barrier to disclosing alcohol or other drug use (Taylor et al., 2007). In Scotland, midwives indicated that pregnant women who experienced poor provider-client rapport at the first antenatal appointment tended to refrain from disclosing their true alcohol consumption levels (Doi et al., 2015). Finally, social expectation such as "pregnant women are not supposed to drink", was thought to result in under-reporting and none/false disclosure (Doi et al., 2014). Below is an illustrative quote from a midwife in one of the eligible studies:

*"People know that it is not good to drink in pregnancy and therefore they don't always tell you the truth because they know that maybe you disapprove or it will make them feel guilty if they knew that they are honest and told you" (25, p3) (Doi et al., 2014).*

#### **5.5.3.6 Inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy**

Inconclusive evidence about the consequences of alcohol or other drug use in pregnancy was identified as a barrier in three studies (Doi et al., 2014; Holland et al., 2016a; van der Wulp et al., 2013). In a study undertaken surrounding perinatal marijuana use (Holland et al., 2016a), healthcare providers expressed their unfamiliarity and unawareness of conclusive evidence regarding potential risks associated with maternal marijuana use as a barrier (Holland et al., 2016a). A qualitative investigation of alcohol use advice during pregnancy among the Dutch midwives revealed that the uncertainty about the consequences of alcohol use in pregnancy was an impediment to screening women for alcohol use in pregnancy (van der Wulp et al., 2013). Below is an illustrative quote from a midwife:

*"marijuana, I try to encourage people to stop, but not really all that strongly. . . . We always talk about methadone and problems with [opiate] use in pregnancy and . . . cocaine obviously is another really important one that I would spend a lot of time on . . . I mean, outcomes [for marijuana use during pregnancy] are not as important. There are no syndromes caused by marijuana that we know of. It doesn't affect the pregnancy, health outcomes the same way [as other drugs]" (23, p1448) (Holland et al., 2016a).*



### 5.5.3.7 *Concerns about guilt and anxiety*

Two studies identified health care providers' concerns about women's reactions to screening for alcohol or other drug use as a barrier (France et al., 2010; van der Wulp et al., 2013). Both studies affirmed that providers were concerned about anxiety and guilt their clients may experience if they asked about alcohol or other drug use (France et al., 2010; van der Wulp et al., 2013). Below is an illustrative quote from a midwife:

*"Women often feel guilty when they drink alcohol before they knew they were pregnant. I try to downgrade their feelings of guilt by telling them that alcohol is not dangerous when there is no blood contact between mother and child"* (27, pe94) (van der Wulp et al., 2013).

## 5.6 Discussion

The aim of this narrative review was to explore the barriers to screening pregnant women for alcohol or other drugs in maternity care settings. During antenatal consultations offering routine screening and providing interventions to pregnant women who use alcohol or other drugs may improve maternal and neonatal outcomes (Morse et al., 2000; World Health Organization, 2010). However, healthcare professionals' endeavours to offer such services are often hindered by a range of barriers. Although models of care may vary across countries, barriers to screening and subsequent interventions for alcohol or other drug use are not dissimilar.

The purpose of antenatal care is to monitor and improve the wellbeing of the women and their fetuses. Despite this, while most healthcare providers are committed to the provision of holistic support and care, many are often forced to prioritise certain aspects of care due to increased workload and time constraint (Chief Nursing Officers of England et al., 2010; Deery, 2005; Doi et al., 2014; Doi et al., 2015). In the face of the rapidly changing population, providers are faced with the challenge of meeting the health and social care needs of their clients (Chief Nursing Officers of England et al., 2010). This includes managing complex circumstances such as poverty and unemployment (Chief Nursing Officers of England et al., 2010), homelessness (Little et al., 2005), domestic violence (Marcellus et al., 2015), child protection issues (Jaques et al., 2014), extensive documentation and referral protocols (France et al., 2010). These psychosocial aspects often come hand-in-hand with alcohol or other drug use, become time-consuming and stressful, thus discourage the healthcare providers to address this during antenatal consultations (Doi et al., 2015). Some

providers believe these are beyond their professional practice. Even those who are willing to intervene, often end up with receiving little or no support from the relevant agencies (Corse et al., 1995; Wouldes, 2009). Thus, this identified system failure results in reluctance to screening and referrals for further management (Nygaard & Aasland, 2011; Taylor et al., 2007).

The relationship between healthcare providers and their clients is fundamental to optimal maternity care service delivery (Lundgren & Berg, 2007). It is also well known that establishing effective communication between a woman and her provider is essential towards not only establishing culturally safe care, but also developing rapport (Lundgren & Berg, 2007; Peplau, 1991). In the current review, findings illustrated inadequate rapport was a barrier to consultation about potentially sensitive topics such as alcohol or other drug use. Most antenatal screenings occur during the initial consultation (Chief Nursing Officers of England et al., 2010; Diekman et al., 2000), when the pregnant woman may likely be in face-to-face contact with the practitioner for the first time. This phase is referred to as 'orientation phase', in which the practitioner is getting to know and build a rapport with the women (Peplau, 1991). Although building a trusting relationship may take time, various practices can be implemented to support healthcare workers to improve their interpersonal skills so that they can strategically elicit relevant information from their clients. More importantly, screening at multiple points or subsequent visits should be encouraged to identify substance-using pregnant women and to offer support for making behavioural change (Corse et al., 1995). The perception that most women who use alcohol or other drugs during pregnancy are unlikely to disclose during the first antenatal consultation (Doi et al., 2015) further discourages routine screening. Provision of screening all women for alcohol or other drugs in general health assessment as a routine practice may facilitate an unbiased approach and potentially create a culture in which women can feel empowered by knowledge and informed choice, leading to positive behaviour change.

Under-reporting or none/false disclosure of alcohol or other drug use was identified as a barrier to screening and providing interventions during pregnancy (Doi et al., 2015; Taylor et al., 2007; van der Wulp et al., 2013). Effective communication skills of healthcare providers is necessary to obtain sensitive information and support behavioural change. Therapeutic communication skills, e.g., motivational interviewing techniques to support a woman-centred and non-judgemental approach may encourage pregnant women to disclose alcohol or other

drug use and get help. While on the one hand fears of being judged can deter women from disclosing sensitive information and seeking antenatal care, on the other hand, becoming pregnant can also be a motivating factor for seeking treatment. This highlights the need for health professionals in maternity care settings to be trained in managing complex care needs, in addition to optimal service provision, to ensure an effective integration to specialist treatment and ongoing monitoring.

As identified repeatedly in the current review, health professionals in maternity care settings perceived a lack of necessary skills to competently support pregnant women who are at risk. This may be remedied through ongoing specific education and training at the primary care level to increase confidence in discussing alcohol or other drug use and sensitively posing the appropriate questions. Again, while literature notes many organisational barriers, and that not all these barriers are removable in the short-term, having appropriate assessment tools and guidelines that outline process and protocols for managing women requiring specialized care in antenatal settings may facilitate routine screening and intervention practices (Taylor et al., 2007).

## **5.7 Strengths and Limitations**

To our knowledge, this is the first review that systematically summarised studies on barriers to screening for maternal alcohol or other drug use in maternity care settings from the healthcare providers' perspectives. This review has been strengthened by its extensive and multiple database searches and the quality appraisal of the included articles. This review has also some limitations. Firstly, only a few studies met the inclusion criteria, of which the majority (55%) focused on alcohol screening and brief interventions. Since the literature search and selection process was conducted in English language, relevant article(s) in other languages were not identified. Exclusion of unpublished reports, review articles, commentaries and studies conducted in developing countries might have led to the omission of certain relevant information. Secondly, all the studies were from Europe, USA and Australia; thus, the findings of this review might not reflect the barriers to screening for alcohol or other drug use in developing countries or resource-limited settings. Moreover, the heterogeneity of the study population could have resulted in response bias, as there is a possibility that some of the healthcare providers – such as allied health professionals – might not have been directly involved in providing antenatal care services.

## **5.8 Conclusions and Recommendations**

This narrative review found a range of barriers to screening pregnant women for alcohol or other drugs. Given the adverse impacts of alcohol or other drug use on perinatal outcomes, and the opportunity to reach many women during this period, necessary efforts should be made to adequately screen all pregnant women. Further research is needed in this area – particularly on the educational needs of healthcare workers, including effective communication skills for screening. Likewise, at the organisational level, validated screening tools and policy development to facilitate best screening practice is required for referral and ongoing monitoring of at-risk women to minimise harm and improve perinatal health outcomes.

## **5.9 Conflict of Interest**

The authors have no conflict of interest to declare.

## **Chapter 6: Barriers and Facilitators in Antenatal Settings to Screening and Referral of Pregnant Women Who Use Alcohol or Other Drugs: A Qualitative Study of Midwives' Experience**

### **6.1 Preface**

The previous chapter presents a systematic review that identified the barriers experienced by healthcare professionals in screening pregnant women for alcohol or other drugs in maternity care settings. Based on the findings of this review, a semi-structured interview guide was developed and used to interview midwives in this exploratory qualitative study.

This chapter presents an empirical qualitative research conducted to explore barriers and facilitators experienced by midwives in antenatal settings to screening and referral of pregnant women who use substances. The study presented in this chapter has been published. The pre-print of the manuscript as originally submitted are included in this document. Readers are encouraged to view the final peer-reviewed manuscripts in the journal of publication:

Oni, H. T., Buultjens, M., Blandthorn, J., Davis, D., Abdel-latif, M., & Islam, M. M. (2020). Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience. *Midwifery*, 81, 102595.

## 6.2 Abstract

**Background:** Screening pregnant women for substance use is highly recommended in antenatal care settings. Although midwives provide routine screening for substance use and referral for treatment in pregnancy, little is known about the barriers and facilitators they experience. **Aim:** The study explored barriers and facilitators experienced by midwives in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs. **Design/setting:** A semi-structured interview was adopted to explore barriers and facilitators experienced by midwives in screening and referring pregnant women for alcohol or other drugs specialized services. Eighteen midwives were recruited from urban, regional and rural antenatal settings in Victoria. Interviews were tape recorded and transcribed verbatim. Themes were generated by thematic analysis, the process of identifying patterns within the data. **Findings:** Of the seven themes identified under barriers, five could be categorised as “institution and provider-related”, namely: (i) *lack of validated screening tool*, (ii) *inadequate support and training*, (iii) *discomfort in screening*, (iv) *lack of multidisciplinary team and specialised treatment in regional and rural areas*, and (v) *workload and limited consultation time*. Conversely, two themes could be classified as ‘client-related’, namely (i) *non- or partial-disclosure of substance use*, and (ii) *reluctance and non-adherence to referrals*. All five themes under facilitators were “institution and provider-related”. They are (i) *a woman-centred philosophy of care*, (ii) *evidence of harms from substance use on neonates*, (iii) *experience and training*, (iv) *continuity of care*, and (v) *availability of multidisciplinary team and funding*. **Key conclusions and implications for practice:** To the best of our knowledge, this is the first study of its kind conducted in Victoria. This study not only adds to the limited body of knowledge on barriers experienced by midwives but also identifies facilitators in antenatal settings that promote screening and referral of pregnant women who use substance. Most of the barriers and facilitators are interrelated. Despite midwives’ willingness to screen all pregnant women for substance use and provision of referral, they often felt limited in their capacity. Availability and accessibility to validated screening tool(s), in addition to regular, ongoing training for all midwives to maintain clinical competence and provide effective communication are imperative. Availability of a multidisciplinary team, funds and specialised care facilities such as detoxification and mental health services, especially in regional and rural areas, are necessary to effectively support at-risk pregnant women.

**Keywords:** Screening, referral, pregnancy, substance use, barriers, facilitators, Australia

### 6.3 Introduction

Drinking alcohol and/or using illicit drugs (referred as ‘substance’ hereafter) in pregnancy is associated with a wide range of adverse maternal and child outcomes (Jansson et al., 2008). Thus women are recommended to abstain from substance use when they are pregnant or planning to become pregnant (Ministry of Health NSW, 2014; World Health Organization, 2014). Screening for substance use and referral of pregnant women who use substance are highly recommended in antenatal care settings (Ford et al., 2009; French, 2013; Miles et al., 2014).

In Australia, four in ten pregnant women consumed alcohol, and 2.2% had used an illicit substance during pregnancy in 2013 (Australian Institute of Health and Welfare, 2014). In 2016, approximately 1 in 4 pregnant women consumed a similar amount of alcohol before and after they were aware of their pregnancy (Australian Institute of Health and Welfare, 2017b). Factors such as being single or separated, unemployed, low socio-economic status and low level of education, homelessness, unplanned pregnancy, and domestic violence contribute to substance use in pregnancy (Oni et al., 2019).

Pregnant women are regarded as a high priority for substance use screening and referral to health and social care services in Australia (Miles, 2012; Ministry of Health NSW, 2014; Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2013). To facilitate this, national clinical guidelines for the management of drug use during pregnancy, birth and the early development years of the newborn was developed in 2006, and updated in 2014 (Ministry of Health NSW, 2014; New South Wales Department of Health, 2006). The most recent guidelines highlight three core services, namely (i) referral to specialised services in conjunction with midwifery and obstetric care, (ii) consistent access to a case manager and care team throughout pregnancy, and (iii) specialised support services that promote harm minimisation and relapse prevention such as counselling and pharmacotherapies (New South Wales Department of Health, 2006).

Midwives are often the primary carer provider, and central to screening and informing women about the consequences of substance use in pregnancy (Miles et al., 2014). Although previous studies have examined healthcare professionals’ attitudes of working with pregnant women who use substance (Fonti et al., 2016; Miles et al., 2014), little is known about the barriers and facilitators in antenatal settings to screening and referral of experienced by

Australian midwives (France et al., 2010). Considering the optimum yet challenging opportunity for midwives to screen and refer pregnant women who use substance, and facilitate harm minimisation during the antenatal period, exploring barriers and facilitators that midwives experience is crucial for understanding the current practice in antenatal care settings. Therefore, this study aimed to explore midwives' experiences of barriers and facilitators in antenatal settings to screening and referral of pregnant women who use substance.

## **6.4 Methods**

### **6.4.1 Study design**

This study adopted an exploratory qualitative research design (Brink & Wood, 1998). Interviews were conducted to elicit information about midwives' experience of the barriers and facilitators to screening and referral of pregnant women who use substance. Convenience sampling technique was used to recruit participants (Polit & Beck, 2010). To participate in this study, the inclusion criteria were: the participant must be a midwife, and currently working with pregnant women in maternity care settings within Victoria, a state in south-eastern Australia. To recruit participants, an email invitation along with the study proposal was sent to the maternity healthcare managers in both metropolitan, regional and rural maternity care settings in Victoria.

In the current study, barriers and facilitators were defined as any organisational, provider or patient-level factors that prevent or promote screening and referral of women who use substance (Johnson et al., 2010) in pregnancy.

### **6.4.2 Study setting and participants**

A convenience sample of six publicly funded health facilities (two metropolitan hospitals, two regional hospitals and two remote/rural health centres) that render antenatal services were invited to participate. Addressed to maternity healthcare managers, email invitations were sent for further distribution among staff seeking midwives' interest in participation.

The interviews were conducted in Victoria where antenatal care can be provided by a midwife, hospital doctor, general practitioner or obstetrician or a combination of these professionals. The type of antenatal care depends on the woman's health, risk of



complications, location and the woman's choice. Some common maternity models of care available across Victoria include shared care model: *care is shared between two health professionals, in most cases a midwife and a doctor sharing the carer role*; caseload midwifery model: *involves one midwife in a primary or lead role in caring for the woman*; team midwifery care model: *involves a small team of midwives care for the woman*. However, in some rural and regional areas, a woman choice may be limited by the services available (Bryant, 2009; Victorian Government Department of Human Services, 2002).

We conducted interviews with midwives involved in the care of women during pregnancy in Victoria, Australia. Eighteen midwives were interviewed, of which 12 worked in outpatient clinics with relatively low-risk pregnant women. Majority of this subset who worked in antenatal clinics were relatively less experienced in screening and providing referral to pregnant women who use substance. These midwives are involved in screening women at their first antenatal visit and in referring them for further support or specialised care when necessary. The remaining six midwives were working in specialised units – such as those where midwives provide one-on-one antenatal education with a specific focus on substance use.

The average age of all the midwives was 42 years and the average duration of midwifery practice was 14 years. All 18 midwives were female, 10 were from metropolitan and eight were from rural and regional health facilities.

### **6.4.3 Data collection**

Interviews were conducted by the first author between September and November 2018. Face-to-face interviews were conducted with 13 participants who were residing around metropolitan areas and telephone interviews with the remaining five residing in regional areas.

A semi-structured interview guide (available in appendix) was developed with minor modifications after the first few interviews to incorporate additional information from the field notes. Participants were given the opportunity to choose a quiet and private venue. Interviews took 30-45 minutes and were tape recorded with participants' consent and transcribed verbatim by the first author. All participants were informed that they would remain anonymous and no facility name would be mentioned in the report. Each participant was assigned a pseudonym while transcribing the data to maintain confidentiality.

The interviews covered a broad range of questions relating to barriers and facilitators experienced by midwives in screening and offering referrals to pregnant women who use substance. Data saturation was achieved after 13 interviews.

#### **6.4.4 Data analysis**

The NVIVO QSR International Qualitative Analysis software (Version 12) for Windows was used to facilitate the coding process and generate themes. Interview transcripts were analysed using thematic analysis based on the guidelines outlined in qualitative methodology literature (Aronson, 1995; Attride-Stirling, 2001; Braun & Clarke, 2006; Braun et al., 2014; Joffe & Yardley, 2004).

Verbatim transcripts of the audiotaped interviews were read several times before coding. All 18 transcripts were coded by two coders in relation to the research questions and codes were adjusted when necessary. Similar codes were clustered to generate themes. To ensure the validity of the analysis, generated themes were reviewed independently by two researchers. Disagreement was resolved by face-to-face discussion.

#### **6.4.5 Ethical considerations**

The study was approved by the University Human Ethics Committee (Approval number: HEC18095). The interviews were carried out in accordance with the Helsinki Declaration (World Medical Association, 2001). A written copy of the participant information sheet and a description of the study were given to each midwife and informed consent was obtained. The voluntary nature of participation, confidentiality and anonymity, and the freedom to withdraw at any point in the study were made clear to the midwives.

### **6.5 Results**

This study aimed to identify barriers and facilitators experienced by midwives in screening and referral of pregnant women who use substance. In total, seven themes were derived under *barriers* and five themes were generated under *facilitators*. Of the seven themes identified under barriers, five could be categorised as “institution and provider-related”. They are: (i) *lack of validated screening tool*, (ii) *inadequate support and training*, (iii) *discomfort in screening*, (iv) *lack of multidisciplinary team and specialised treatment in regional and rural areas*, and (v) *workload and limited consultation time*. Conversely, two themes could be

classified as ‘client-related’, namely (i) *non- or partial-disclosure of substance use*, and (ii) *reluctance and non-adherence to referrals*. All five themes identified under facilitators could be categorised as “institution and provider-related”. They are (i) *a woman-centred philosophy of care*, (ii) *evidence of harms from substance use on neonates*, (iii) *experience and training*, (iv) *continuity of care*, and (v) *availability of multidisciplinary team and funding* seven barriers (Figure 6.1).

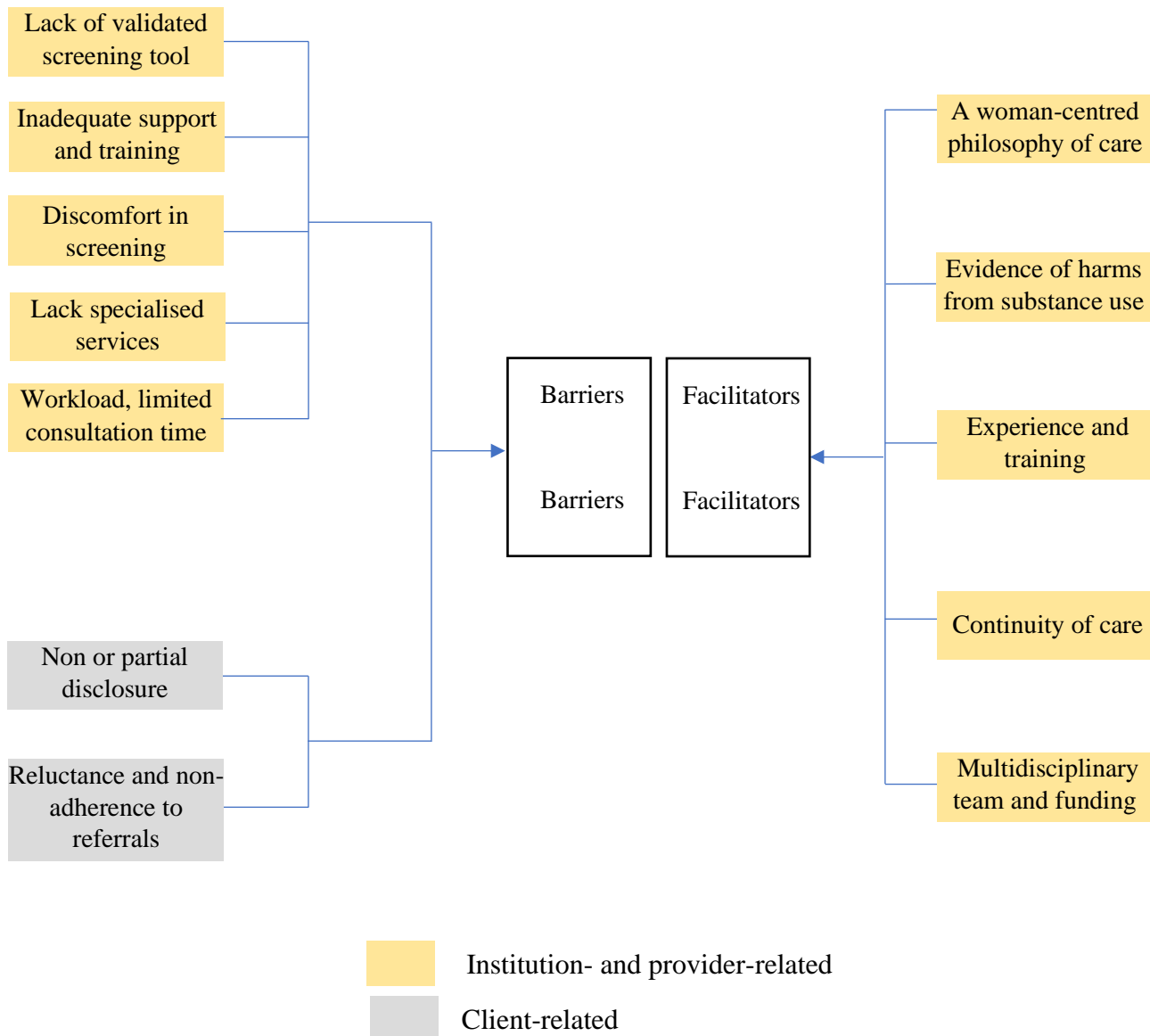


Figure 6. 2: Themes and subthemes of barriers and facilitators in antenatal setting to screening and referral of pregnant women who use substance

### **6.5.1 Barriers to screening and referral of pregnant women who use substance in antenatal settings**

#### ***6.5.1.1 Lack of validated screening tools***

Midwives stated that screening of all pregnant women for substance use is routinely performed, as it is a requirement of midwifery service. The majority further highlighted that most screening takes place at the initial appointment. No tool was specified by the midwives when asked to detail the screening tool(s) for substance use in the antenatal clinic. Rather a subset of questions was reported to be used, and these questions come from the Victorian Maternity Record, Birthing Outcome System and/or Pre-booking Appointment Questionnaire. The Victorian Maternity Record provides a complete record of pregnancy care and progress. The Birthing Outcome System database offers the care summaries of clients' pregnancy and birth episode. The Pre-booking Appointment Questionnaire was designed for assessing pregnant women before the booking appointment. Some midwives stated that these questions were not doing a good job in eliciting adequate information from the women. They also stated that having an appropriate and validated screening tool might enhance the effectiveness of substance use screening in maternity care settings. A midwife said: *"The standard questions we asked are: 'do you drink alcohol, smoke cigarettes or use any other drug throughout pregnancy?'. There isn't an actual tool"* (Midw9).

#### ***6.5.1.2 Inadequate support and training***

The majority of the midwives indicated that screening pregnant women for substance use as part of their role. Nevertheless, some expressed a lack of support and training on how to effectively screen and ask pregnant women questions pertinent to substance use. Further, they reported to have no formal training or education on substance use screening in pregnancy, as illustrated by this quote: *"We don't receive any support from the organisation. We haven't had proper training on substance use in pregnancy, except my initial training as a student midwife"* (Midw9).

Although there are opportunities to attend training and education sessions for the midwives working in metropolitan areas, a distinct lack of ongoing educational opportunities was identified by the midwives working in regional and rural areas. The latter group also expressed that often the trainings were organised in the metropolitan context, rarely considering what was available and accessible for midwives and their clients in regional and

rural areas. A midwife said: *“We have training in the city every three months but again the training is all about what the pregnant women (who use substance) in the city have access to more than what we've got access to (in the regional areas) and some of our pregnant women are not gonna travel all the way to the city”* (Midw15).

#### **6.5.1.3 Discomfort in screening**

Some midwives explained that they sometimes felt uncomfortable. A wide range of reasons was mentioned for this including feeling discomfort, fear of being judgmental, fear of offending and embarrassment. For example, a participant said, *“sometimes it's really difficult to ask the women these questions because you feel like you're passing judgement...”* (Midw3). Another midwife stated, *“I do feel uncomfortable asking the question sometimes because especially with the alcohol question, ummm I know the answer especially if the women are Muslim, they don't drink alcohol and so when I ask the question they get really offended”* (Midw1). Some were embarrassed in raising such a sensitive topic as illustrated by this quote *“I think all pregnant women should be screened but I don't think it happens properly, maybe the reason is that a lot of the midwives feel embarrassed about asking substance-related questions”* (Midw2). Some were also uncomfortable with screening due to lack of a clear protocol of what to do or where to refer the women after disclosure of substance use. A midwife said: *“So, I feel very uncomfortable, there is no guidelines or protocol written to be followed on what to do when they (pregnant women) disclosed alcohol and drug use”* (Midw4).

#### **6.5.1.4 Lack of multidisciplinary team and specialised treatment in regional and rural areas**

Midwives discussed the lack of multidisciplinary care and specialised treatment as being barriers they experience in regional and rural areas. A few midwives expressed concerns about pregnant women not being able to access services such as detoxification. Additionally, they noted a lack of health professionals, central to supporting individuals using substance, such as psychiatrists and social workers in their organisations. It was perceived that this shortage directly impacts the midwife's ability in referring women to appropriate care. As mentioned by a midwife, *“All hospitals should have a multidisciplinary team, especially in the Aboriginal areas...there's nothing in those areas and yet the drug use and the poverty and the disadvantages in those areas are huge”* (Midw16).

In the metropolitan areas, midwives can refer pregnant women who use substance for

specialised treatment. These services are mostly offered within the hospital, hence accessible by the women. However, midwives in regional and rural areas identified limited or no such services for women. As a result, women were referred to the pharmacotherapy or alcohol and drug support service facilities located elsewhere and often at distant locations. A midwife said: *“I used to work in the city and we had an excellent alcohol and drug programme....it was really easy to refer women but there're no such services in this area (regional) and I think that's a big gap”* (Midw11).

#### **6.5.1.5 Workload and limited consultation time**

Midwives working in the antenatal clinic are the first point of contact for many women who access antenatal care services. They are responsible for filling out the Victorian Maternity Record or Birthing Outcome System by taking a wide range of information including the family, gynecological obstetric and health-related histories. Within a limited consultation time, midwives are also expected to perform clinical observations such as checking vital signs of the women, fetal heart rate; and referring the women for specialised care and support, if deemed necessary. Given all these, some midwives felt there was not enough time to screen for substance use. A midwife said, *“Time is one of those things we don't just have.... we don't have time to screen for everything properly... our booking visits are roughly about half-an-hour and we are supposed to screen and find out about their (pregnant women) medical history, the previous pregnancy history, family violence, mental health, and the list just goes on”* (Midw5).

#### **6.5.1.6 Non- or partial-disclosure of substance use**

Despite having the provision of routine screening, some pregnant women were not ready to disclose their substance use. Midwives observed that usually most women partially disclose usage because they are worried about losing their babies to child protection services. A midwife said, *“I think a lot of women who aren't disclosing aren't disclosing because they are worried they are going to get reported to the child protection services of the Department of Human Services”* (Midw5). Non- or partial-disclosure was also associated with feelings of guilt and shame about usage as illustrated in this quote *“It's pretty rare that women disclose drug use, probably because they feel ashamed”* (Midw12). A lack of continuity of care and insufficient rapport between the midwives and the women were other important reasons identified by some midwives, as illustrated by the following quote: *“where I work, the midwives rarely see the same woman twice, so most women would come through the*

*maternity system each time seeing someone different and the only continuity is the history, how would they disclose?” (Midw4).* Insufficient knowledge about the potential risks of substance use in pregnancy and fear of being judged by midwives and the community, especially in the regional and rural areas, were also perceived as contributing factors to women’s non- or partial-disclosure.

#### **6.5.1.7 Reluctance and non-adherence to referrals**

Some women are reluctant to accept referrals for specialist care such as mental health and alcohol and drug services. Midwives found this challenging and expressed their frustration. However, in a situation when the midwives are genuinely concerned about the health of the baby, the unit supervisor or the doctor is notified immediately, as exemplified by this quote, *“Sometimes they don't want a referral, I can't do anything really...if I was to put a referral in, they will be unhappy with it” (Midw8).*

Disengagement from maternity services poses a significant barrier to referral of pregnant women who use substance. Midwives described a variety of strategies that have been put in place to facilitate attendance, these include provision for transportation and taxi vouchers; counselling and education; psychosocial and emotional support; and availability of on-call and follow-up services. Despite all these efforts, some pregnant women would disappear for months. Lack of motivation to change was identified as the dominant reason for such disengagement, as illustrated by the following quote: *“...the issues come around the women themselves... they're often not ready.... they often don't even remember they've got appointments” (Midw13).* A chaotic lifestyle was also identified by a few midwives. For instance, a midwife stated, *“I think one of the biggest problems is that very often these women are very chaotic in their lifestyles, thus they fail to attend appointments (Midw14).* Stigma was identified as an important factor for disengagement, as illustrated in the quote, *“Stigma around illicit drug use is affecting our work with these women. Women carry a lot of shame especially when they are pregnant and using (substance)” (Midw16).* Other contributing factors include guilt and shame, partner's influence, and denial of the adverse impact of substance use on their babies.

### **6.5.2 Facilitators to screening and referral to pregnant women who use substance**

Five main themes emerged from the interviews surrounding facilitators. Of note, some of the factors highlighted as barriers by some midwives were also considered as facilitators by other midwives. The five themes are outlined below:

#### **6.5.2.1 A woman-centred philosophy of care**

One of the strongest facilitators to screening and referral of pregnant women who use substance was midwives' sense of responsibility and willingness to help and reduce harm to the women and their babies. Midwives considered this subgroup as being vulnerable and in need of support. Here is a quote from a midwife: *"I also think these women need our support. They are usually vulnerable people. So, it's about looking out for them and their babies"*. (Midw9) Another midwife stated: *"I think mostly is about trying to help people and these women are probably in lots of way more in need of help than most normal healthy women, also is never just having a drugs issue is always having everything going on"* (Midw4).

#### **6.5.2.2 Evidence of harms from substance use on neonates**

Exposure to substance use during pregnancy is associated with a significantly increased risk of adverse neonatal health. Midwives who had worked in the neonatal setting attested that witnessing the effects of substance use in pregnancy on neonates motivated them to screen and refer. A midwife said: *"Actually, looking at the evidence of what happens when women use alcohol and drugs during pregnancy and the effects on the babies... making sure we (midwives) prevent those sorts of things as best as we can and educate women about those sorts of things are important to me. I want the best outcomes for women and their babies at the end of it"* (Midw5).

#### **6.5.2.3 Experience and training**

For some of the midwives, experience and training on how to initiate a conversation around alcohol or other drug use in a non-judgmental manner was a facilitator. Here is an illustrative quote from a midwife: *"I definitely think, as I become more experienced, I feel more comfortable with screening women for substance use"* (Midw4).

#### **6.5.2.4 Continuity of care**

Some midwives who were working in the continuity of care model stated that the continuity of care strengthens their relationships with the women, promotes trust and encourages



disclosure of sensitive information like substance use. A midwife stated: *“I love the long-time relationship, the continuity of care, and women love it too”* (Midw13).

#### **6.5.2.5 Availability of multidisciplinary team and funding**

Availability and accessibility to multidisciplinary health professionals and funding are perceived as facilitators in the metropolitan areas. Midwives working in the metropolitan area work together with health professionals of different disciplines – such as psychologists, obstetricians, social workers and mental health specialists – to more holistically meet the needs of the women. They also have access to funding and can link the women with necessary services such as detoxification, pharmacotherapy and mental health. Here is a quote from a midwife working in the city: *“We are very lucky in the city, we actually have our own separate funding. We also have a multidisciplinary team”* (Midw14).

### **6.6 Discussion**

Screening all women for alcohol or other drugs and providing referrals over the antenatal period may pose a challenge yet offer a significant opportunity for harm minimisation and access to appropriate care. This study adds to the limited body of literature surrounding the barriers experienced by midwives and suggests a range of factors that currently hinder screening practices and referrals. Common barriers experienced by midwives included a lack of validated screening tools, inadequate support and training, lack of multidisciplinary team and specialised treatment, workload and limited consultation time, and discomfort in screening. In relation to pregnant women, non- or partial- disclosure of substance use and reluctance, and/or non-adherence to referrals were considered barriers to care and optimal treatment. The study also identified several facilitators that promote screening and referral of pregnant women who use alcohol or other drugs. Main themes included experience and on-going training, continuity of care, availability of a multidisciplinary team and funding.

The role of midwives in antenatal settings is broad and demanding (Doi et al., 2014). Despite midwives' willingness to provide quality care, they felt a lack of continuity, and limited time spent with women during antenatal consultations to be a significant barrier to comprehensive care that entails a biopsychosocial approach. In this study, most midwives highlighted the importance of continuity of care. Traditionally, continuity of care is idealised in the patient's experience of a 'continuous caring relationship' with an identified healthcare professional (e.g., one woman one midwife) (Gulliford et al., 2006). While the evidence for continuity of

care is favourable (Homer, 2016; Sandall, 2014; Sandall et al., 2015), this model may not be always feasible due to workforce shortages, lack of funding, and lack of opportunity to practice across the full spectrum of maternity care (Brodie, 2002; Homer, 2006; Jansson et al., 2008; Leap, 2002; Leap et al., 2003). Although this model of care has been adopted in Australia, it is not as widespread as should be. To further expand this model, a certain degree of restructuring of maternity services and collaboration among medical professionals involved in the care of pregnant women is necessary (Homer, 2006; Homer, 2016).

Discomfort to screening for substance use was found to be a considerable barrier among midwives with relatively less experience in screening and providing a referral of pregnant women. This discomfort is mostly associated with the fear of being judgmental or offending the clients by raising and discussing sensitive topics such as substance use in pregnancy. This was particularly common when midwives work with women from minority groups. This is consistent with previous literature that illustrates that some midwives believe a Muslim woman neither drinks alcohol nor uses drugs, a belief which may cause further discomfort and create a barrier to screening all pregnant women at the initial and all subsequent antenatal visits (Department of Health, 2017; Ministry of Health NSW, 2014; New South Wales Department of Health, 2006; The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018; World Health Organization, 2014). However, when examined from clients' perspective, a previous Australian study found a high level of acceptability to screening for alcohol consumption and being advised not to consume alcohol during pregnancy (McElwaine et al., 2013). A survey in an antenatal clinic revealed that Australian women do not feel judged by midwives when screened for alcohol and drug use in pregnancy (Seib et al., 2012). These findings suggest that the fear of discomfort in addressing substance use (Payne et al., 2014; Watkins et al., 2015) and its impact on the client-clinician relationship may be overrated by the midwives. Strategies to address such perceptions include a combination of education and training and the provision of a supportive working environment that will assist midwives to have complex conversations about what could be described sensitive and non-traditional topics in pregnancy (Anderson et al., 2004; Payne et al., 2014; Richmond & Anderson, 1994; Rush et al., 1995; Shaw et al., 1978).

The problem of partial- or non-disclosure of substance use was perceived to be a result of a wide range of internal and external factors including fear of involvement of child protection services, inadequate rapport between the clients and the midwives, stigma and lack of

awareness of women about the health risks of substance use in pregnancy. Fear of stigma was perceived to be considerable in smaller communities where ‘everyone knows everyone’ and pregnant women who use substance can easily be labelled as ‘bad woman or mother’, which can further impede disclosure and accessing treatment facilities (Beckman, 1994; Jackson & Shannon, 2012a, 2012b). Public education and awareness are crucial in eliminating internal and external barriers such as shame and stigma against the women especially in regional and rural areas (Beckman, 1994).

The reluctance of women to follow-up with referrals for treatment was of concern to midwives in the current study, and the reasons for such behaviours are complex and multifaceted (Avilla et al., 2017). Although this study revealed midwives’ views of external and internal impetuses hindering willingness and adherence to referrals, further research is needed to better understand the complexity. The wider literature suggests several factors act behind this inertia to referrals such as stigma (Bradley et al., 1998; Jackson & Shannon, 2012a); homelessness (Forrester & Harwin, 2006; Little et al., 2005), fear of child protection services (Taylor et al., 2007), and chaotic lifestyles (Gueta, 2017). While it is outside the scope of this study to assess the complexity from the pregnant women’s perspective, it is likely that to improve referral uptake, consideration of the social determinants of health and wellbeing is required (Gueta, 2017; LeBel et al., 2008; Small et al., 2010).

In this study, training on screening and referral was identified both as a barrier and a facilitator. This observation is consistent with that in the literature (Bland et al., 2001; Oni et al., 2018; Seybold et al., 2014). Training is crucial especially for the non-specialised and less experienced midwives on how to empathetically initiate a conversation, and effectively communicate about substance use in a non-judgmental manner (Khadivzadeh et al., 2015). Paluzzi and her colleagues emphasised extensive training on substance use in pregnancy for midwives-educators but also continuing education programmes for practicing midwives as well (Paluzzi et al., 2002). Further, provision of regular training services and professional development for all midwives, particularly those in regional and rural areas, is required as there are continuous changes that occur in the use of drugs, including the way drugs are taken. This has implications for practice. To truly understand the phenomena and be one step ahead, midwives need to be abreast of common practices that relate to substance-use (Australian Institute of Health and Welfare, 2016; Seybold et al., 2014).

A lack of validated screening tool(s) was identified as a barrier, and the use of evidence-based screening tool(s) was suggested as a way forward. Unfortunately, few screening tools have been evaluated for use among pregnant women and most are designed to screen for alcohol consumption. The T-ACE (Take, Annoyed, Cut-down, Eye opener); TWEAK (Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down); and AUDIT (Alcohol Use Disorder Identification Test) are three such tools found suitable for identifying alcohol consumption in pregnancy (Chang, 2001; Keegan et al., 2010; National Drug & Alcohol Research Centre, 2016; US Preventive Services Task Force, 2004). The WHO developed an abbreviated version of ASSIST (Alcohol, Smoking, and Substance Involvement Screening) known as ASSIST-Lite (World Health Organization Assist Working Group, 2002). This tool is now being used in many settings (Diseth, 2001; Gryczynski et al., 2014; Hotham et al., 2016). Also, 4 P's Plus was found suitable for screening substance use in pregnancy in some settings (Chasnoff et al., 2005). Further research is recommended to examine the comparative effectiveness of these validated tools and the current practice of using a set of questions from Victorian Maternity Record or Birthing Outcome System or Pre-booking Appointment.

The problem of inadequate resources is salient in regional and rural areas. As a result, pregnant women often need to be referred to the health facilities located elsewhere and often in metropolitan areas. A commitment of pregnant women, who use substance and reside in regional and rural areas, to specialised services delivered in the metropolitan areas may be non-viable, given the distance, their chaotic lifestyle and the financial cost involved (Jackson & Shannon, 2012a, 2012b). Development of such specialised care facilities in strategically and geographically suitable areas, identifying and promoting some “champions” among midwives or doctors who have necessary training and experience to act as resource persons, along with offering transport support to the vulnerable women are, perhaps, a feasible solution to enhance service provision and care for pregnant women who use substance.

## **6.7 Strengths and Limitations of the Study**

This study adds to the limited body of knowledge on barriers and facilitators experienced by midwives in the screening and referral of pregnant women who use substance. The qualitative method used in this study is appropriate for exploring midwives' experiences about their daily practices. A limitation of this study is that it is not known as to what extent these barriers and facilitators impact on delivering care. Further research is recommended to

explore this. Also, while the study covered metropolitan, rural and regional health facilities, it did not cover the entire spectrum of facilities e.g. private health facilities. Another limitation is that all participants were recruited from one state in Australia. Hence, the findings may not be generalisable to other locations. However, some of the barriers and facilitators identified in this study, such as non- or partial-disclosure (Doi et al., 2014; Taylor et al., 2007); significant workloads and limited consultation time (Holland et al., 2016b; Wangberg, 2015), and continuous training and education (Oni et al., 2018; Taylor et al., 2007) have been documented in various geographical settings with diverse economic and political conditions. Thus, these findings may have 'conceptual generalisability' (Green & Thorogood, 2013) and be applicable to other settings.

## **6.8 Conclusion**

In summary, this study identified a range of barriers and facilitators that midwives experience in antenatal care settings to screening and providing referrals to pregnant women who use substance. These barriers and facilitators were identified based on their day-to-day experience in working with pregnant women who use substance. Midwives acknowledged the significant and strategic role they play in substance use screening and provision of referral, yet they felt limited in their capacity to effectively support at-risk pregnant women. Inadequate support and training, a lack of validated screening tools and a shortage of targeted resources in regional and rural areas were identified as the major barriers. Willingness to help, experience and training, continuity of care, and presence of multidisciplinary team (Oni et al., 2020a) to refer women were considered strategic facilitators to increasing service provision for at-risk pregnant women.

## **6.9 Implications for Practice**

Relevant training should be given to non-specialised and less experienced midwives to increase their screening skills, competence on effective communication, and education in substance use relating to pregnant women. At an organisational level, more work needs to be conducted to develop a fluid multidisciplinary approach to service provision for women that includes continuity of care. At the community level, attention to the topic via mass media campaigns should also be considered to educate the community about the harms from substance use during pregnancy. At the governmental level, funding and necessary support

should be provided to build specialised care services for pregnant women who use substance, especially in the regional and rural areas.

## **Chapter 7: Discussion**

### **7.1 Preface**

This doctoral research explored and assessed alcohol and/or other drug use in pregnancy, short-term health outcomes of newborn infants of substance-using women and current midwives' practices in Australia regarding screening and referral of substance-using pregnant women:

The specific objectives were to:

- identify and synthesise the demographic characteristic and short-term health outcomes of neonates of mothers who use alcohol and/or other drugs during pregnancy in an Australian context (Chapter 3)
- examine the neonatal outcomes of women with substance-related disorders admission during pregnancy (January 2007 to December 2016) (Chapter 4)
- conduct a systematic review to identify barriers to screening in maternity care settings for substance use during pregnancy from the perspectives of healthcare professionals (Chapter 5) and
- explore the barriers and facilitators experienced by midwives in screening and referral of substance-using pregnant women in Victorian maternity settings (Chapters 6).

The thesis commenced with a synthesis of the existing literature on the short-term health outcomes of newborns of substance-using mothers and their demographic characteristics to establish the scope of the problem in the Australian context. Given the limited up-to-date evidence of local perinatal outcomes, this was followed by a quantitative retrospective study using linked data over a 10-year period that examined the associations of substance use (opioids, cannabis, stimulants and alcohol) in pregnancy with neonatal outcomes. Based on the scope of the problem and strong evidence of detrimental health outcomes, a global systematic review was later conducted to identify barriers to screening in maternity care settings for alcohol or other drug use during pregnancy from the perspectives of healthcare professionals. To ensure a more comprehensive analysis and further inform policy, practice and service provision, the research concluded with a qualitative study that explored barriers and facilitators to screening and referral of pregnant women in Victorian maternity settings. This chapter will summarise the findings and discuss the strengths and limitations of the

overall research. Finally, the implications of the overall findings on practice, policy and potential future research will be discussed.

## 7.2 Summary of Key Research Findings

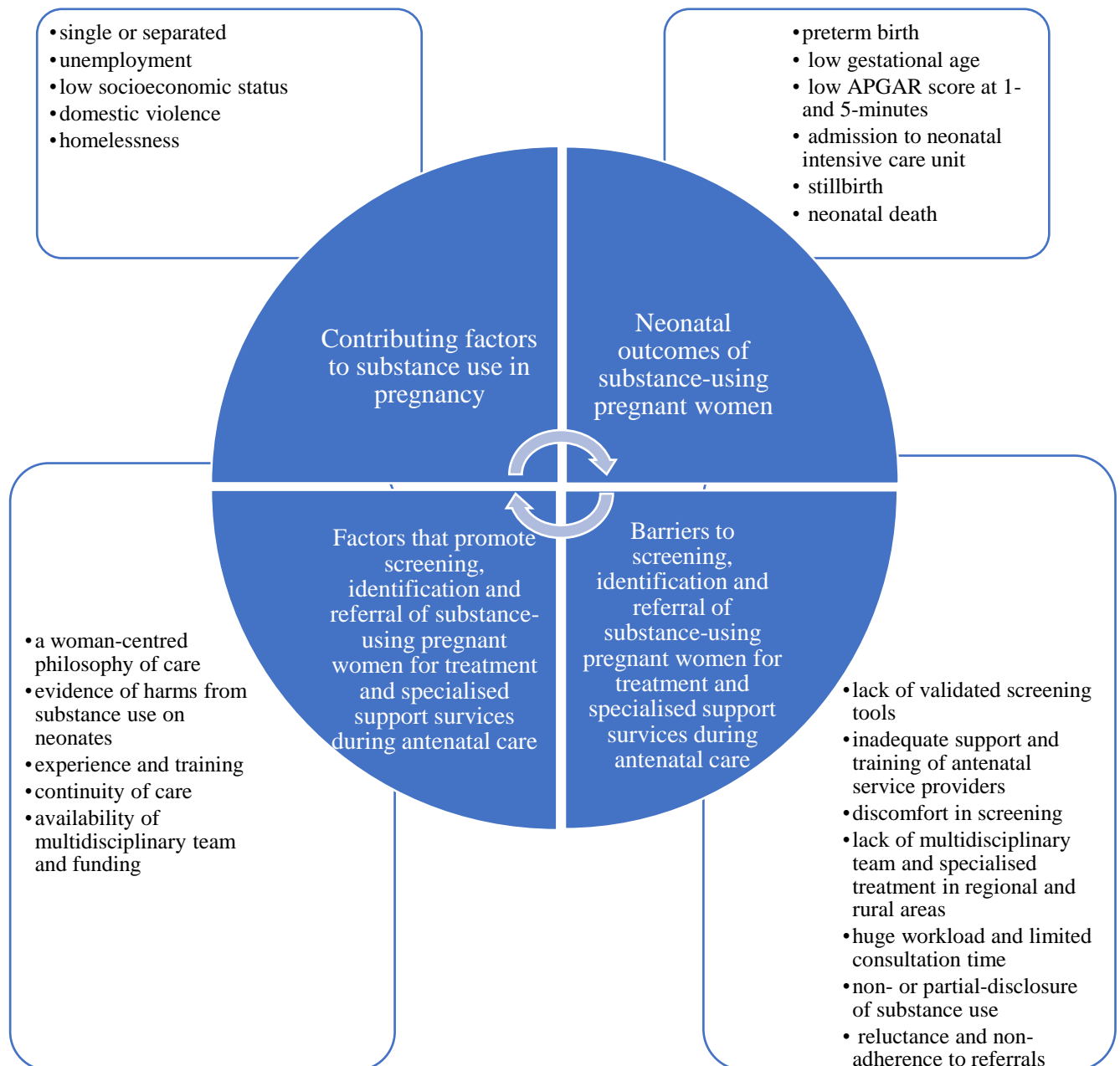


Figure 7.1: Summary of the key findings of the research



### **7.2.1 Neonatal outcomes and demographic characteristics of pregnant women who use alcohol and/or other drugs**

The evidence concerning the outcomes of maternal alcohol and/or other drug use on neonatal outcomes varies in the literature due to factors such as types and amount of substance use (Taplin et al., 2015), socioeconomic status of the women (Scott & Lust, 2010), level of support and care received during pregnancy (Abdel-Latif et al., 2013; Scott & Lust, 2010). Also, maternal substance use is often exacerbated and/or associated with chaotic lifestyles and certain social determinants of health such as domestic violence (Oei et al., 2010; Velez et al., 2021) and mental illness (Kar et al., 2021; Martin et al., 2015; Pentecost et al., 2021). Therefore, to examine the neonatal outcomes and demographic characteristics of substance-using pregnant women in an Australian context, the following research was conducted:

1. a systematic review that summarised available evidence of neonatal outcomes and demographic characteristics of substance-using pregnant women (Oni et al., 2019).
2. an analysis of a linked dataset containing records over a 10-year period to examine the associations of substance use in pregnancy (opioids, cannabis, stimulants and alcohol) and neonatal outcomes (Oni et al., 2020a).

Although pregnant women who use substances come from varied socioeconomic and ethnic backgrounds, the findings of this research show that pregnant women who use alcohol and/or other drugs are predominantly socially disadvantaged compared to their counterparts (Oni et al., 2019). Alcohol and/or other drug use was more prevalent among women who were single or separated (Brown et al., 2016), unemployed (O'Leary et al., 2012), of low socioeconomic status (Hayatbakhsh et al., 2012), homeless, victims of domestic violence and/or socially isolated (Brown et al., 2016; Quinlivan & Evans, 2002). These factors, which can influence the health-seeking behaviour and health service use, if not addressed, may have adverse impacts on the neonatal outcomes even more significantly than the teratological effects of substance use in pregnancy (Nair et al., 2003; Pfeifer & Haile, 2021). Despite state and territory initiated support programmes and guidelines for pregnant women with particular attention to substance use in pregnancy (Taplin et al., 2015), the continuous use of substances in pregnancy and thus negative neonatal outcomes – leading to ongoing personal and economic detriments is concerning. As identified, there is an increasing tendency of substance-using pregnant women disengaging from or avoiding health services as well as late presentations at antenatal care (Oni et al., 2020b; Taplin et al., 2015). Therefore, the

interventions, programmes and health policies guiding substance use in pregnancy need to take into account these factors and be responsive to the needs of women and their families. Further, there is a need for an expansion of interventions and social services to meet the often-complex needs of substance-using women.

The linked data study is the first in Australia to use multilevel analysis to examine neonatal outcomes of pregnant women with substance-related ICD-10-AM codes and compared them with that of pregnant women with no such code over a 10-year period. Unlike previous studies of linked datasets (Burns et al., 2006a, 2006b), the study took into account the effect of the geographical variability on the outcome variables using the Socio-Economic Indexes for Areas (SEIFA) data. Multilevel logistic regression analysis was performed, considering the hierarchical nature of the datasets (e.g. mothers are nested within Local Government Areas). Even after adjusted for smoking and other confounders such as maternal age, marital status and SEIFA, maternal substance use is significantly correlated with most of the assessed neonatal outcomes including preterm birth, low gestational age, low APGAR score at 1- and 5-minutes, admission to neonatal intensive care unit and stillbirth.

The results of the linked data analysis suggest that a higher percentage of women who use alcohol and/or other drugs in pregnancy smoked heavily (smoking over ten cigarettes per day during pregnancy) compared to non-substance users. For instance, approximately 39% of pregnant women who use opioids were heavy smokers and over 40% of cannabis users smoked more than ten cigarettes per day compared to 2% in the non-substance use group. This study highlights the importance of promoting safe and effective tobacco use cessation interventions in pregnancy, especially among pregnant women who use alcohol and/or other drugs. Therefore, smoking cessation interventions need to be integrated into the routine care of pregnant women who use alcohol and/or other drugs (Mendelsohn & Wodak Am, 2016). Also, a higher percentage of Indigenous pregnant women were using substances; this observation needs to be understood within the historical, social, and political contexts (Kelly, 2013). Policies and guidelines that do not acknowledge these contexts may likely prove ineffective and culturally unsafe and can impede positive health-seeking behaviours and nonadherence to treatment regimens and healthcare services (Shahram et al., 2017). An individual-level intervention targeting smoking behaviour and co- substance use need to be complemented by necessary policy changes that will address external stressors affecting the lives of pregnant women who use alcohol and other drugs and enhance the capacity of

healthcare professionals to provide evidence-based women-centred care (Rahman et al., 2021).

In this research, cannabis was found to be the most frequently used substance in pregnancy, followed by opioids, alcohol and stimulants. The increased use of maternal cannabis, as observed in the current research and other Australian research (Abdel-Latif et al., 2013; Burns et al., 2006a, 2006b), may be in part due to its social, legal and medical acceptance as demonstrated in other countries (Grzeskowiak et al., 2020; Hall & Weier, 2015). Although, recreational cannabis use has been legalised and socially accepted in many parts of the world, continuing use of cannabis in pregnancy is a risk factor for adverse neonatal outcomes including preterm birth, stillbirth and neonatal death (Forray, 2016; Oni et al., 2019). Furthermore, the results showed that exposure to alcohol and polysubstance in utero possibly result in stillbirth. These findings are consistent with the results of other studies that drew on routinely collected population-level data in developed countries (Brown et al., 2016; Burns et al., 2006b; Jaques et al., 2014). Collectively, this highlights the importance of timely identification of maternal substance use by healthcare providers during antenatal routine screening and referral of substance-using pregnant women for coordinated care and interventions such as methadone or buprenorphine maintenance therapy.

Another important finding from the linked data study was an increased percentage of fetal distress among pregnant women who use substance compared to non-substance users, and the rate is particularly high among the polysubstance users. Also, a significant increase was noted in the percentages of general anaesthetic among this cohort, which may be partially due to high rates of fetal distress which could probably leads to vaginally assisted birth or Caesarean section. Given that assisted birth can result in maternal morbidity (Bullens et al., 2016; Buultjens et al., 2013), more research is needed to establish the relationship between substance use in pregnancy and fetal distress.

In summary, there is evidence in this research that alcohol and other drug use in pregnancy adversely affects the mother-infant dyad. To minimise harm, midwives and healthcare professionals need to identify maternal substance use and refer substance-using pregnant women for pharmacotherapies and/or other interventions during antenatal consultation (Forray, 2016; Pajulo et al., 2001; Reddy et al., 2017).

### **7.2.2 Barriers and facilitators experienced by midwives in antenatal settings to screening and referral of pregnant women who use substances**

Although the use of alcohol and/or other drugs in pregnancy can negatively affect neonatal outcomes, identification of maternal alcohol and other drug use during routine antenatal screening and referral of substance-using pregnant women for necessary support are crucial to preventing or minimising the harm of the mother-infant dyad. Given the frequent contact of pregnant women with maternity health services during pregnancy, midwives and other healthcare providers have a unique opportunity during routine antenatal screening to identify women who may be partaking in risky health behaviours such as substance use (National Drug & Alcohol Research Centre, 2016). To understand the current screening and referral practices of pregnant women in antenatal settings, this research explored midwives' experiences.

Routine antenatal screening and referral of pregnant women is designed to create a pathway for ongoing support that can include treatment and enhanced psychosocial support, with the goal to improve pregnancy outcomes (Byatt et al., 2020; World Health Organization, 2010). Although midwives' roles include a universal screening of pregnant women for substance use and referrals as required, they felt limited in their capacity due to a range of barriers. In this research, the barriers experienced by the midwives can be categorised as 'institution and provider-related' and 'client-related'. The institution and provider-related barriers include

1. lack of validated screening tools,
2. inadequate support and training,
3. discomfort in screening,
4. lack of multidisciplinary team and specialised treatment in regional and rural areas, and
5. workload and limited consultation time.

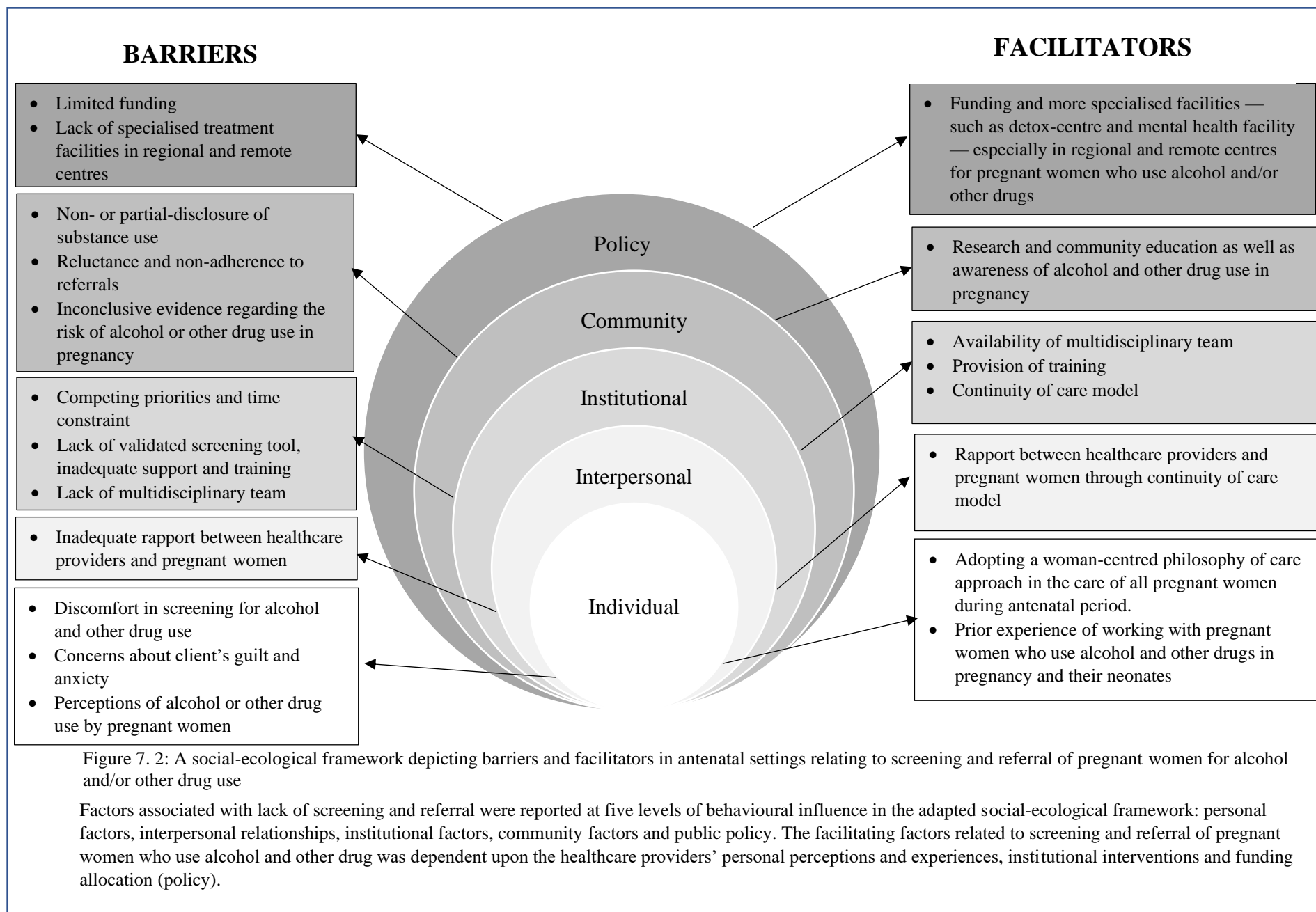
The client-related barriers identified included:

1. non- or partial-disclosure of substance use, and
2. reluctance and non-adherence to referrals.

The midwives also highlighted certain factors as facilitators to screening and referral of substance-using pregnant women for appropriate services, these include:

1. a woman-centred philosophy of care
2. evidence of harms from substance use on neonates
3. experience and training
4. continuity of care
5. availability of multidisciplinary team and funding

Based on the above findings, a social-ecological framework is proposed to help understand the barriers and facilitators in antenatal settings relating to screening and referral of pregnant women who use alcohol and other drugs. The framework emphasizes the interaction and interdependence between factors within and across all levels of health behaviours. It recognises that behaviours are affected by multiple levels of influence including personal factors, interpersonal processes, organisational factors, community factors and public policy (Dawson et al., 2012). Social-ecological framework postulates that behaviours both shape and are shaped by social and environmental characteristics (McLeroy et al., 1988; Unger-Saldaña et al., 2020). The findings in Chapters 5 and 6 suggest that barriers and facilitators exist at all levels of the social-ecological system, hence addressing these needs at all levels is imperative for infective screening and referral of pregnant women who use alcohol and/or other drug (Figure 7.2).



Despite the midwifery practices of routine screening of pregnant women for substance use, especially at the initial appointment, no specific validated screening tool has been adopted for screening substance use across antenatal care settings in Victoria. Midwives reported using a subset of questions from the Victorian Maternity Record, Birthing Outcome System and/or Pre-booking Appointment Questionnaire to ascertain for substance use. The midwives voiced their concerns about the effectiveness of using this set of questions in eliciting adequate information from the women. Although some researchers argue that incorporating questions regarding substance use into the general history-taking template may put the women at ease and promote disclosure (Burns et al., 2016; Wilson & Thorp, 2008), it has long been acknowledged that identifying substance use in pregnancy without the assistance of a validated screening tool may pose a challenge for midwives (McNamara et al., 2005). A range of validated screening tools for identifying maternal substance use have been recommended in Australia. These include T-ACE (Take, Annoyed, Cutdown, Eye opener); TWEAK (Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down); AUDIT- C (Alcohol Use Disorder Identification Test - Consumption); and ASSIST (alcohol, smoking and substance involvement screening test) (Ministry of Health NSW, 2014; Taplin et al., 2015; The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). Cumulatively, this suggests further research is required to compare the effectiveness of current screening practices which simply questions a woman, versus validated screening tools.

Inadequate support and training, both barriers, could lead to a practitioner's discomfort in screening and impede identification and referral of substance-using pregnant women. As suggested by the midwives in this research, strategies to resolve such issues could include a combination of continuous education and training that enables midwives to have complex and sensitive conversations with pregnant women (Anderson et al., 2004). Continuous learning competence and maximising health outcomes for women and their unborn child (Khadivzadeh et al., 2015; Paluzzi et al., 2002). Online e-learning resources for screening and identification of substance use in pregnancy have been developed through the Royal Australian College of General Practitioners, the Royal Australian and New Zealand College of Obstetricians and Gynaecologists, and the Australian College of Midwives. However, it is believed that there still remains a need for multi-component dissemination strategies that address a combination of reach, ability, or motivation to facilitate the use of these resources by the midwives (McCormack et al., 2013).

A comprehensive, coordinated and individualised service provided by a multidisciplinary team of healthcare practitioners who are supportive, non-judgemental and nurturing can significantly improve the neonatal outcomes of substance-using pregnant women (Miles et al., 2012; Myles, 2000; Turienzo et al., 2019). A lack of multidisciplinary and specialist services in regional and rural areas can have direct impacts on the ability to provide local referrals to women for treatment and support. Given the complex nature of supporting pregnant women who use substances, a multidisciplinary team consisting of a midwife, an obstetrician, a psychiatrist, a social worker, and an alcohol and other drug (AOD) counsellor is often required to provide holistic care that encompasses the varied individual and social determinants of health (Economidoy et al., 2012). Implementing a multidisciplinary team approach and the development of specialised care facilities in strategically and geographically suitable areas are crucial. Also, identifying and promoting some “champions” among midwives or doctors who have the necessary training and experience to act as resource persons, along with offering transport support to the vulnerable women are, perhaps, a feasible solution to enhance service provision and care for pregnant women who use substance(s).

The role of midwives is broad and includes the provision of holistic support and care for pregnant women and their families during antenatal consultation. As a result, many midwives are often forced to prioritise certain aspects of care due to increased workload and time constraints, which may impact the midwife–woman relationship (Deery, 2005; Doi et al., 2014; Doi et al., 2015). As suggested by the midwives, the continuity of care model allows enough time to establish a trusting relationship between the midwives and the pregnant women, and may promote a continuous and consistent assessment of substance use in pregnancy as well as any necessary coordination of care required by the women (Coupland et al., 2021; Gulliford et al., 2006; Homer, 2016). Due to an increase in demand for midwifery continuity of care models in Australia, midwives are working together in small groups to provide midwife-led continuity of care in maternity settings. However, it is not as widespread as it should be (Homer, 2016). Providing continuity of care requires reform in the provision of maternity services, and critical to such reform is the collaboration among healthcare providers involved in the care of pregnant women as well as effective referral pathways and good information sharing and communication channels (Department of Health, 2011; Homer, 2016).



Monitoring and ensuring the wellbeing of the women and their unborn child are paramount during antenatal consultations. However, this can only be achieved if a pregnant woman truly discloses to the healthcare provider any behaviour that may adversely affect the pregnancy outcomes such as substance use. In the present research, midwives expressed their concerns about non- or partial- disclosure of substance use by pregnant women. One key factor influencing this barrier is the fear of involvement of the child protection agency of the Department of Health and Human Services (DHHS), which is believed to potentially result in the baby being removed from the mother. The justification of DHHS' involvement and its work methods is beyond the scope of this research; however, findings of this study highlight the importance of practicing due caution in dealing with substance-using mothers, as otherwise many cases of adverse health outcomes of newborns or child abuse attributed to maternal substance use may remain unnoticed due to non- or partial-disclosure of substance use.

In summary, this research highlights midwives perceived barriers and facilitators to screening and referral of substance-using pregnant women. Midwives acknowledged the significant role they play in screening and identification of maternal substance use, as well as referral of substance-using women for necessary support; yet they felt limited in their capacity to effectively render these services. Perceptions were largely reflective of the overwhelming barriers such as inadequate support and training, lack of a validated screening tool, feeling uncomfortable, and clients' unwillingness and nonadherence to referrals for treatment and specialised care support. Continuity of care and continuous training and education were identified as notable facilitators. Clearly, most of the barriers are potential facilitators if they can be resolved.

### **7.3 Strengths and Limitations**

The strengths of this doctoral research include the use of both quantitative and qualitative research design which allows the research aims to be broader and more extensive in the selection of research questions, rather than using a single method approach. Also, the use of linked administrative datasets over a 10-year period enables this thesis to answer epidemiological questions that require long-term follow up of large samples and would otherwise be very expensive, time-consuming and organisationally difficult to undertake (Boyd et al., 2015; Sibthorpe et al., 1995; Virnig & McBean, 2001). The data linkage design has several advantages over other study designs. Firstly, the data linkage approach is less

intrusive and is effective in investigating sensitive research questions such as the scope of substance use in pregnancy. Secondly, this design allows access to a large sample to generate high-quality evidence that can inform public health policies and practices. Furthermore, in this study, a multilevel modelling approach with the inclusion of Socio-Economic Indexes for Areas (SEIFA) and geographical variabilities as confounders was used to draw appropriate inferences and conclusions from multistage stratified clustered data.

This research not only established the adverse neonatal outcomes of substance-using pregnant women, but also identified a range of factors that can promote identification of maternal substance use and referral of substance-using pregnant women for ongoing treatment and support services.

This research has a number of limitations. Firstly, two types of errors may undermine data linkage quality (Boyd et al., 2015; Harron et al., 2017):

1. false positives, where two records are falsely designated as a match; and
2. false negatives, where two records are designated as a non-match when they should not be.

However, in Australia, the accuracy for linkages is considered to be exceptionally high with over 99.76 % of all ‘true pairs’ (Boyd et al., 2015), which means the likelihood of false positive and false negative errors is very low and unlikely to have a substantial impact on the study findings. Secondly, the use of the Australian Modification of the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10-AM) coding to identify births in the substance use groups could either underestimate or exaggerate the prevalence of maternal substance use and associated neonatal outcomes due to misclassification by healthcare providers and undisclosed use of substance(s).

Also, the non-probability, purposive sampling used in the qualitative study and the recruitment of all participants from one state in Australia might limit the generalisability of the findings. Nevertheless, some of the barriers and facilitators identified in this research, such as non or partial disclosure of substance use (Doi et al., 2014; Taylor et al., 2007); large workloads and time constraints of midwives (Holland et al., 2016a; Wangberg, 2015) and the importance of continuous training and education (Oni et al., 2018; Taylor et al., 2007) have been documented in different geographical regions with diverse economic and political settings as evidence in the global systematic review (Oni et al., 2018). Thus, these findings

may have ‘conceptual generalisability’ (Green & Thorogood, 2013) and be applicable to other settings. Although an in-depth interview is considered appropriate to provide deep and multi-layered descriptions of human experiences, it may also threaten the validity of the findings because participants may be selective and biased in expressing their experiences. To minimise this potential confounder, the freedom to withdraw at any point from the study without prejudice was made clear to the participants and each participant was reassured about confidentiality prior to the interview.

Another limitation of this study is the exclusion of tobacco use in pregnancy.

Tobacco/cigarette consumption in pregnancy is still a major public health issue in Australia and most countries around the world. However, unlike maternal alcohol and other drug use, tobacco (cigarette) use in pregnancy has been substantially examined in Australia and different parts of the world (Crume, 2019; Gibson & Porter, 2021; Mohsin & Jalaludin, 2008; Ratsch et al., 2021; Ratsch et al., 2019). This is partly because the extent of alcohol and other drug use in pregnancy is rarely explored, as there is currently no routine national data collection, with the exception of tobacco use (Coupland et al., 2021). For instance, data on smoking during pregnancy can be sourced from the National Perinatal Data Collection (NPDC). The NPDC is a routine national population-based, cross-sectional collection of data on pregnancy and childbirth. Whereas data on alcohol consumption and illicit drug use during pregnancy are usually sourced from the National Drug Strategy Household Survey (NDSHS), a survey conducted every two to three years (Australian Institute of Health and Welfare, 2020). Also, unlike maternal alcohol and other drug use, tobacco use in pregnancy can be quantified relatively easily.

#### **7.4 Implications for Policy and Practices, and Recommendations**

As the findings of this thesis suggest, despite the adverse health impact of substance use in pregnancy on neonatal outcomes, a considerable number of women continue to use substance(s) throughout their pregnancies. There is certainly a need for progress to be made in preventing women from using substance(s), effectively addressing substance use in pregnancy by promoting screening and identification of maternal substance use, as well as referrals for interventions during antenatal consultation. The policies and practices should accommodate more practical and supportive implementation of the following five elements:

1. education and training

2. evidence-based assessment
3. coordinated care and treatment
4. financial resources
5. involvement of child protection agencies and
6. research.

#### **7.4.1 Education and training**

##### ***7.4.1.1 Educate the public about the potential adverse health outcomes of substance use in pregnancy***

The current Australian policy and practice guidelines adopt a clinical approach in addressing substance use in pregnancy and emphasise harm minimisation (Burns et al., 2016; Taplin et al., 2015). Some experts argue that along with harm minimisation, more interventions are needed on primary prevention of the initial occurrence of the problem (Lester et al., 2004; Ordean et al., 2017). In this case, education campaigns about the potential dangers of substance use in pregnancy and health warning labels on alcoholic beverages and other substances (Wigg & Stafford, 2016) (e.g., prescription opioids and benzodiazepines) may be an important way of making the public aware of the health risks of alcohol and other substance use. The good news is that in July 2020, the Australia New Zealand Food Standards Code was amended with the requirement of displaying a pregnancy warning label for all alcoholic beverages (Food Standards Australia New Zealand (FSANZ), 2020; Smith et al., 2020).

Although pregnant women and women of childbearing age should be the priority groups, it is also important to educate young people as risk-taking behaviour often begins in adolescence and young adulthood (Teesson et al., 2017). The national practice guidelines for the management of substance use in pregnancy mainly focus on women (Ministry of Health NSW, 2014; National Drug & Alcohol Research Centre, 2016), education and interventions also need to target partners given that married or cohabiting partners can influence each other's health behaviour patterns to a significant degree. Having partners and friends with anti-substance use attitudes could significantly minimise the likelihood of substance use during pregnancy (Lester et al., 2004; Ordean et al., 2017). Education must highlight the short- and long-term adverse health impacts of substance use in pregnancy on a child; the importance of antenatal care and having a connection to the healthcare system during pregnancy for the health and wellbeing of the mother-infant dyad.

#### **7.4.1.2 *Educate and train healthcare providers***

Pregnancy is often the ideal time for healthcare providers to provide maternal care services and intervention, not only to reduce the short-term maternal and neonatal morbidity and mortality effects of maternal substance use, but also for intergenerational prevention of several chronic health conditions and disability (Arabin & Baschat, 2017; Logan et al., 2017). Identification and referral of substance-using pregnant women can be initiated during routine antenatal screening. Therefore, healthcare professionals, especially in maternity care settings, need regular training on how to initiate and obtain sensitive information such as maternal substance use, promote behavioural change and referrals to specialised services – ideally in the same organisation to enable more coordinated and fluid care and support.. Therapeutic communication skills, e.g. motivational interviewing techniques to support a woman-centred and nonjudgmental approach may encourage pregnant women to disclose substance use and get help. Also, the midwives need to be continually updated about the available resources in the community to make appropriate referrals and connect these women to services (Lester et al., 2004).

#### **7.4.2 Evidence-based assessment**

As discussed earlier, in Australia, validated screening tools have been introduced to screen a range of substance use in pregnancy. For instance, the Australian Capital Territory (ACT) implemented ACT eASSIST (Alcohol, Smoking and Substance Involvement Screening Test), an electronic version of the World Health Organization’s ASSIST (Taplin et al., 2015). Likewise, Western Australia has introduced the AUDIT–C tool for alcohol use screening in pregnancy (Taplin et al., 2015). Given that Victorian midwives noted their concern about the effectiveness of using a subset of questions from the Victorian Maternity Record, Birthing Outcome System and/or Pre-booking Appointment Questionnaire to screen substance use, the current screening tools need to be evaluated and validated.

#### **7.4.3 Coordinated care and treatment**

There is a range of coordinated care across Australia for women who use substances. These include various support groups and social services often managed by different organisations, opioid replacement pharmacotherapy such as methadone and buprenorphine, and specialist services within the public hospitals such as women’s alcohol and drug services in Royal Women’s Hospital (Department of Health and Human Services, 2018). Given that

intervention services require women to be motivated for behaviour change, services could develop family-based approaches that include partners and/or other family members (Groenewald & Bhana, 2018). Further, evidence shows that maternal substance use is often associated with poor socioeconomic factors such as homelessness and domestic violence (Davie-Gray et al., 2013; Oei et al., 2012; Oni et al., 2019). Intervention services and programmes need to encompass a biopsychosocial framework to be responsive to the needs of each woman which may include psychosocial needs, pharmacotherapy needs, mental health intervention, parenting skills and other support services. Additionally, an extensive follow-up plan should be an integral part of treatment to prevent possible relapse (Committee on Obstetric Practice, 2017; Lester et al., 2004).

#### **7.4.4 Financial resources**

In this study, availability and accessibility to funds in metropolitan areas to support pregnant women who use substances is perceived as a facilitator by midwives. However, this same factor is one of the major barriers in rural and regional areas. Funds should be allocated for programmes and necessary resources that comprehensively address maternal substance use in regional and rural Australia. Availability and accessibility to appropriate resources – continuous education and training, detoxification centre, mental health facilities, and multidisciplinary team – may promote screening and referral of pregnant women who use substances. Also, the budget should target prevention, treatment and policy research in the area of mental health and substance use, particularly during pregnancy.

#### **7.4.5 Involvement of child protection agencies**

One of the major barriers to pregnant women disclosing their substance use, as reported by the midwives, was fear of having their child taken by child protection agencies. In Australia, notification to the Department of Health and Human Service's child protection agencies is mandatory for midwives if they fear for the child's safety. However, early child protection involvement in pregnancy may also facilitate support for women to address their risk factors and improve outcomes for mothers and babies after birth (Bromfield et al., 2010). For instance, a woman may be referred for rehabilitation service and mental health treatment by the child protection agency. Although parental substance use can lead to social isolation and place children in a highly chaotic and abusive environment, not all parents using substances are incapable of effective parenting (Moore et al., 2010). As a result, all identified substance-

using pregnant women are assessed case-by-case by child protection agencies to decide whether and when to act on removing a child. Educating all pregnant women about the purpose of child protection agencies' involvement and their services may help alleviate their fear and promote disclosure of substance use and influence behavioural change.

#### **7.4.6 Research**

Currently, national legislation and policies around substance use in pregnancy focus on early identification and the provision of appropriate services and supports. However, the extent to which this is realised in practice is limited due to a range of barriers identified in this research. Further, research involving sustained coordinated care and intervention to develop best-practice across a range of clinical and psychosocial outcomes, taking into consideration of demographic, economic and environmental variables are required.

#### **7.5 Conclusion**

The research presented in this thesis offers an overview of substance use in pregnancy, short-term health outcomes of newborns and the midwives' current practices regarding screening and referral pregnant women who use substances in Australia. Overall, the findings of the reviews and empirical studies suggest women who use a substance during pregnancy are socially and financially vulnerable. These vulnerabilities may influence their exposure to substance use and adversely affect the health outcomes of the newborns. Study 1 of this thesis contributes to identifying those vulnerable factors and estimating the short-term health outcomes of the newborns. Identifying this group and addressing their social determinants of health is an important public health task. The retrospective study (Study 2) offered an up-to-date situation of substance use among pregnant women and the relationship between substance use and short-term health outcomes of newborns. The findings of Study 2 also suggest that despite having state- and territory-initiated guidelines for screening, many pregnant women continue to use substances during their pregnancy. Study 3 helped identify the barriers midwives face in screening and referring to substance-using pregnant women. However, generalisability was a limitation of Study 3, as it is a global literature review. Study 4 addresses much of that limitation as it provides an in-depth understanding of the barriers in the Australian context. This qualitative study also helped to examine the facilitators of screening substance use in pregnancy. Thus, the findings of each of these four studies are

complementary to each other, and, together, they offer an important set of information for public health interventions.



## References

- Abdel-Latif, M. E., Bajuk, B., Lui, K., & Oei, J. (2007). Short-term outcomes of infants of substance-using mothers admitted to neonatal intensive care units in New South Wales and the Australian Capital Territory. *Journal of Paediatrics & Child Health*, 43(3), 127-133. <https://doi.org/10.1111/j.1440-1754.2007.01031.x>
- Abdel-Latif, M. E., Oei, J., Craig, F., Lui, K., NSW, & ACT NAS Epidemiology Group. (2013). Profile of infants born to drug-using mothers: a state-wide audit. *Journal of Paediatrics & Child Health*, 49(1), E80-86. <https://doi.org/10.1111/j.1440-1754.2012.02471.x>
- Addis, A., Moretti, M. E., Syed, F. A., Einarson, T. R., & Koren, G. (2001). Fetal effects of cocaine: an updated meta-analysis. *Reproductive Toxicology*, 15(4), 341-369.
- Anderson, P., Kaner, E., Wutzke, S., Funk, M., Heather, N., Wensing, M., Grol, R., Gual, A., & Pas, L. (2004). Attitudes and managing alcohol problems in general practice: an interaction analysis based on findings from a WHO collaborative study. *Alcohol and Alcoholism*, 39(4), 351-356. <https://doi.org/10.1093/alcalc/agh072>
- Arabin, B., & Baschat, A. A. (2017). Pregnancy: an underutilized window of opportunity to improve long-term maternal and infant health—an appeal for continuous family care and interdisciplinary communication. *Frontiers in pediatrics*, 5(69), 1-18. <https://doi.org/10.3389/fped.2017.00069>
- Aronson, J. (1995). A pragmatic view of thematic analysis. *MCC Behavioral Care*, 2(1), 1-3. <https://doi.org/10.46743/2160-3715/1995.2069>
- Arpa, S. (2017). *Women who use drugs: Issues, needs, responses, challenges and implications for policy and practice*. Retrieved from [http://www.emcdda.europa.eu/system/files/attachments/6235/EuropeanResponsesGuide2017\\_BackgroundPaper-Women-who-use-drugs.pdf](http://www.emcdda.europa.eu/system/files/attachments/6235/EuropeanResponsesGuide2017_BackgroundPaper-Women-who-use-drugs.pdf)
- Arrish, J., Yeatman, H., & Williamson, M. (2016). Australian midwives and provision of nutrition education during pregnancy: a cross sectional survey of nutrition knowledge, attitudes, and confidence. *Women and Birth*, 29(5), 455-464. <https://doi.org/10.1016/j.wombi.2016.03.001>
- Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative research*, 1(3), 385-405. <https://doi.org/10.1177/146879410100100307>

- Austin, P. C., & Merlo, J. (2017). Intermediate and advanced topics in multilevel logistic regression analysis. *Statistics in medicine*, 36(20), 3257-3277.  
<https://doi.org/10.1002/sim.7336>
- Australian Bureau of Statistics. (2011). *SEIFA-An Overview*. Retrieved from  
<https://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/1376.0Main%20Features3402013>
- Australian College of Midwives. (2004). *Midwifery Philosophy & Values*. Retrieved from  
<https://www.midwives.org.au/midwifery-philosophy-values>
- Australian College of Midwives. (2018). *Midwives -The Best Maternity Care*. Retrieved from  
<https://www.midwives.org.au/midwives-best-maternity-care>
- Australian Institute of Health and Welfare. (2014). *National Drug Strategy Household Survey detailed report 2013*. Drug statistics series no. 28. Cat. no. PHE 183. Canberra: AIHW. <https://www.aihw.gov.au/reports/illicit-use-of-drugs/2013-ndshs-detailed/contents/table-of-contents>
- Australian Institute of Health and Welfare. (2016). *Australia's health 2016*. Australia's health series no. 15. Cat. no. AUS 199. Canberra: AIHW.  
<http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129556761>
- Australian Institute of Health and Welfare. (2017a). *Australia's mothers and babies 2015—in brief*. Perinatal statistics series no. 33. Cat no. PER 91. Canberra: AIHW.
- Australian Institute of Health and Welfare. (2017b). *National Drug Strategy Household Survey 2016: Detailed findings*. Drug Statistics series no. 31. Cat. no. PHE 214. Canberra: AIHW. [www.aihw.gov.au](http://www.aihw.gov.au)
- Australian Institute of Health and Welfare. (2020). *Australia's children*.
- Avilla, R. M., Surjan, J., de Fátima Ratto Padin, M., Canfield, M., Laranjeira, R. R., & Mitsuhiro, S. (2017). Factors associated with attrition rate in a supportive care service for substance using pregnant women in Brazil. *The American Journal on Addictions*, 26(7), 676–679. <https://doi.org/10.1111/ajad.12579>
- Ayres-de-Campos, D. (2017). Acute Fetal Hypoxia/Acidosis. In *Obstetric Emergencies* (pp. 7-25). Springer.
- Baggio, S., & Iglesias, K. (2020). On the limitations of the Alcohol Use Disorders Identification Test (AUDIT). *Drug and Alcohol Dependence*, 206, 107662.  
<https://doi.org/10.1016/j.drugalcdep.2019.107662>.

- Bailey, B. A., Wood, D. L., & Shah, D. (2020). Impact of pregnancy marijuana use on birth outcomes: results from two matched population-based cohorts. *Journal of Perinatology*, 40, 1477–1482. <https://doi.org/10.1038/s41372-020-0643-z>
- Barnett-Page, E., & Thomas, J. (2009). Methods for the synthesis of qualitative research: a critical review. *BMC medical research methodology*, 9(1), 1-11. <https://doi.org/10.1186/1471-2288-9-59>
- Barton, A. J. (2020). 2020: International Year of the Nurse and Midwife. *Journal of Nursing Education*, 59(1), 3-4. <https://doi.org/10.3928/01484834-20191223-01>
- Bartu, A., Freeman, N. C., Gawthorne, G. S., Codde, J. P., & Holman, C. D. A. J. (2004). Mortality in a cohort of opiate and amphetamine users in Perth, Western Australia. *Addiction*, 99(1), 53-60. <https://doi.org/10.1111/j.1360-0443.2004.00602.x>
- Bartu, A. E., Ilett, K. F., Hackett, L. P., Doherty, D. A., & Hamilton, D. (2012). Buprenorphine exposure in infants of opioid-dependent mothers at birth. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 52(4), 342-347. <https://doi.org/10.1111/j.1479-828X.2012.01424.x>
- Beckman, L. J. (1994). Treatment needs of women with alcohol problems. *Alcohol Health and Research World*, 18(3), 206-211. [https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6876404/#ffn\\_sectitle](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6876404/#ffn_sectitle)
- Behnke, M., & Eyler, F. D. (1993). The consequences of prenatal substance use for the developing fetus, newborn, and young child. *International Journal of the Addictions*, 28(13), 1341-1391. <https://doi.org/10.3109/10826089309062191>
- Behnke, M., Smith, V. C., & Committee on Substance Abuse. (2013). Prenatal substance abuse: short- and long-term effects on the exposed fetus [Review]. *Pediatrics*, 131(3), e1009-1024. <https://doi.org/10.1542/peds.2012-3931>
- Bell, J. C., Raynes-Greenow, C., Turner, R. M., Bower, C., Nassar, N., & O'Leary, C. M. (2014). Maternal alcohol consumption during pregnancy and the risk of orofacial clefts in infants: a systematic review and meta-analysis. *Paediatr Perinat Epidemiol*, 28(4), 322-332. <https://doi.org/10.1111/ppe.12131>
- Bell, R., & Lumley, J. (1989). Alcohol consumption, cigarette smoking and fetal outcome in Victoria, 1985. *Community Health Studies*, 13(4), 484-491. <https://doi.org/10.1111/j.1753-6405.1989.tb00707.x>
- Benningfield, M. M., Arria, A. M., Kaltenbach, K., Heil, S. H., Stine, S. M., Coyle, M. G., Fischer, G., Jones, H. E., & Martin, P. R. (2010). Co-occurring psychiatric symptoms are associated with increased psychological, social, and medical impairment in opioid

- dependent pregnant women. *The American Journal on Addictions*, 19(5), 416-421.  
<https://doi.org/10.1111/j.1521-0391.2010.00064.x>
- Bird, A. L., Grant, C. C., Bandara, D. K., Mohal, J., Atatoa-Carr, P. E., Wise, M. R., Inskip, H., Miyahara, M., & Morton, S. M. (2017). Maternal health in pregnancy and associations with adverse birth outcomes: Evidence from Growing Up in New Zealand. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 57(1), 16-24. <https://doi.org/10.1111/ajo.12557>
- Bland, E., Oppenheimer, L. W., Oppenheimer, L., Brisson-Carroll, G., Morel, C., Holmes, P., & Gruslin, A. (2001). Influence of an educational program on medical students' attitudes to substance use disorders in pregnancy. *The American journal of drug and alcohol abuse*, 27(3), 483-490. <https://doi.org/10.1081/ADA-100104513>
- Blandthorn, J., Forster, D. A., & Love, V. (2011). Neonatal and maternal outcomes following maternal use of buprenorphine or methadone during pregnancy: findings of a retrospective audit. *Women Birth*, 24(1), 32-39.  
<https://doi.org/10.1016/j.wombi.2010.07.001>
- Bogenschutz, M. P., Donovan, D. M., Adinoff, B., Crandall, C., Forcehimes, A. A., Lindblad, R., Mandler, R. N., Oden, N. L., Perl, H. I., & Walker, R. (2011). Design of NIDA CTN Protocol 0047: screening, motivational assessment, referral, and treatment in emergency departments (SMART-ED). *The American journal of drug and alcohol abuse*, 37(5), 417-425. <https://doi.org/10.3109/00952990.2011.596971>
- Bonello, M. R., Xu, F., Li, Z., Burns, L., Austin, M. P., & Sullivan, E. A. (2014). Mental and behavioral disorders due to substance abuse and perinatal outcomes: a study based on linked population data in New South Wales, Australia. *International journal of environmental research and public health*, 11(5), 4991-5005.  
<https://doi.org/10.3390/ijerph110504991>
- Bourgueil, Y., Marek, A., & Mousquès, J. (2009). Three models of primary care organisation in Europe, Canada, Australia and New-Zealand. *Questions d'économie de la santé*, 189, 1-6. <https://www.semanticscholar.org/paper/Three-Models-of-Primary-Care-Organisation-in-and-Bourgueil-Marek/50a5b51545511255a5f44f7e33863368ceece3b3>
- Boyd, J. H., Randall, S. M., Ferrante, A. M., Bauer, J. K., McInnery, K., Brown, A. P., Spilsbury, K., Gillies, M., & Semmens, J. B. (2015). Accuracy and completeness of patient pathways—the benefits of national data linkage in Australia. *BMC Health Services Research*, 15(1), 1-8. <https://doi.org/10.1186/s12913-015-0981-2>

- Bradley, K. A., Boyd-Wickizer, J., Powell, S. H., & Burman, M. L. (1998). Alcohol consumption by New Zealand women during pregnancy. *JAMA*, 280(2), 166-171.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, 3(2), 77-101.  
<https://www.tandfonline.com/doi/abs/10.1191/1478088706QP063OA>
- Braun, V., Clarke, V., & Terry, G. (2014). Thematic analysis. *Qual Res Clin Health Psychol*, 24, 95-114. [https://doi.org/10.1007/978-1-137-29105-9\\_7](https://doi.org/10.1007/978-1-137-29105-9_7)
- Brecht, M.-L., & Herbeck, D. M. (2014). Pregnancy and fetal loss reported by methamphetamine-using women. *Substance abuse: research and treatment*, 8, SART. S14125. <https://doi.org/10.4137/SART.S14125>
- Breen, C., Awbery, E., & Burns, L. (2014). *Supporting Pregnant Women who use Alcohol or other Drugs: a review of the evidence*. Canberra: National Drug and Alcohol Research Centre. Retrieved from <https://ndarc.med.unsw.edu.au/resource/supporting-pregnant-women-who-use-alcohol-or-other-drugs-review-evidence>
- Brink, P. J., & Wood, M. J. (1998). *Advanced design in nursing research*. Sage.
- Brodie, P. (2002). Addressing the barriers to midwifery—Australian midwives speaking out. *The Australian Journal of Midwifery*, 15(3), 5-14. [https://doi.org/10.1016/S1031-170X\(02\)80003-4](https://doi.org/10.1016/S1031-170X(02)80003-4)
- Bromfield, L., Lamont, A., Parker, R., & Horsfell, B. (2010). *Issues for the safety and wellbeing of children in families with multiple and complex problems*, (NCPC Issues No. 33). Melbourne: Australian Institute of Family Studies. Retrieved from <https://aifs.gov.au/cfca/publications/issues-safety-and-wellbeing-children-families-multiple-and-co>
- Brown, S. J., Mensah, F. K., Kit, J. A., Stuart-Butler, D., Glover, K., Leane, C., Weetra, D., Gartland, D., Newbury, J., & Yelland, J. (2016). Use of cannabis during pregnancy and birth outcomes in an Aboriginal birth cohort: A cross-sectional, population-based study. *BMJ Open*, 6 (2). <https://doi.org/10.1136/bmjopen-2015-010286>
- Bryant, R. (2009). *Improving maternity services in Australia: the report of the maternity services review*. Canberra: Office of the Commonwealth Chief Nurse and Midwifery Officer. Retrieved from <https://www1.health.gov.au/internet/main/publishing.nsf/Content/maternityservicesreview-report>
- Bullens, L. M., Moors, S., van Runnard Heimel, P. J., van der Hout-van, M. B., & Oei, S. G. (2016). Practice variation in the management of intrapartum fetal distress in the

- Netherlands and the Western world. *European Journal of Obstetrics & Gynecology and Reproductive Biology*, 205, 48-53. <https://doi.org/10.1016/j.ejogrb.2016.08.012>
- Burns, L., Coleman-Cowger, V. H., & Breen, C. (2016). Managing maternal substance use in the perinatal period: current concerns and treatment approaches in the United States and Australia. *Substance abuse: research and treatment*, 10, SART. S34558. <https://doi.org/10.4137/SART.S34558>
- Burns, L., Conroy, E., & Mattick, R. P. (2010). Infant mortality among women on a methadone program during pregnancy. *Drug and Alcohol Review*, 29(5), 551-556. <https://doi.org/10.1111/j.1465-3362.2010.00176.x>
- Burns, L., & Mattick, R. P. (2007). Using population data to examine the prevalence and correlates of neonatal abstinence syndrome [Research Support, Non-U.S. Gov't]. *Drug & Alcohol Review*, 26(5), 487-492. <https://doi.org/10.1080/09595230701494416>
- Burns, L., Mattick, R. P., & Cooke, M. (2006a). Use of record linkage to examine alcohol use in pregnancy. *Alcoholism: Clinical & Experimental Research*, 30(4), 642-648. <https://doi.org/10.1111/j.1530-0277.2006.00075.x>
- Burns, L., Mattick, R. P., & Cooke, M. (2006b). The use of record linkage to examine illicit drug use in pregnancy. *Addiction*, 101(6), 873-882. <https://doi.org/10.1111/j.1360-0443.2006.01444.x>
- Burns, L., Mattick, R. P., Lim, K., & Wallace, C. (2007). Methadone in pregnancy: treatment retention and neonatal outcomes. *Addiction*, 102(2), 264-270. <https://doi.org/10.1111/j.1360-0443.2006.01651.x>
- Buultjens, M., Murphy, G., Robinson, P., & Milgrom, J. (2013). The perinatal period: A literature review from the biopsychosocial perspective. *Clinical Nursing Studies*, 1(3), 19-31. <https://doi.org/10.5430/cns.v1n3p19>
- Byatt, N., Masters, G. A., Bergman, A. L., & Simas, T. A. M. (2020). Screening for Mental Health and Substance Use Disorders in Obstetric Settings. *Current Psychiatry Reports*, 22(11), 1-13.
- Centre for Health Record Linkage. (2020a). *APDC Data Dictionary*. Retrieved from <https://www.cherel.org.au/data-dictionaries#section1>
- Centre for Health Record Linkage. (2020b). *PDC Data Dictionary*. Retrieved from <https://www.cherel.org.au/data-dictionaries#section10>
- Chang, G. (2001). Alcohol-screening instruments for pregnant women. *Alcohol Research and Health*, 25(3), 204-210.



- Chang, G., Ondersma, S. J., Blake-Lamb, T., Gilstad-Hayden, K., Orav, E. J., & Yonkers, K. A. (2019). Identification of substance use disorders among pregnant women: A comparison of screeners. *Drug and Alcohol Dependence*, 205, 107651. <https://doi.org/10.1016/j.drugalcdep.2019.107651>
- Chasnoff, I. J., McGourty, R. F., Bailey, G. W., Hutchins, E., Lightfoot, S. O., Pawson, L. L., Fahey, C., May, B., Brodie, P., & McCulley, L. (2005). The 4P's Plus© screen for substance use in pregnancy: clinical application and outcomes. *Journal of Perinatology*, 25(6), 368-374. <https://doi.org/10.1038/sj.jp.7211266>
- Chief Nursing Officers of England, Northern Ireland, & Scotland and Wales. (2010). *Midwifery 2020: Delivery Expectations*. Department of Health, London. <https://www.gov.uk/government/publications/midwifery-2020-delivering-expectations>
- Chou, D., Daelmans, B., Jolivet, R. R., Kinney, M., & Say, L. (2015). Ending preventable maternal and newborn mortality and stillbirths. *BMJ*, 351, h4255. <https://doi.org/10.1136/bmj.h4255>
- Coleman-Cowger, V. H., Oga, E. A., Peters, E. N., Trocin, K. E., Koszowski, B., & Mark, K. (2019). Accuracy of three screening tools for prenatal substance use. *Obstetrics and Gynecology*, 133(5), 952-961. <https://doi.org/10.1097/AOG.0000000000003230>
- Coles, L., & Porter, E. (2008). *Public health skills: a practical guide for nurses and public health practitioners*. Blackwell.
- Collins, D., & Lapsley, H. M. (2008). *The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05*. Department of Health and Ageing Canberra. Retrieved from <http://www.ag.gov.au/cca>
- Committee on Obstetric Practice. (2017). Committee Opinion No. 711: opioid use and opioid use disorder in pregnancy. *Obstetrics and Gynecology*, 130(2), e81-e94. <https://doi.org/10.1097/AOG.0000000000002235>
- Connelly, L. M. (2016). Trustworthiness in qualitative research. *Medsurg Nursing*, 25(6), 435-437.
- Corse, S. J., McHugh, M. K., & Gordon, S. M. (1995). Enhancing provider effectiveness in treating pregnant women with addictions. *Journal of Substance Abuse Treatment*, 12(1), 3-12. [https://doi.org/10.1016/0740-5472\(94\)00073-5](https://doi.org/10.1016/0740-5472(94)00073-5)
- Corsi, D. J., Walsh, L., Weiss, D., Hsu, H., El-Chaar, D., Hawken, S., Fell, D. B., & Walker, M. (2019). Association between self-reported prenatal cannabis use and maternal,

- perinatal, and neonatal outcomes. *JAMA*, 322(2), 145-152.  
<https://doi.org/doi:10.1001/jama.2019.8734>
- Counsell, A. M., Smale, P. N., & Geddis, D. C. (1994). Alcohol consumption by New Zealand women during pregnancy. *New Zealand Medical Journal*, 107(982), 278-281.
- Coupland, H., Moensted, M. L., Reid, S., White, B., Eastwood, J., Haber, P., & Day, C. (2021). Developing a model of care for substance use in pregnancy and parenting services, Sydney, Australia: Service provider perspectives. *Journal of Substance Abuse Treatment*, 131, 108420.
- Crawford-Williams, F., Steen, M., Esterman, A., Fielder, A., & Mikocka-Walus, A. (2015). “If you can have one glass of wine now and then, why are you denying that to a woman with no evidence”: Knowledge and practices of health professionals concerning alcohol consumption during pregnancy. *Women and Birth*, 28(4), 329-335. <https://doi.org/10.1016/j.wombi.2015.04.003>
- Creswell, J. W., Plano Clark, V. L., Gutmann, M. L., & Hanson, W. E. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 209-240). Sage.
- Crume, T. (2019). Tobacco use during pregnancy. *Clinical Obstetrics and Gynecology*, 62(1), 128-141.
- Davie-Gray, A., Moor, S., Spencer, C., & Woodward, L. J. (2013). Psychosocial characteristics and poly-drug use of pregnant women enrolled in methadone maintenance treatment. *Neurotoxicology and Teratology*, 38, 46-52.  
<https://doi.org/10.1016/j.ntt.2013.04.006>
- Dawson, A. P., Cargo, M., Stewart, H., Chong, A., & Daniel, M. (2012). “I know it’s bad for me and yet I do it”: exploring the factors that perpetuate smoking in Aboriginal Health Workers-a qualitative study. *BMC Health Services Research*, 12(1), 1-12.
- Deery, R. (2005). An action-research study exploring midwives’ support needs and the affect of group clinical supervision. *Midwifery*, 21(2), 161-176.  
<https://doi.org/10.1016/j.midw.2004.10.006>
- Department of Health. (2011). *National Maternity Services Plan: Provision of maternity care*  
 Retrieved from  
<https://www1.health.gov.au/internet/publications/publishing.nsf/Content/pacd-maternityservicesplan-toc~pacd-maternityservicesplan-chapter3>



- Department of Health. (2017). *National Drug Strategy 2017-2026*. Retrieved from [https://www.health.gov.au/internet/main/publishing.nsf/Content/55E4796388E9EDE5CA25808F00035035/\\$File/National-Drug-Strategy-2017-2026.docx](https://www.health.gov.au/internet/main/publishing.nsf/Content/55E4796388E9EDE5CA25808F00035035/$File/National-Drug-Strategy-2017-2026.docx)
- Department of Health. (2019). *Australia's Future Health Workforce Report – Midwives*. Retrieved from <https://www1.health.gov.au/internet/main/publishing.nsf/Content/australias-future-health-workforce-midwife-report>
- Department of Health and Human Services. (2018). *Alcohol and other drugs program guidelines: Program and service specifications*. Retrieved from <https://www2.health.vic.gov.au/alcohol-and-drugs/aod-service-standards-guidelines/aod-program-guidelines>
- DeVido, J., Bogunovic, O., & Weiss, R. D. (2015). Alcohol use disorders in pregnancy. *Harvard review of psychiatry*, 23(2), 112-121. <https://doi.org/10.1097/HRP.0000000000000070>
- Diekman, S. T., Floyd, R. L., Decoufle, P., Schulkin, J., Ebrahim, S. H., & Sokol, R. J. (2000). A survey of obstetrician–gynecologists on their patients' alcohol use during pregnancy. *Obstetrics & Gynecology*, 95(5), 756-763. [https://doi.org/10.1016/S0029-7844\(99\)00616-X](https://doi.org/10.1016/S0029-7844(99)00616-X)
- Diseth, Å. (2001). Validation of a Norwegian version of the Approaches and Study Skills Inventory for Students (ASSIST): application of structural equation modelling. *Scandinavian Journal of Educational Research*, 45(4), 381-394. <https://doi.org/10.1080/00313830120096789>
- Dobbins, T. A., Sullivan, E. A., Roberts, C. L., & Simpson, J. M. (2012). Australian national birthweight percentiles by sex and gestational age, 1998-2007. *Medical Journal of Australia*, 197(5), 291. [https://www.mja.com.au/system/files/issues/dob11331\\_fm.pdf](https://www.mja.com.au/system/files/issues/dob11331_fm.pdf)
- Doi, L., Cheyne, H., & Jepson, R. (2014). Alcohol brief interventions in Scottish antenatal care: a qualitative study of midwives' attitudes and practices. *BMC Pregnancy & Childbirth*, 14(170), 1-10. <https://doi.org/10.1186/1471-2393-14-170>
- Doi, L., Jepson, R., & Cheyne, H. (2015). A realist evaluation of an antenatal programme to change drinking behaviour of pregnant women [Research Support, Non-U.S. Gov't]. *Midwifery*, 31(10), 965-972. <https://doi.org/10.1016/j.midw.2015.06.007>
- Economidoy, E., Klimi, A., & Vivilaki, V. G. (2012). Caring for substance abuse pregnant women: The role of the midwife. *Health Science Journal*, 6(1), 161-169.

- Eldridge, W. B., Foster, C., & Wyble, L. (2018). Neonatal Abstinence Syndrome Due to Maternal Kratom Use. *Pediatrics*, 142(6), e20181839.  
<https://doi.org/10.1542/peds.2018-1839>
- Ellwood, D. A., Sutherland, P., Kent, C., & O'Connor, M. (1987). Maternal narcotic addiction: pregnancy outcome in patients managed by a specialized drug-dependency antenatal clinic. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 27(2), 92-98. <https://doi.org/10.1111/j.1479-828X.1987.tb00952.x>
- Fares, I., McCulloch, K. M., & Raju, T. N. (1997). Intrauterine cocaine exposure and the risk for sudden infant death syndrome: a meta-analysis. *J Perinatol*, 17(3), 179-182.  
<http://www.ncbi.nlm.nih.gov/pubmed/9210070>
- Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health Services Research*, 48(6pt2), 2134-2156. <https://doi.org/10.1111/1475-6773.12117>
- Fonti, S., Davis, D., Ferguson, S. J. W., & Birth. (2016). The attitudes of healthcare professionals towards women using illicit substances in pregnancy: A cross-sectional study. 29(4), 330-335. <https://doi.org/10.1016/j.wombi.2016.01.001>
- Food Standards Australia New Zealand (FSANZ). (2020). *Pregnancy warning labels on alcoholic beverages. Approval report - proposal 1050*. Retrieved from <https://www.foodstandards.gov.au/code/proposals/DocumentsZP1050%20Approval%20Report.pdf>.
- Ford, R., Bammer, G., & Becker, N. (2009). Improving nurses' therapeutic attitude to patients who use illicit drugs: workplace drug and alcohol education is not enough. *International Journal of Nursing Practice*, 15(2), 112-118.  
<https://doi.org/10.1111/j.1440-172X.2009.01732.x>
- Forray, A. (2016). Substance use during pregnancy. *F1000Research*, 5:887.  
<https://doi.org/10.12688/f1000research.7645.1>
- Forray, A., & Foster, D. (2015). Substance Use in the Perinatal Period. *Current Psychiatry Reports*, 17(11), 91. <https://doi.org/10.1007/s11920-015-0626-5>
- Forrester, D., & Harwin, J. (2006). Parental substance misuse and child care social work: findings from the first stage of a study of 100 families. *Child & Family Social Work*, 11(4), 325-335. <https://doi.org/10.1111/j.1365-2206.2006.00415.x>
- Fox, D. J., Pettygrove, S., Cunniff, C., O'Leary, L. A., Gilboa, S. M., Bertrand, J., Druschel, C. M., Breen, A., Robinson, L., & Ortiz, L. (2015). Fetal alcohol syndrome among children aged 7–9 years—Arizona, Colorado, and New York, 2010. *MMWR*.

*Morbidity and mortality weekly report*, 64(3), 54-57.

<http://www.cdc.gov/ncbddd/fasd/training.html>.

- France, K., Henley, N., Payne, J., D'Antoine, H., Bartu, A., O'Leary, C., Elliott, E., & Bower, C. (2010). Health professionals addressing alcohol use with pregnant women in Western Australia: Barriers and strategies for communication [Empirical Study; Interview; Focus Group; Qualitative Study]. *Substance use & misuse*, 45(10), 1474-1490. <https://doi.org/10.3109/10826081003682172>
- French, E. (2013). Substance abuse in pregnancy: Compassionate and competent care for the patient in labor [Conference Paper]. *Clinical Obstetrics and Gynecology*, 56(1), 173-177. <https://doi.org/10.1097/GRF.0b013e31828030f4>
- Galland, B. C., Mitchell, E. A., Thompson, J. M., Wouldes, T., & Group, N. I. S. (2013). Auditory evoked arousal responses of 3-month-old infants exposed to methamphetamine in utero: a nap study. *Acta Paediatrica*, 102(4), 424-430. <https://doi.org/10.1111/apa.12136>
- Gerardin, M., Victorri-Vigneau, C., Louvigne, C., Rivoal, M., & Jolliet, P. (2011). Management of cannabis use during pregnancy: an assessment of healthcare professionals' practices. *Pharmacoepidemiology and drug safety*, 20(5), 464-473. <https://doi.org/10.1002/pds.2095>
- Gibson, G. T., Baghurst, P. A., & Colley, D. P. (1983). Maternal alcohol, tobacco and cannabis consumption and the outcome of pregnancy. *Australian and New Zealand Journal of Obstetrics and Gynaecology*, 23(1), 15-19. <https://doi.org/10.1111/j.1479-828X.1983.tb00151.x>
- Gibson, L., & Porter, M. (2021). Alcohol and Tobacco use While Breastfeeding and Risk of Autism Spectrum Disorder or Attention Deficit/Hyperactivity Disorder. *Journal of autism and developmental disorders*, 1-12.
- Giles, W., Patterson, T., Sanders, F., Batey, R., Thomas, D., & Collins, J. (1989). Outpatient methadone programme for pregnant heroin using women. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 29(3), 225-229. <https://doi.org/10.1111/j.1479-828X.1989.tb01724.x>
- Gorman, M. C., Orme, K. S., Nguyen, N. T., Kent III, E. J., & Caughey, A. B. (2014). Outcomes in pregnancies complicated by methamphetamine use. *American journal of obstetrics and gynecology*, 211(4), 429.e421-429.e427. <https://doi.org/10.1016/j.ajog.2014.06.005>

- Gouin, K., Murphy, K., & Shah, P. S. (2011). Effects of cocaine use during pregnancy on low birthweight and preterm birth: systematic review and metaanalyses. *American journal of obstetrics and gynecology*, 204(4), 340. e341-340. e312.  
<https://doi.org/10.1016/j.ajog.2010.11.013>
- Green, C. R., Roane, J., Hewitt, A., Muhajarine, N., Mushquash, C., Sourander, A., Lingley-Pottie, P., McGrath, P., & Reynolds, J. N. (2014). Frequent behavioural challenges in children with fetal alcohol spectrum disorder: a needs-based assessment reported by caregivers and clinicians. *Journal of Population Therapeutics and Clinical Pharmacology*, 21(3), e405-420.  
<https://www.jptcp.com/index.php/jptcp/article/view/591/516>
- Green, J., & Thorogood, N. (2013). *Qualitative Methods for Health Research*. SAGE
- Greenmyer, J., Stacy, J., Klug, M., Foster, K., Tiongson, C., & Burd, L. (2020). Pregnancy Status is Associated With Screening for Alcohol and Other Substance Use in the Emergency Department. *J Addict Med*, 14(4), e64-e69.  
<https://doi.org/10.1097/ADM.0000000000000616>
- Groenewald, C., & Bhana, A. (2018). Substance abuse and the family: An examination of the South African policy context. *Drugs: education, prevention and policy*, 25(2), 148-155. <https://doi.org/10.1080/09687637.2016.1236072>
- Gryczynski, J., Kelly, S. M., Mitchell, S. G., Kirk, A., O'grady, K. E., & Schwartz, R. P. (2014). Validation and performance of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) among adolescent primary care patients. *Addiction*, 111(12), 2263-2263. <https://doi.org/10.1111/add.12767>
- Grzeskowiak, L. E., Grieger, J. A., Andraweera, P., Knight, E. J., Leemaqz, S., Poston, L., McCowan, L., Kenny, L., Myers, J., & Walker, J. J. (2020). The deleterious effects of cannabis during pregnancy on neonatal outcomes. *Medical Journal of Australia*, 212(11), 519-524. <https://doi.org/10.5694/mja2.50624>
- Gueta, K. (2017). A qualitative study of barriers and facilitators in treating drug use among Israeli mothers: An intersectional perspective. *Social Science & Medicine*, 187, 155-163. <https://doi.org/10.1016/j.socscimed.2017.06.031>
- Gulliford, M., Naithani, S., & Morgan, M. (2006). What is 'continuity of care'? *Journal of Health Services Research & Policy*, 11(4), 248-250.  
<https://doi.org/10.1258/135581906778476490>

- Gyarmathy, V., Giraudon, I., Hedrich, D., Montanari, L., Guarita, B., & Wiessing, L. (2009). Drug use and pregnancy—challenges for public health. *Eurosurveillance*, 14(9), 19142. <https://doi.org/10.2807/ese.14.09.19142-en>
- Haight, S. C., Ko, J. Y., Tong, V. T., Bohm, M. K., & Callaghan, W. M. (2018). Opioid use disorder documented at delivery hospitalization—United States, 1999–2014. *Morbidity and Mortality Weekly Report*, 67(31), 845-849. <https://pcssnow.org/wp-content/uploads/2014/02/5B-DSM-5-Opioid-Use-Disorder-Diagnostic-Criteria.pdf>.
- Hall, W., & Weier, M. (2015). Assessing the public health impacts of legalizing recreational cannabis use in the USA. *Clinical Pharmacology & Therapeutics*, 97(6), 607-615. <https://doi.org/10.1002/cpt.110>
- Harron, K., Dibben, C., Boyd, J., Hjern, A., Azimae, M., Barreto, M. L., & Goldstein, H. (2017). Challenges in administrative data linkage for research. *Big data & society*, 4(2), . <https://doi.org/10.1177/2053951717745678>
- Hayatbakhsh, M. R., Flenady, V. J., Gibbons, K. S., Kingsbury, A. M., Hurrion, E., Mamun, A. A., & Najman, J. M. (2012). Birth outcomes associated with cannabis use before and during pregnancy. *Pediatric Research*, 71(2), 215-219. <https://doi.org/10.1038/pr.2011.25>
- Hayatbakhsh, M. R., Kingsbury, A. M., Flenady, V., Gilshenan, K. S., Hutchinson, D. M., & Najman, J. M. (2011). Illicit drug use before and during pregnancy at a tertiary maternity hospital 2000-2006. *Drug & Alcohol Review*, 30(2), 181-187. <https://doi.org/10.1111/j.1465-3362.2010.00214.x>
- Henderson, J., Gray, R., & Brocklehurst, P. (2007). Systematic review of effects of low–moderate prenatal alcohol exposure on pregnancy outcome. *BJOG: An International Journal of Obstetrics & Gynaecology*, 114(3), 243-252.
- Henderson, T., Shepherd, J., & Sundararajan, V. (2006). Quality of diagnosis and procedure coding in ICD-10 administrative data. *Medical care*, 44(11), 1011-1019. <https://www.jstor.org/stable/41219556>
- Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, 327(7414), 557-560. <https://www.ncbi.nlm.nih.gov/pubmed/12958120>
- Hoffman, R. S., & Goldfrank, L. (1990). The impact of drug abuse and addiction on society. *Emergency medicine clinics of North America*, 8(3), 467-480. <https://europepmc.org/article/med/2201515>

- Holland, C. L., Nkumsah, M. A., Morrison, P., Tarr, J. A., Rubio, D., Rodriguez, K. L., Kraemer, K. L., Day, N., Arnold, R. M., & Chang, J. C. (2016a). "Anything above marijuana takes priority": Obstetric providers' attitudes and counseling strategies regarding perinatal marijuana use. *Patient Education & Counseling*, 99(9), 1446-1451. <https://doi.org/https://dx.doi.org/10.1016/j.pec.2016.06.003>
- Holland, C. L., Rubio, D., Rodriguez, K. L., Kraemer, K. L., Day, N., Arnold, R. M., Tarr, J. A., & Chang, J. C. (2016b). Obstetric Health Care Providers' Counseling Responses to Pregnant Patient Disclosures of Marijuana Use. *Obstetrics & Gynecology*, 127(4), 681-687. <https://doi.org/10.1097/AOG.0000000000001343>
- Holman, C. A. J., Bass, A. J., Rouse, I. L., & Hobbs, M. S. (1999). Population-based linkage of health records in Western Australia: development of a health services research linked database. *Australian and New Zealand journal of public health*, 23(5), 453-459. <https://doi.org/10.1111/j.1467-842X.1999.tb01297.x>
- Homer, C. S. (2006). Challenging midwifery care, challenging midwives and challenging the system. *Women and Birth*, 19(3), 79-83. <https://doi.org/10.1016/j.wombi.2006.07.002>
- Homer, C. S. (2016). Models of maternity care: evidence for midwifery continuity of care. *Medical Journal of Australia*, 205(8), 370-374. <https://doi.org/10.5694/mja16.00844>
- Hotham, E. D., Ali, R. L., & White, J. M. (2016). Analysis of qualitative data from the investigation study in pregnancy of the ASSIST Version 3.0 (The Alcohol, Smoking and Substance Involvement Screening Test). *Midwifery*, 34, 183-197. <https://doi.org/10.1016/j.midw.2015.11.011>
- Hudak, M. L., & Tan, R. C. (2012). Neonatal drug withdrawal. *Pediatrics*, 129(2), e540-e560. <https://doi.org/10.1542/peds.2011-3212>
- Hughes, Z. (2016). Substance misuse: can midwives really make a difference? *Practising Midwife*, 19(4), 18-20. <https://europepmc.org/article/med/27172675>
- Huizink, A. C. (2014). Prenatal cannabis exposure and infant outcomes: overview of studies. *Progress in Neuro-Psychopharmacology & Biological Psychiatry*, 3(52), 45-52. <https://doi.org/10.1016/j.pnpbp.2013.09.014>
- Hussein Rassool, G., & Oyefeso, A. O. (1993). The need for substance misuse education in health studies curriculum: a case for nursing education. *Nurse Education Today*, 13(2), 107-110. [https://doi.org/10.1016/0260-6917\(93\)90026-X](https://doi.org/10.1016/0260-6917(93)90026-X)
- Hwang, S. S., Diop, H., Liu, C. L., Yu, Q., Babakhanlou-Chase, H., Cui, X., & Kotelchuck, M. (2017). Maternal Substance Use Disorders and Infant Outcomes in the First Year



- of Life among Massachusetts Singletons, 2003-2010. *Journal of Pediatrics*, 191, 69-75. <https://doi.org/10.1016/j.jpeds.2017.08.045>
- International Confederation of Midwives. (2017). *ICM International Definition of the Midwife*. Retrieved from <https://www.internationalmidwives.org/our-work/policy-and-practice/icm-definitions.html>
- Jackson, A., & Shannon, L. (2012a). Barriers to receiving substance abuse treatment among rural pregnant women in Kentucky. *Maternal & Child Health Journal*, 16(9), 1762-1770. <https://doi.org/10.1007/s10995-011-0923-5>
- Jackson, A., & Shannon, L. (2012b). Examining barriers to and motivations for substance abuse treatment among pregnant women: does urban-rural residence matter? *Women & Health*, 52(6), 570-586. <https://doi.org/10.1080/03630242.2012.699508>
- Jansson, L. M., Choo, R., Velez, M. L., Lowe, R., & Huestis, M. A. (2008). Methadone maintenance and long-term lactation. *Breastfeeding medicine*, 3(1), 34-37. <https://doi.org/10.1089/bfm.2007.0032>
- Jaques, S., Kingsbury, A., Henshcke, P., Chomchai, C., Clews, S., Falconer, J., Abdel-Latif, M., Feller, J., & Oei, J. (2014). Cannabis, the pregnant woman and her child: weeding out the myths. *Journal of Perinatology*, 34(6), 417-424. <https://doi.org/10.1038/jp.2013.180>
- Joffe, H., & Yardley, L. (2004). Content and thematic analysis. In D. Marks & L. Yardley (Eds.), *Research Methods for Clinical Health Psychology* (pp. 56-68). Sage.
- Johnson, M., Jackson, R., Guillaume, L., Meier, P., & Goyder, E. (2010). Barriers and facilitators to implementing screening and brief intervention for alcohol misuse: a systematic review of qualitative evidence. *Journal of Public Health*, 33(3), 412-421. <https://doi.org/10.1093/pubmed/fdq095>
- Jones, H. E., Finnegan, L. P., & Kaltenbach, K. (2012a). Methadone and buprenorphine for the management of opioid dependence in pregnancy. *Drugs*, 72(6), 747-757. <https://doi.org/10.2165/11632820-000000000-00000>
- Jones, H. E., Heil, S. H., Baewert, A., Arria, A. M., Kaltenbach, K., Martin, P. R., Coyle, M. G., Selby, P., Stine, S. M., & Fischer, G. (2012b). Buprenorphine treatment of opioid-dependent pregnant women: a comprehensive review. *Addiction*, 107, 5-27. <https://doi.org/10.1111/j.1360-0443.2012.04035.x>
- Kar, P., Tomfohr-Madsen, L., Giesbrecht, G., Bagshawe, M., & Lebel, C. (2021). Alcohol and substance use in pregnancy during the COVID-19 pandemic. *Drug and Alcohol Dependence*, 108760.

- Keegan, J., Parva, M., Finnegan, M., Gerson, A., & Belden, M. (2010). Addiction in pregnancy. *Journal of Addictive Diseases*, 29(2), 175-191.  
<https://doi.org/10.1080/10550881003684723>
- Kelly, J. (2013). Decolonizing sexual health nursing with Aboriginal women. *Can J Nurs Res*, 45(3), 50-65. <https://doi.org/10.1177/084456211304500304>
- Kelly, J. J., Davis, P. G., & Henschke, P. N. (2000). The drug epidemic: Effects on newborn infants and health resource consumption at a tertiary perinatal centre. *Journal of Paediatrics and Child Health*, 36(3), 262-264. <https://doi.org/10.1046/j.1440-1754.2000.00492.x>
- Kennare, R., Heard, A., & Chan, A. (2005). Substance use during pregnancy: risk factors and obstetric and perinatal outcomes in South Australia. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 45(3), 220-225. <https://doi.org/10.1111/j.1479-828X.2005.00379.x>
- Khadivzadeh, T., Katebi, M. S., Sepehri Shamloo, Z., & Esmaily, H. (2015). Assessment of midwives' communication skills at the maternity wards of teaching hospitals in mashhad in 2014. *Journal of midwifery reproductive health*, 3(3), 394-400.
- Khan, H. R., & Shaw, E. (2011). Multilevel logistic regression analysis applied to binary contraceptive prevalence data. *Journal of Data Science*, 9, 93-110.  
<https://ssrn.com/abstract=2019344>
- Khan, K. S., Kunz, R., Kleijnen, J., & Antes, G. (2003). Five steps to conducting a systematic review. *Journal of the royal society of medicine*, 96(3), 118-121.
- Kipke, M. D., Montgomery, S. B., Simon, T. R., & Iverson, E. F. (1997). "Substance abuse" disorders among runaway and homeless youth. *Substance use & misuse*, 32(7-8), 969-986. <https://doi.org/10.3109/10826089709055866>
- Ko, J. Y., Tong, V. T., Haight, S. C., Terplan, M., Stark, L., Snead, C., & Schulkin, J. (2019). Obstetrician–gynecologists' practices and attitudes on substance use screening during pregnancy. *Journal of Perinatology*, 40 (3), 422-432. <https://doi.org/10.1038/s41372-019-0542-3>
- LaGasse, L. L., Woudes, T., Newman, E., Smith, L. M., Shah, R. Z., Derauf, C., Huestis, M. A., Arria, A. M., Della Grotta, S., & Wilcox, T. (2011a). Prenatal methamphetamine exposure and neonatal neurobehavioral outcome in the USA and New Zealand. *Neurotoxicology and Teratology*, 33(1), 166-175.  
<https://doi.org/10.1016/j.ntt.2010.06.009>



- LaGasse, L. L., Wouldes, T., Newman, E., Smith, L. M., Shah, R. Z., Derauf, C., Huestis, M. A., Arria, A. M., Grotta, S. D., Wilcox, T., & Lester, B. M. (2011b). Prenatal methamphetamine exposure and neonatal neurobehavioral outcome in the USA and New Zealand [Empirical Study; Longitudinal Study; Prospective Study; Quantitative Study]. *Neurotoxicology and Teratology*, 33(1), 166-175.  
<https://doi.org/10.1016/j.ntt.2010.06.009>
- Larsen, K., & Merlo, J. (2005). Appropriate assessment of neighborhood effects on individual health: integrating random and fixed effects in multilevel logistic regression. *Am J Epidemiol*, 161(1), 81-88. <https://doi.org/https://doi.org/10.1093/aje/kwi017>
- Leap, N. (2002). Identifying the midwifery practice component of Australian midwifery education programs. Results of the Australian midwifery action project (AMAP) education survey. *The Australian Journal of Midwifery*, 15(3), 15-23.  
[https://doi.org/10.1016/S1031-170X\(02\)80004-6](https://doi.org/10.1016/S1031-170X(02)80004-6)
- Leap, N., Barclay, L., & Sheehan, A. (2003). Results of the Australian Midwifery Action Project Education Survey. Paper 2: Barriers to effective midwifery education as identified by midwifery course coordinators. *Australian Midwifery*, 16(3), 6-11.  
[https://doi.org/10.1016/S1448-8272\(03\)80010-X](https://doi.org/10.1016/S1448-8272(03)80010-X)
- LeBel, T. P., Burnett, R., Maruna, S., & Bushway, S. (2008). The chicken and egg'of subjective and social factors in desistance from crime. *European Journal of Criminology*, 5(2), 131-159. <https://doi.org/10.1177/1477370807087640>
- Lemola, S., Gkiouleka, A., Urfer-Maurer, N., Grob, A., Schwarz, K. T., & Meyer-Leu, Y. (2020). Midwives' engagement in smoking-and alcohol-prevention in prenatal care before and after the introduction of practice guidelines in Switzerland: comparison of survey findings from 2008 and 2018. *BMC Pregnancy and Childbirth*, 20(1), 31.  
<https://doi.org/10.1186/s12884-019-2706-8>
- Lester, B. M., Andreozzi, L., & Appiah, L. (2004). Substance use during pregnancy: time for policy to catch up with research. *Harm Reduction Journal*, 1(5), 1-44.  
<https://doi.org/10.1186/1477-7517-1-5>
- Liamputtong, P. (2013). *The science of words and the science of numbers : research methods as foundations for evidence-based practice in health*. Oxford University Press
- Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P., Clarke, M., Devereaux, P. J., Kleijnen, J., & Moher, D. (2009). The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care

- interventions: explanation and elaboration. *Journal of clinical epidemiology*, 62(10), e1-e34. <https://doi.org/10.1016/j.jclinepi.2009.06.006>
- Lincoln, Y. S., & Guba, E. G. (1985). Establishing trustworthiness. *Naturalistic inquiry*, 289(331), 289-327.
- Little, M., Shah, R., Vermeulen, M. J., Gorman, A., Dzendoletas, D., & Ray, J. G. (2005). Adverse perinatal outcomes associated with homelessness and substance use in pregnancy. *Canadian Medical Association Journal*, 173(6), 615-618. <https://doi.org/10.1503/cmaj.050406>
- Logan, C. A., Rothenbacher, D., & Genuneit, J. (2017). Postpartum smoking relapse and breast feeding: defining the window of opportunity for intervention. *Nicotine & Tobacco Research*, 19(3), 367-372. <https://doi.org/10.1093/ntr/ntw224>
- Ludlow, J. P., Evans, S. E., & Hulse, A. (2004). Obstetric and perinatal outcomes in pregnancies associated with illicit substance abuse. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 44(4), 302-306. <https://doi.org/10.1111/j.1479-828X.2004.00221.x>
- Lumley, J., Correy, J. F., Newman, N. M., & Curran, J. T. (1985). Cigarette smoking, alcohol consumption and fetal outcome in Tasmania 1981-82. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 25(1), 33-40. <https://doi.org/10.1111/j.1479-828X.1985.tb00599.x>
- Lund, T. (2012). Combining qualitative and quantitative approaches: Some arguments for mixed methods research. *Scandinavian Journal of Educational Research*, 56(2), 155-165. <https://doi.org/10.1080/00313831.2011.568674>
- Lundgren, I., & Berg, M. (2007). Central concepts in the midwife–woman relationship. *Scandinavian Journal of Caring Sciences*, 21(2), 220-228. <https://doi.org/10.1111/j.1471-6712.2007.00460.x>
- Lundsberg, L. S., Illuzzi, J. L., Belanger, K., Triche, E. W., & Bracken, M. B. (2015). Low-to-moderate prenatal alcohol consumption and the risk of selected birth outcomes: a prospective cohort study. *Annals of epidemiology*, 25(1), 46-54.e43. <https://doi.org/10.1016/j.annepidem.2014.10.011>
- Marcellus, L., MacKinnon, K., Benoit, C., Phillips, R., & Stengel, C. (2015). Reenvisioning success for programs supporting pregnant women with problematic substance use [Research Support, Non-U.S. Gov't]. *Qualitative Health Research*, 25(4), 500-512. <https://doi.org/10.1177/1049732314551058>

- Martin, C. E., Longinaker, N., Mark, K., Chisolm, M. S., & Terplan, M. (2015). Recent trends in treatment admissions for marijuana use during pregnancy. *J Addict Med*, 9(2), 99-104. <https://doi.org/http://dx.doi.org/10.1097/ADM.0000000000000095>
- Martin, S. L., English, K. T., Clark, K. A., Cilenti, D., & Kupper, L. L. (1996). Violence and substance use among North Carolina pregnant women. *American Journal of Public Health*, 86(7), 991-998. <https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.86.7.991>
- Maupin, R., Jr., Lyman, R., Fatsis, J., Prystowski, E., Nguyen, A., Wright, C., Kissinger, P., & Miller, J., Jr. (2004). Characteristics of women who deliver with no prenatal care. *J Matern Fetal Neonatal Med*, 16(1), 45-50. <http://www.ncbi.nlm.nih.gov/pubmed/15370082>
- May, P. A., Chambers, C. D., Kalberg, W. O., Zellner, J., Feldman, H., Buckley, D., Kopald, D., Hasken, J. M., Xu, R., Honerkamp-Smith, G., Taras, H., Manning, M. A., Robinson, L. K., Adam, M. P., Abdul-Rahman, O., Vaux, K., Jewett, T., Elliott, A. J., Kable, J. A., Akshoomoff, N., Falk, D., Arroyo, J. A., Hereld, D., Riley, E. P., Charness, M. E., Coles, C. D., Warren, K. R., Jones, K. L., & Hoyme, H. E. (2018). Prevalence of Fetal Alcohol Spectrum Disorders in 4 US Communities. *JAMA*, 319(5), 474-482. <https://doi.org/10.1001/jama.2017.21896>
- McCarthy, J. J., Leamon, M. H., Finnegan, L. P., & Fassbender, C. (2017). Opioid dependence and pregnancy: minimizing stress on the fetal brain. *American journal of obstetrics and gynecology*, 216(3), 226-231. <https://doi.org/10.1016/j.ajog.2016.10.003>
- McCormack, L., Sheridan, S., Lewis, M., Boudewyns, V., Melvin, C. L., Kistler, C., Lux, L. J., Cullen, K., & Lohr, K. N. (2013). Communication and dissemination strategies to facilitate the use of health-related evidence. *Evidence Report/technology Assessment*, 213, 1-520. <https://doi.org/10.23970/ahrqepcerta213>
- McElwaine, K. M., Freund, M., Campbell, E. M., Knight, J., Bowman, J. A., Doherty, E. L., Wye, P. M., Wolfenden, L., Lecathelinais, C., & McLachlan, S. J. B. h. s. r. (2013). The delivery of preventive care to clients of community health services. *BMC Health Services Research*, 13(1), 167.
- McGrory, J., Breckenridge, J., & Mowll, J. (2020). Women who use alcohol and other drugs during pregnancy: exploring the complexity of client engagement and their compliance with human service expectations. *Journal of Social Work Practice*, 34(1), 81-94. <https://doi.org/10.1080/02650533.2019.1572079>

- McLeod, D., Benn, C., Pullon, S., Viccars, A., White, S., Cookson, T., & Dowell, A. (2003). The midwife's role in facilitating smoking behaviour change during pregnancy. *Midwifery*, 19(4), 285-297. [https://doi.org/10.1016/S0266-6138\(03\)00038-X](https://doi.org/10.1016/S0266-6138(03)00038-X)
- McLeod, D., Pullon, S., Cookson, T., & Cornford, E. (2002). Factors influencing alcohol consumption during pregnancy and after giving birth. *New Zealand Medical Journal*, 115(1157), 1-7. <http://www.nzma.org.nz/journal/>
- McLeroy, K. R., Bibeau, D., Steckler, A., & Glanz, K. (1988). An ecological perspective on health promotion programs. *Health Educ Q*, 15(4), 351-377. <https://doi.org/10.1177/109019818801500401>
- McNamara, T. K., Orav, E. J., Wilkins-Haug, L., & Chang, G. (2005). Risk during pregnancy—Self-report versus medical record. *American journal of obstetrics and gynecology*, 193(6), 1981-1985. <https://doi.org/10.1016/j.ajog.2005.04.053>
- Mendelsohn, C., & Wodak Am, A. (2016). Smoking cessation in people with alcohol and other drug problems. *Australian family physician*, 45, 569-573. <http://www.racgp.org.au/afp/2016/august/smoking-cessation-in-people-with-alcohol-and-other-drug-problems/>
- Merlo, J., Wagner, P., Ghith, N., & Leckie, G. (2016). An original stepwise multilevel logistic regression analysis of discriminatory accuracy: the case of neighbourhoods and health. *PLoS ONE [Electronic Resource]*, 11(4), e0153778. <https://doi.org/10.1371/journal.pone.0153778>
- Metz, T. D., Allshouse, A. A., Hogue, C. J., Goldenberg, R. L., Dudley, D. J., Varner, M. W., Conway, D. L., Saade, G. R., & Silver, R. M. (2017). Maternal marijuana use, adverse pregnancy outcomes, and neonatal morbidity. *American journal of obstetrics and gynecology*, 217(4), 478. e471-478. e478.
- Metz, T. D., & Stickrath, E. H. (2015). Marijuana use in pregnancy and lactation: a review of the evidence. *American journal of obstetrics and gynecology*, 213(6), 761-778. <https://doi.org/10.1016/j.ajog.2015.05.025>
- Miles, M. (2012). Caring for pregnant women who use illicit drugs. *Australian Nursing Journal*, 20(3), 41-42. <https://doi.org/10.536/DRO/DU:30079762>
- Miles, M., Chapman, Y., & Francis, K. (2012). Making a difference: the experiences of midwives working with women who use illicit drugs. *International Journal of Childbirth*, 2(4), 245-254. <https://doi.org/10.1891/0886-6708.2.4.245>

- Miles, M., Chapman, Y., Francis, K., & Taylor, B. (2014). Midwives experiences of establishing partnerships: Working with pregnant women who use illicit drugs. *Midwifery*, 30(10), 1082-1087. <https://doi.org/10.1016/j.midw.2013.06.020>
- Miles, M., Francis, K., & Chapman, Y. (2010). Challenges for midwives: pregnant women and illicit drug use. *Australian Journal of Advanced Nursing*, 28(1), 83-90.
- [Record #287 is using a reference type undefined in this output style.]
- Ministry of Health. (2015b). *New Zealand Health Survey*. Ministry of Health Wellington, New Zealand. Retrieved from <https://www.health.govt.nz/nz-health-statistics/national-collections-and-surveys/surveys/new-zealand-health-survey>
- Ministry of Health NSW. (2014). *Clinical guidelines: Substance Use During Pregnancy Birth and the Postnatal Period*. Retrieved from <https://www.health.nsw.gov.au/aod/professionals/Publications/substance-use-during-pregnancy-summary.pdf>
- Minozzi, S., Amato, L., Bellisario, C., Ferri, M., & Davoli, M. (2013). Maintenance agonist treatments for opiate-dependent pregnant women. *Cochrane Database of Systematic Reviews*, 11, . <https://doi.org/10.1002/14651858.CD006318.pub4>
- Moehring, A., Rumpf, H.-J., Hapke, U., Bischof, G., John, U., & Meyer, C. (2019). Diagnostic performance of the Alcohol Use Disorders Identification Test (AUDIT) in detecting DSM-5 alcohol use disorders in the General population. *Drug and Alcohol Dependence*, 204, 107530. <https://doi.org/10.1016/j.drugalcdep.2019.06.032>
- Mohsin, M., & Jalaludin, B. (2008). Influence of previous pregnancy outcomes and continued smoking on subsequent pregnancy outcomes: an exploratory study in Australia. *BJOG: An International Journal of Obstetrics & Gynaecology*, 115(11), 1428-1435.
- Moore, T., Noble-Carr, D., & McArthur, M. (2010). Who cares? Young people with parents who use alcohol or other drugs talk about their experiences with services. *Australian Institute of Family Studies*, <https://aifs.gov.au/publications/family-matters/issue-85/who-cares> (85), 18-27.
- Morse, B., Gehshan, S., & Hutchins, E. (2000). *Screening for substance abuse during pregnancy: Improving care, improving health*. National Center for Education in Maternal and Child Health, Arlington, Va, USA.
- Myles, J. (2000). *Influence of illicit and licit substances for the pregnant user and the neonate* In Pregnancy and Drug Misuse Update 2000, a seminar organised by the Co-operation Group to Combat Drug Abuse and Illicit Trafficking in Drugs (Pompidou Group) (pp. 21-29), Council of Europe Publishing, Strasburg.

- Nagarajan, M., & Goodman, D. (2020). Not just substance use: the critical gap in nutritional interventions for pregnant women with opioid use disorders. *Public Health*, 180, 114-116. <https://doi.org/10.1016/j.puhe.2019.10.025>
- Nair, P., Schuler, M. E., Black, M. M., Kettinger, L., & Harrington, D. (2003). Cumulative environmental risk in substance abusing women: early intervention, parenting stress, child abuse potential and child development. *Child Abuse & Neglect*, 27(9), 997-1017. [https://doi.org/10.1016/S0145-2134\(03\)00169-8](https://doi.org/10.1016/S0145-2134(03)00169-8)
- National Centre for Classification in Health. (2017). *The Tenth Edition of ICD-10-AM/ACHI/ACS*. Retrieved from <https://www.sydney.edu.au/health-sciences/ncch/icd-10-am.shtml>
- National Drug & Alcohol Research Centre. (2016). *Supporting pregnant women who use alcohol or other drugs: A Guide for Primary Health Care Professionals*. <https://ndarc.med.unsw.edu.au/resource/quick-guide-identifying-women-risk-alcohol-smoking-or-other-drug-use-during-pregnancy>
- National Health and Medical Research Council. (2009). Australian guidelines to reduce health risks from drinking alcohol. *NHMRC Canberra*.
- New South Wales Department of Health. (2006). *National clinical guidelines for the management of drug use during pregnancy, birth and the early development years of the newborn*. New South Wales Department of Health. Retrieved from <https://www.drugsandalcohol.ie/6297/>
- Nygaard, P., & Aasland, O. G. (2011). Barriers to implementing screening and brief interventions in general practice: findings from a qualitative study in Norway. *Alcohol and Alcoholism*, 46(1), 52-60. <https://doi.org/10.1093/alcalc/agq073>
- O'Connor, A., Harris, E., Seeber, C., Hamilton, D., Fisher, C., & Sachmann, M. (2020). Methamphetamine use in pregnancy, child protection, and removal of infants: Tertiary centre experience from Western Australia. *Midwifery*, 83, 102641. <https://doi.org/10.1016/j.midw.2020.102641>
- O'Leary, C. M., Jacoby, P. J., Bartu, A., D'Antoine, H., & Bower, C. (2013a). Maternal Alcohol Use and Sudden Infant Death Syndrome and Infant Mortality Excluding SIDS. *Pediatrics*, 131(3), E770-E778. <https://doi.org/10.1542/peds.2012-1907>
- O'Leary, C. M., Nassar, N., Kurinczuk, J. J., & Bower, C. (2009). The effect of maternal alcohol consumption on fetal growth and preterm birth. *BJOG: An International Journal of Obstetrics & Gynaecology*, 116(3), 390-400. <https://doi.org/10.1111/j.1471-0528.2008.02058.x>



- O'Leary, C. M., Nassar, N., Kurinczuk, J. J., de Klerk, N., Geelhoed, E., Elliott, E. J., & Bower, C. (2010). Prenatal alcohol exposure and risk of birth defects. *Pediatrics*, 126(4), e843-e850. <https://doi.org/10.1542/peds.2010-0256>
- O'Leary, C. M., Taylor, C., Zubrick, S. R., Kurinczuk, J. J., & Bower, C. (2013b). Prenatal alcohol exposure and educational achievement in children aged 8-9 years [Empirical Study; Followup Study; Longitudinal Study; Retrospective Study; Quantitative Study]. *Pediatrics*, 132(2), e468-e475. <https://doi.org/http://dx.doi.org/10.1542/peds.2012-3002>
- O'Leary, C. M., Watson, L., D'Antoine, H., Stanley, F., & Bower, C. (2012). Heavy maternal alcohol consumption and cerebral palsy in the offspring. *Developmental Medicine and Child Neurology*, 54(3), 224-230. <https://doi.org/10.1111/j.1469-8749.2011.04201.x>
- O'Leary, C. M., Nassar, N., Kurinczuk, J. J., & Bower, C. (2009). The effect of maternal alcohol consumption on fetal growth and preterm birth. *BJOG: An International Journal of Obstetrics & Gynaecology*, 116(3), 390-400. <https://doi.org/10.1111/j.1471-0528.2008.02058.x>
- Oats, J. N., Beischer, N. A., Breheny, J. E., & Pepperell, R. J. (1984). The outcome of pregnancies complicated by narcotic drug addiction. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 24(1), 14-16. <https://doi.org/10.1111/j.1479-828X.1984.tb03314.x>
- Oei, J., Abdel-Latif, M. E., Clark, R., Craig, F., & Lui, K. (2010). Short-term outcomes of mothers and infants exposed to antenatal amphetamines [Multicenter Study Research Support, Non-U.S. Gov't]. *Archives of Disease in Childhood Fetal & Neonatal Edition*, 95(1), F36-41. <https://doi.org/10.1136/adc.2008.157305>
- Oei, J. L., Kingsbury, A., Dhawan, A., Burns, L., Feller, J. M., Clews, S., Falconer, J., & Abdel-Latif, M. E. (2012). Amphetamines, the pregnant woman and her children: a review. *Journal of Perinatology*, 32(10), 737-747. <https://doi.org/10.1038/jp.2012.59>
- Office for National Statistics. (2019). *Birth characteristics* Retrieved from <https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/livebirths/datasets/birthcharacteristicsinenglandandwales>
- Oh, S., Salas-Wright, C. P., Vaughn, M. G., & DiNitto, D. M. (2017). Marijuana use during pregnancy: A comparison of trends and correlates among married and unmarried pregnant women. *Drug & Alcohol Dependence*, 181, 229-233. <https://doi.org/10.1016/j.drugalcdep.2017.09.036>

- Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2018). Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis. *Women and Birth*, 32(6), 479-486. <https://doi.org/10.1016/j.wombi.2018.11.009>
- Oni, H. T., Buultjens, M., Abdel-Latif, M. E., & Islam, M. M. (2020a). Neonatal Outcomes of Infants Born to Women Who Use Substances in Pregnancy: A Multilevel Analysis of Linked Data *Manuscript submitted for publication*.
- Oni, H. T., Buultjens, M., Davis, D., Abdel-latif, M., & Islam, M. M. (2020b). Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience. *Midwifery*, 81, 102595. <https://doi.org/10.1016/j.midw.2019.102595>
- Oni, H. T., Khan, M. N., Abdel-Latif, M., Buultjens, M., & Islam, M. M. (2019). Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review. *Journal of Obstetrics Gynaecology Research*, 45(9), 1783-1795. <https://doi.org/10.1111/jog.14051>
- Ordean, A., Wong, S., & Graves, L. (2017). No. 349-substance use in pregnancy. *Journal of Obstetrics and Gynaecology Canada*, 39(10), 922-937. e922.
- Pace, R., Pluye, P., Bartlett, G., Macaulay, A. C., Salsberg, J., Jagosh, J., & Seller, R. (2012). Testing the reliability and efficiency of the pilot Mixed Methods Appraisal Tool (MMAT) for systematic mixed studies review. *International journal of nursing studies*, 49(01), 47-53. <https://doi.org/10.1016/j.ijnurstu.2011.07.002>
- Pajulo, M., Savonlahti, E., Sourander, A., Helenius, H., & Piha, J. (2001). Antenatal depression, substance dependency and social support. *Journal of affective disorders*, 65(1), 9-17. [https://doi.org/https://doi.org/10.1016/S0165-0327\(00\)00265-2](https://doi.org/https://doi.org/10.1016/S0165-0327(00)00265-2)
- Paluzzi, P., Deggins, N., Hutchins, E., & Burkhardt, P. (2002). The role of midwives in caring for women with substance use disorders: implications for training [Review]. *Substance Abuse*, 23(3), 223-233. <https://doi.org/10.1080/08897070209511517>
- Patel, P., Abdel-Latif, M. E., Hazelton, B., Wodak, A., Chen, J., Emsley, F., Feller, J. M., Lui, K., & Oei, J. L. (2013). Perinatal outcomes of Australian buprenorphine-exposed mothers and their newborn infants. *Journal of Paediatrics and Child Health*, 49(9), 746-753. <https://doi.org/10.1111/jpc.12264>
- Patra, J., Bakker, R., Irving, H., Jaddoe, V. W., Malini, S., & Rehm, J. (2011). Dose-response relationship between alcohol consumption before and during pregnancy and the risks of low birthweight, preterm birth and small for gestational age (SGA)—a systematic



- review and meta-analyses. *BJOG: An International Journal of Obstetrics & Gynaecology*, 118(12), 1411-1421. <https://doi.org/10.1111/j.1471-0528.2011.03050.x>
- Patrick, S. W., Schumacher, R. E., Benneyworth, B. D., Krans, E. E., McAllister, J. M., & Davis, M. M. (2012). Neonatal abstinence syndrome and associated health care expenditures: United States, 2000-2009. *JAMA*, 307(18), 1934-1940. <https://doi.org/10.1001/jama.2012.3951>
- Payne, J. M., Watkins, R. E., Jones, H. M., Reibel, T., Mutch, R., Wilkins, A., Whitlock, J., & Bower, C. (2014). Midwives' knowledge, attitudes and practice about alcohol exposure and the risk of fetal alcohol spectrum disorder. *BMC Pregnancy and Childbirth*, 14(1), 377. <https://doi.org/10.1186/s12884-014-0377-z>
- Pentecost, R., Latendresse, G., & Smid, M. (2021). Scoping Review of the Associations Between Perinatal Substance Use and Perinatal Depression and Anxiety. *Journal of Obstetric, Gynecologic & Neonatal Nursing*.
- Peplau, H. E. (1991). *Interpersonal relations in nursing: A conceptual frame of reference for psychodynamic nursing*. Springer Publishing Company.
- Pfeifer, L. R., & Haile, Z. T. (2021). Unmet Mental Health Care Needs and Illicit Drug Use During Pregnancy. *J Addict Med*, 15(3), 233-240.
- Plummer-D'Amato, P. (2008). Focus group methodology Part 1: Considerations for design. *International Journal of Therapy and Rehabilitation*, 15(2), 69-73. <https://doi.org/10.12968/ijtr.2008.15.2.28189>
- Pluye, P., Gagnon, M.-P., Griffiths, F., & Johnson-Lafleur, J. (2009). A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. *International journal of nursing studies*, 46(4), 529-546. <https://doi.org/10.1016/j.ijnurstu.2009.01.009>
- Pluye, P., Robert, E., Cargo, M., Bartlett, G., O'cathain, A., Griffiths, F., Boardman, F., Gagnon, M.-P., & Rousseau, M. (2011). Proposal: A mixed methods appraisal tool for systematic mixed studies reviews. *Montréal: McGill University*, 2, 1-8. <https://www.scienceopen.com/document?vid=feb74b8c-08fd-4b8c-ad08-65f7c2b8108e>
- Polit, D. F., & Beck, C. T. (2009). *Essentials of nursing research: Appraising evidence for nursing practice*. Lippincott Williams & Wilkins.

- Polit, D. F., & Beck, C. T. (2010). Generalization in quantitative and qualitative research: Myths and strategies. *International journal of nursing studies*, 47(11), 1451-1458. <https://doi.org/10.1016/j.ijnurstu.2010.06.004>
- Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K., & Duffy, S. (2006). Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version, 1*, b92. <https://doi.org/10.13140/2.1.1018.4643>
- Popova, S., Lange, S., Probst, C., Gmel, G., & Rehm, J. (2017). Estimation of national, regional, and global prevalence of alcohol use during pregnancy and fetal alcohol syndrome: a systematic review and meta-analysis. *The Lancet Global Health*, 5(3), e290-e299. [https://doi.org/10.1016/S2214-109X\(17\)30021-9](https://doi.org/10.1016/S2214-109X(17)30021-9)
- Population Australia. (2020a). *Population of New South Wales 2020*. Retrieved from <http://www.population.net.au/population-of-new-south-wales/>
- Population Australia. (2020b). *Population of Victoria 2020*. Retrieved from <http://www.population.net.au/population-of-victoria/>
- Poulton, B. C., & West, M. A. (1993). Effective multidisciplinary teamwork in primary health care. *Journal of advanced nursing*, 18(6), 918-925. <https://doi.org/10.1046/j.1365-2648.1993.18060918.x>
- Qato, D. M., Zhang, C., Gandhi, A. B., Simoni-Wastila, L., & Coleman-Cowger, V. H. (2020). Co-use of alcohol, tobacco, and licit and illicit controlled substances among pregnant and non-pregnant women in the United States: Findings from 2006 to 2014 National Survey on Drug Use and Health (NSDUH) data. *Drug and Alcohol Dependence*, 206, 107-729. <https://doi.org/10.1016/j.drugalcdep.2019.107729>
- Quinlivan, J. A., & Evans, S. F. (2002). The impact of continuing illegal drug use on teenage pregnancy outcomes--a prospective cohort study. *BJOG : An International Journal of Obstetrics and Gynaecology*, 109(10), 1148-1153. <https://doi.org/10.1111/j.1471-0528.2002.01536.x>
- Rahman, T., Eftekhari, P., Bovill, M., Baker, A. L., & Gould, G. S. (2021). Socioecological mapping of barriers and enablers to smoking cessation in Indigenous Australian women during pregnancy and postpartum: A systematic review. *Nicotine and Tobacco Research*, 23(6), 888-899.
- Rangmar, J., Hjern, A., Vinnerljung, B., Strömmland, K., Aronson, M., & Fahlke, C. (2015). Psychosocial outcomes of fetal alcohol syndrome in adulthood. *Pediatrics*, 135(1), e52-e58. <https://doi.org/10.1542/peds.2014-1915>

- Ratsch, A., Bogossian, F., & Steadman, K. (2021). Central Australian Aboriginal women's pregnancy, labour and birth outcomes following maternal smokeless tobacco (pituri) use, cigarette use or no-tobacco use: a prospective cohort study. *BMC Public Health*, 21(1), 1-13.
- Ratsch, A., Steadman, K., Ryu, B., & Bogossian, F. (2019). Tobacco and pituri use in pregnancy: a protocol for measuring maternal and perinatal exposure and outcomes in central Australian Aboriginal women. *Methods and protocols*, 2(2), 47.
- Rayment-Jones, H., Silverio, S. A., Harris, J., Harden, A., & Sandall, J. (2020). Project 20: Midwives' insight into continuity of care models for women with social risk factors: What works, for whom, in what circumstances, and how. *Midwifery*, 84, 102654. <https://doi.org/10.1016/j.midw.2020.102654>
- Reddy, U. M., Davis, J. M., Ren, Z., & Greene, M. F. (2017). Opioid use in pregnancy, neonatal abstinence syndrome, and childhood outcomes: executive summary of a joint workshop by the Eunice Kennedy Shriver National Institute of Child Health and Human Development, American Congress of Obstetricians and Gynecologists, American Academy of Pediatrics, Society for Maternal-Fetal Medicine, Centers for Disease Control and Prevention, and the March of Dimes Foundation. *Obstetrics and Gynecology*, 130(1), 10-28. <https://doi.org/10.1097/AOG.0000000000002054>
- Richardson, R., Bolisetty, S., & Ingall, C. (2001). The profile of substance-using pregnant mothers and their newborns at a regional rural hospital in New South Wales. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 41(4), 415-419. <https://doi.org/10.1111/j.1479-828X.2001.tb01320.x>
- Richmond, R. L., & Anderson, P. (1994). Research in general practice for smokers and excessive drinkers in Australia and the UK. III. Dissemination of interventions. *Addiction*, 89(1), 49-62. <https://doi.org/10.1111/j.1360-0443.1994.tb00849.x>
- Riddell, S., Shanahan, M., Degenhardt, L., & Roxburgh, A. (2008). A review of the use of US-derived aetiological fractions in an Australian setting for antenatal problems related to cocaine use. *Australian & New Zealand Journal of Public Health*, 32(4), 393-394. <https://doi.org/10.1111/j.1753-6405.2008.00262.x>
- Riley, E. P., Infante, M. A., & Warren, K. R. (2011). Fetal alcohol spectrum disorders: an overview. *Neuropsychology review*, 21(2), 73-80. <https://doi.org/10.1007/s11065-011-9166-x>
- Royal Australian and New Zealand College of Obstetricians and Gynaecologists. (2013, 2018). *Substance use in pregnancy*. Retrieved from <https://www.ranzcog.edu.au>

- Rush, B. R., Crowe, T. G., Powell, L. Y., & Ellis, K. (1995). Substance abuse facilitator model: Health promotion training for family physicians. *Journal of Continuing Education in the Health Professions*, 15(2), 106-116.  
<https://doi.org/10.1002/chp.4750150208>
- Ryan, G., Dooley, J., Gerber Finn, L., & Kelly, L. (2019). Nonpharmacological management of neonatal abstinence syndrome: a review of the literature. *The Journal of Maternal-Fetal & Neonatal Medicine*, 32(10), 1735-1740.  
<https://doi.org/10.1080/14767058.2017.1414180>.
- Sandall, J. (2014). *"The contribution of continuity of midwifery care to high quality maternity care" London*. The Royal College of Midwives. Retrieved from [www.rcm.org.uk](http://www.rcm.org.uk)
- Sandall, J., Soltani, H., Gates, S., Shennan, A., & Devane, D. (2015). Midwife-led continuity models versus other models of care for childbearing women. *Cochrane Database of Systematic Reviews*, 4, . <https://doi.org/10.1002/14651858.CD004667.pub5>
- Scott, K., & Lust, K. (2010). Illicit substance use in pregnancy—a review. *Obstet Med*, 3(3), 94-100. <https://doi.org/10.1258/om.2010.100014>
- Seib, C. A., Daglish, M., Heath, R., Booker, C., Reid, C., & Fraser, J. (2012). Screening for alcohol and drug use in pregnancy. *Midwifery*, 28(6), 760-764.  
<https://doi.org/https://doi.org/10.1016/j.midw.2011.08.003>
- Seybold, D., Calhoun, B., Burgess, D., Lewis, T., Gilbert, K., & Casto, A. (2014). Evaluation of a training to reduce provider bias toward pregnant patients with substance abuse [Empirical Study; Quantitative Study]. *Journal of Social Work Practice in the Addictions*, 14(3), 239-249. <https://doi.org/10.1080/1533256X.2014.933730>
- Shahram, S. Z., Bottorff, J. L., Kurtz, D. L., Oelke, N. D., Thomas, V., Spittal, P. M., & Partnership, C. P. (2017). Understanding the life histories of pregnant-involved young aboriginal women with substance use experiences in three Canadian cities. *Qualitative Health Research*, 27(2), 249-259.  
<https://doi.org/10.1177/1049732316657812>
- Shaw, S. J., Cartwright, A. K. J., Spratley, T. A., & Harwin, J. (1978). *Responding to drinking problems*. Croom Helm, London, UK.
- Shen, Y., Lo-Ciganic, W.-H., Segal, R., & Goodin, A. J. (2020). Prevalence of substance use disorder and psychiatric comorbidity burden among pregnant women with opioid use disorder in a large administrative database, 2009–2014. *Journal of Psychosomatic Obstetrics & Gynecology*, 10.1080/0167482X.2020.1727882, 1-7.  
<https://doi.org/10.1080/0167482X.2020.1727882>

- Sibthorpe, B., Kliewer, E., & Smith, L. (1995). Record linkage in Australian epidemiological research: health benefits, privacy safeguards and future potential. *Australian Journal of Public Health*, 19(3), 250-256. <https://doi.org/10.1111/j.1753-6405.1995.tb00439.x>
- Small, J., Curran, G. M., & Booth, B. (2010). Barriers and facilitators for alcohol treatment for women: Are there more or less for rural women? *Journal of Substance Abuse Treatment*, 39(1), 1-13. <https://doi.org/10.1016/j.jsat.2010.03.002>
- Smid, M. C., Metz, T. D., & Gordon, A. J. (2019). Stimulant use in pregnancy: An under-recognized epidemic among pregnant women. *Clinical Obstetrics and Gynecology*, 62(1), 168-184. <https://doi.org/10.1097/GRF.0000000000000418>
- Smith, J. A., Reid, N., Hewlett, N., D'Antoine, H., Gray, L., & Elliott, E. (2020). Mandatory pregnancy health warning labels on alcohol: Listen to the experts not the industry. *Health Promotion Journal of Australia*, 31(3), 327-329. <https://doi.org/10.1002/hpja.385>
- Srikartika, V. M., & O'Leary, C. M. (2015). Pregnancy outcomes of mothers with an alcohol-related diagnosis: a population-based cohort study for the period 1983-2007 [Research Support, Non-U.S. Gov't]. *BJOG: An International Journal of Obstetrics & Gynaecology*, 122(6), 795-804. <https://doi.org/10.1111/1471-0528.12983>
- StataCorp. (2017). *Stata Statistical Software: Release 15*. College Station, TX: StataCorp LLC. Retrieved from <https://www.stata.com/>
- Stavrou, E., Pesa, N., & Pearson, S.-A. (2012). Hospital discharge diagnostic and procedure codes for upper gastro-intestinal cancer: how accurate are they? *BMC Health Services Research*, 12(1), 1-7. <https://doi.org/10.1186/1472-6963-12-331>
- Stone, R. (2015a). Pregnant women and substance use: fear, stigma, and barriers to care. *Health & justice*, 3(1), 2.
- Stone, R. (2015b). Pregnant women and substance use: fear, stigma, and barriers to care. *Health & justice*, 3(1), 1-15. <https://doi.org/10.1186/s40352-015-0015-5>
- Substance Abuse and Mental Health Services Administration. (2017, 2017). *Results from the 2016 National Survey on Drug Use and Health : Detailed tables*. Office of Applied Studies. <http://www.oas.samhsa.gov/nsduh/2k5nsduh/2k5Results.pdf>
- Tait, R. J., Whetton, S., Shanahan, M., Cartwright, K., Ferrante, A., Gray, D., Kaye, S., McKetin, R., Pidd, K., & Ritter, A. (2018). Quantifying the societal cost of methamphetamine use to Australia. *International Journal of Drug Policy*, 62, 30-36. <https://doi.org/10.1016/j.drugpo.2018.08.015>

- Taplin, S., Richmond, G., & McArthur, M. (2015). *Identifying alcohol and other drug use during pregnancy: Outcomes for women, their partners and their children*. Canberra: Australian National Council on Drugs. . Retrieved from <http://www.acu.edu.au/data/assets/pdffile/0004/755275/AODUseDuringPregnancy.pdf>
- Tashakkori, A., Teddlie, C., & Teddlie, C. B. (1998). *Mixed methodology: Combining qualitative and quantitative approaches* (Vol. 46). Sage.
- Tawfik, G. M., Dila, K. A. S., Mohamed, M. Y. F., Tam, D. N. H., Kien, N. D., Ahmed, A. M., & Huy, N. T. (2019). A step by step guide for conducting a systematic review and meta-analysis with simulation data. *Tropical Medicine and Health*, 47(1), 1-9. <https://doi.org/10.1186/s41182-019-0165-6>
- Taylor, P., Zaichkin, J., Pilkey, D., Leconte, J., Johnson, B. K., & Peterson, A. C. (2007). Prenatal screening for substance use and violence: Findings from physician focus groups. *Maternal and Child Health Journal*, 11(3), 241-247. <https://doi.org/10.1007/s10995-006-0169-9>
- Teesson, M., Newton, N., Slade, T., Carragher, N., Barrett, E., Champion, K., Kelly, E., Nair, N., Stapinski, L., & Conrod, P. J. (2017). Combined universal and selective prevention for adolescent alcohol use: a cluster randomized controlled trial. *Psychological medicine*, 47(10), 1761-1770. <https://doi.org/10.1017/S0033291717000198>
- Terplan, M., McNamara, E. J., & Chisolm, M. S. (2012). Pregnant and non-pregnant women with substance use disorders: the gap between treatment need and receipt. *Journal of Addictive Diseases*, 31(4), 342-349. <https://doi.org/10.1080/10550887.2012.735566>
- Tetstall, E., Liu, A. J., An, E. I., Canalese, J., & Nanan, R. (2009). Pregnancy and neonatal characteristics of opioid-dependent Indigenous Australians: a rural and metropolitan comparison [Comparative Study]. *Australian & New Zealand Journal of Obstetrics & Gynaecology*, 49(3), 279-284. <https://doi.org/10.1111/j.1479-828X.2009.01008.x>
- The Royal Australian and New Zealand College of Obstetricians and Gynaecologists. (2018). *Substance use in pregnancy*. Retrieved from <https://www.ranzcog.edu.au>
- Thomas, D. B. (1995). Cleft palate, mortality and morbidity in infants of substance abusing mothers. *Journal of Paediatrics & Child Health*, 31(5), 457-460.
- Thompson, J., Wright, S., Mitchell, E., Clements, M., Becroft, D., & Scragg, R. (1994a). Risk factors for small for gestational age infants: a New Zealand study. *New Zealand Cot*



- Death Study Group. *The New Zealand medical journal*, 107(973), 71-73.  
<https://europepmc.org/article/med/8202286>
- Thompson, J. M., Wright, S. P., Mitchell, E. A., Clements, M. S., Becroft, D. M., & Scragg, R. K. (1994b). Risk factors for small for gestational age infants: a New Zealand study. New Zealand Cot Death Study Group. *The New Zealand medical journal*, 107(973), 71-73. <https://europepmc.org/article/med/8202286>
- Turienzo, C. F., Roe, Y., Rayment-Jones, H., Kennedy, A., Forster, D., Homer, C., McLachlan, H., & Sandall, J. (2019). Implementation of midwifery continuity of care models for Indigenous women in Australia: perspectives and reflections for the United Kingdom. *Midwifery*, 69, 110-112.  
<https://doi.org/10.1016/j.midw.2018.11.005>
- Tuten, M., Fitzsimons, H., Chisolm, M. S., Jones, H. E., Heil, S. H., & O'Grady, K. E. (2009). The impact of mood disorders on the delivery and neonatal outcomes of methadone-maintained pregnant patients. *The American journal of drug and alcohol abuse*, 35(5), 358-363. <https://doi.org/10.1080/00952990903108231>
- Umer, A., Lilly, C., Hamilton, C., Baldwin, A., Breyel, J., Tolliver, A., Mullins, C., John, C., & Maxwell, S. (2020). Prevalence of alcohol use in late pregnancy. *Pediatric Research*, 88, 312–319. <https://doi.org/10.1038/s41390-019-0731-y>
- Unger-Saldaña, K., Saldaña-Tellez, M., Potter, M. B., Van Loon, K., Allen-Leigh, B., & Lajous, M. (2020). Barriers and facilitators for colorectal cancer screening in a low-income urban community in Mexico City. *Implementation Science Communications*, 1(1), 64. <https://doi.org/10.1186/s43058-020-00055-z>
- US Preventive Services Task Force. (2004). Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: recommendation statement. *Annals of Internal Medicine*, 140(7), 554-556.  
<https://search.proquest.com/docview/222251231?pq-origsite=gscholar&fromopenview=true>
- van der Wulp, N. Y., Hoving, C., & de Vries, H. (2013). A qualitative investigation of alcohol use advice during pregnancy: Experiences of Dutch midwives, pregnant women and their partners. *Midwifery*, 29(11), e89-e98.  
<https://doi.org/10.1016/j.midw.2012.11.014>
- van Dyk, J., Ramanjam, V., Church, P., Koren, G., & Donald, K. (2014). Maternal methamphetamine use in pregnancy and long-term neurodevelopmental and

- behavioral deficits in children. *Journal of Population Therapeutics and Clinical Pharmacology*, 21(2). <https://www.jptcp.com/index.php/jptcp/article/view/329/272>
- Velez, M. L., Jordan, C. J., & Jansson, L. M. (2021). Perinatal Substance Use Disorders: Intrauterine Exposure. In C. G. el-Guebaly N., Galanter M., Baldacchino A.M. (eds) (Ed.), *Textbook of Addiction Treatment* ([https://doi.org/10.1007/978-3-030-36391-8\\_109pp](https://doi.org/10.1007/978-3-030-36391-8_109pp). 1529-1547). Springer, Cham. . [https://doi.org/https://doi.org/10.1007/978-3-030-36391-8\\_109](https://doi.org/https://doi.org/10.1007/978-3-030-36391-8_109)
- Victorian Government Department of Human Services. (2002). *Future directions for Victoria's maternity services*. Retrieved from [www.health.vic.gov.au/maternitycare/pubs.htm](http://www.health.vic.gov.au/maternitycare/pubs.htm)
- Virnig, B. A., & McBean, M. (2001). Administrative data for public health surveillance and planning. *Annual review of public health*, 22(1), 213-230. <https://doi.org/10.1146/annurev.publhealth.22.1.213>
- Walpole, I., Zubrick, S., Pontre, J., & Lawrence, C. (1991). Low to moderate maternal alcohol use before and during pregnancy, and neurobehavioural outcome in the newborn infant. *Developmental medicine and child neurology*, 33(10), 875-883. <https://doi.org/10.1111/j.1469-8749.1991.tb14796.x>.
- Wangberg, S. C. (2015). Norwegian midwives' use of screening for and brief interventions on alcohol use in pregnancy. *Sexual & Reproductive Healthcare*, 6(3), 186-190. <https://doi.org/10.1016/j.srhc.2015.03.001>
- Ward, S. L., Bautista, D., Chan, L., Derry, M., Lisbin, A., Durfee, M. J., Mills, K. S., & Keens, T. G. (1990). Sudden infant death syndrome in infants of substance-abusing mothers. *J Pediatr*, 117(6), 876-881. <http://www.ncbi.nlm.nih.gov/pubmed/2246684>
- Waterman, E. H., Pruett, D., & Caughey, A. B. (2013). Reducing fetal alcohol exposure in the United States. *Obstetrical & gynecological survey*, 68(5), 367-378. <https://doi.org/10.1097/OGX.0b013e31828736d5>
- Watkins, R. E., Payne, J. M., Reibel, T., Jones, H. M., Wilkins, A., Mutch, R., Bower, C., & (2015). Development of a scale to evaluate midwives' beliefs about assessing alcohol use during pregnancy. *BMC Pregnancy & Childbirth*, 15(1), 353.
- Wigg, S., & Stafford, L. D. (2016). Health warnings on alcoholic beverages: perceptions of the health risks and intentions towards alcohol consumption. *PLoS ONE [Electronic Resource]*, 11(4), e0153027. <https://doi.org/10.1371/journal.pone.0153027>
- Wilson, J., & Thorp, J. (2008). *Substance abuse in pregnancy* (Vol. ). The Global Library of Women's Medicine.



- Winkelman, T. N., Villapiano, N., Kozhimannil, K. B., Davis, M. M., & Patrick, S. W. (2018). Incidence and costs of neonatal abstinence syndrome among infants with Medicaid: 2004–2014. *Pediatrics*, 141(4), e20173520. <https://doi.org/10.1542/peds.2017-3520>
- World Health Organization. (1992). The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines. *Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire*, 67(30), 227-227. <https://apps.who.int/iris/handle/10665/37958>
- World Health Organization. (2010). *The involvement of nurses and midwives in screening and brief interventions for hazardous and harmful use of alcohol and other psychoactive substances* World Health Organization. Retrieved from <https://apps.who.int/iris/handle/10665/70480>
- World Health Organization. (2014). *Guidelines for the identification and management of substance use and substance use disorders in pregnancy*. Retrieved from [apps.who.int/iris/bitstream/10665/107130/1/9789241548731\\_eng.pdf](https://apps.who.int/iris/bitstream/10665/107130/1/9789241548731_eng.pdf)
- World Health Organization. (2015). *WHO recommendations on health promotion interventions for maternal and newborn health 2015*. World Health Organization.
- World Health Organization Assist Working Group. (2002). The alcohol, smoking and substance involvement screening test (ASSIST): development, reliability and feasibility. *Addiction*, 97(9), 1183-1194. <https://doi.org/10.1046/j.1360-0443.2002.00185.x>
- World Medical Association. (2001). World Medical Association Declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bulletin of the World Health Organization*, 79(4), 373. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2566407/>
- Wouldes, T. (2009). *What Health Professionals Know & Do About Alcohol and Other Drug Use During Pregnancy*. [www.ahw.org.nz](http://www.ahw.org.nz)
- Wouldes, T. A., & Woodward, L. J. (2010). Maternal methadone dose during pregnancy and infant clinical outcome. *Neurotoxicology & Teratology*, 32(3), 406-413. <https://doi.org/10.1016/j.ntt.2010.01.007>
- Wright, S., Mitchell, E., Thompson, J., Clements, M., Ford, R., & Stewart, A. (1998). Risk factors for preterm birth: a New Zealand study. *The New Zealand medical journal*, 111(1058), 14-16. <https://europepmc.org/article/med/9484428>

- Yonkers, K. A., Gotman, N., Kershaw, T., Forray, A., Howell, H. B., & Rounsaville, B. J. (2010). Screening for prenatal substance use: development of the Substance Use Risk Profile-Pregnancy scale. *Obstet Gynecol*, 116(4), 827-833.  
<https://doi.org/10.1097/AOG.0b013e3181ed8290>
- Young-Wolff, K. C., Sarovar, V., Tucker, L.-Y., Conway, A., Alexeeff, S., Weisner, C., Armstrong, M. A., & Goler, N. (2019). Self-reported daily, weekly, and monthly cannabis use among women before and during pregnancy. *JAMA network open*, 2(7), e196471-e196471. <https://doi.org/10.1001/jamanetworkopen.2019.6471>
- Zgheib, S. M., Kacim, M., & Kostev, K. (2017). Prevalence of and risk factors associated with cesarean section in Lebanon—A retrospective study based on a sample of 29,270 women. *Women and Birth*, 30(6), e265-e271.  
<https://doi.org/10.1016/j.wombi.2017.05.003>
- Zhai, J., Feng, B., Gu, Y., & Sun, Y. (2020). Pregnancy-Related Retinopathy. In *Integrative Ophthalmology* (pp. 249-254). Springer.

## **Appendix**

Appendix A: Article 1

Appendix B: Article 2

Appendix C: Article 3

Appendix D: Interview guide

Appendix E: Participant Information Statement and Consent Form

Appendix F: Ethics approval (qualitative study)

Appendix G: Ethics approval (quantitative study)

Appendix H: Poster presentation

Appendix I: Award

## Appendix A: Article 1

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# Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: A systematic review

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## Abstract

**Aim:** Substance use is not unusual among women of childbearing age. Pregnant women who use a substance and the consequent impacts on a newborn vary across studies and settings. We reviewed New Zealand and Australian literature to examine the short-term health outcomes of newborn of substance-using mothers and their demographic characteristics.

**Methods:** Five medical/nursing databases and google scholar were searched in April 2017. Studies were considered eligible if they described outcomes of newborn of substance-using mothers. Mixed Methods Appraisal Tool was used for quality assessment of candidate studies. Relevant data were extracted and analyzed using narrative synthesis. Based on data availability, a subset of studies was included in meta-analysis.

**Results:** Although findings of individual studies vary, there are some evidence that the infants born to substance-using mothers were likely to have preterm birth, low birthweight, small-for-gestational age, low Apgar score, and admission to neo-natal intensive care unit. The likelihood of adverse health outcomes was much higher for newborns of polysubstance-using mothers, than newborns of mothers using a single substance. Pregnant women who use illicit substance are predominantly socially disadvantaged, in their twenties and or of Aboriginal descent.

**Conclusion:** Infants of substance-using mothers suffer a range of adverse health outcomes. Multidisciplinary and integrated approach of services that ensure supportive social determinants of health may result in a better outcome for newborn and positive behavioral change among mothers.

**Key words:** medical problems in pregnancy, neonatology, substance abuse.

## Introduction

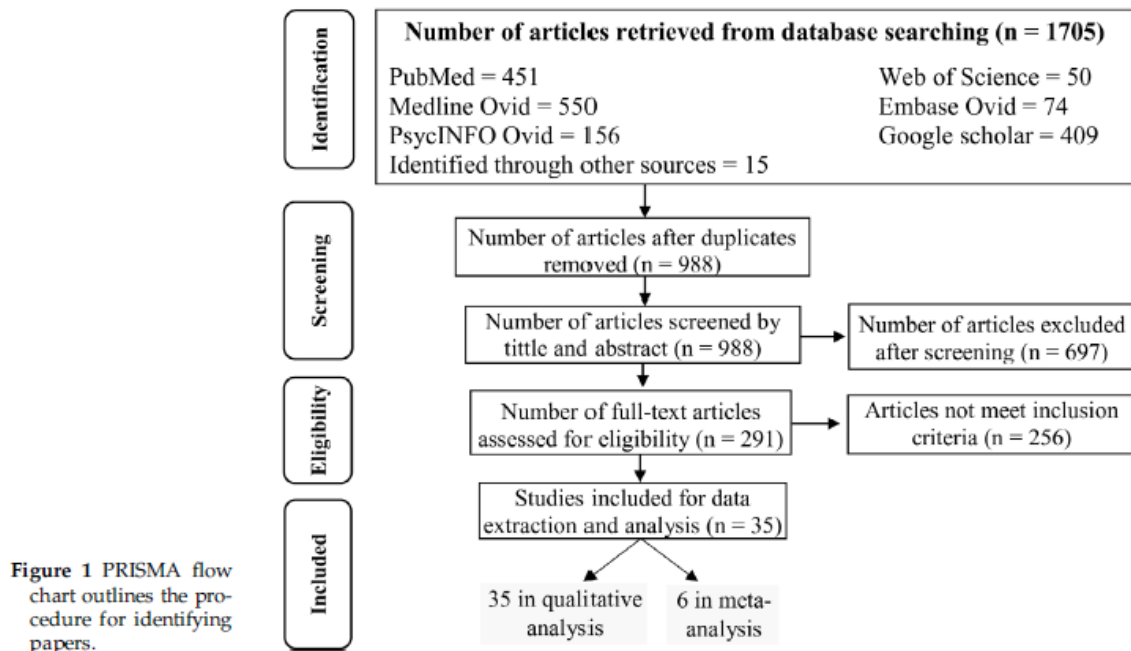
The use of illicit substance and or alcohol is not unusual among women of childbearing age.<sup>1</sup> The adverse health outcomes of perinatal substance use not only affect the mother-infant dyad but can also have considerable socio-economic impacts on society at large.<sup>2,3</sup> According to the National Drug Strategy

Household Survey 2016 although low alcohol consumption and alcohol abstinence in pregnancy are rising in Australia, one in three pregnant women consumed alcohol.<sup>4</sup> Also, a substantial proportion of women with history of substance use continued using even after they were aware of their pregnancy.<sup>4</sup> Similarly, New Zealand Health Survey found one in six pregnant women consumed alcohol and more than

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### Quality assessment

Quality assessment was performed by the first and last authors using the Mixed Methods Appraisal Tool (MMAT) – Version 2011, which is a comprehensive and reliable tool for appraisal of quantitative, qualitative and mixed-method studies.<sup>29,30</sup> Briefly, MMAT consists of two screening criteria applied to all study types; four other criteria for qualitative and quantitative studies, and three criteria for mixed methods studies. Given that all the reviewed studies were of quantitative design, the four MMAT methodological quality questions for assessing quantitative study were used to assess the quality of individual study. The questions are: (i) is the sampling strategy relevant to address the quantitative research question?, (ii) is the sample representative of the population under study?, (iii) are measurements appropriate?, and (iv) is there an acceptable response rate?<sup>30</sup> Studies were assessed and scored between the range of 25% (1/4 criteria met) and 100% (4/4 criteria met) based on MMAT criteria and categorized as having low-average (25%), average (50%), good quality (75%) and high quality (100%). Differences about the quality were resolved by discussion. Of the 35 included studies, two were of low-average quality, 18 were of average quality and 15 were of good quality.

### Data extraction and synthesis

The information extracted included the year of publication, study location, study design, study population, sample size, type of maternal substance use, reported short-term outcome(s) of infants and demographic profile of substance-using mothers.

The retrieved studies were heterogeneous in terms of study-design, sampling, methods and outcome measures. Only few quantitative studies were found suitable for meta-analysis. As a result, we adopted both qualitative and quantitative approaches to synthesis. Narrative synthesis was used for qualitative synthesis. Narrative synthesis can include findings from both qualitative and quantitative method studies.<sup>31,32</sup> Quantitative synthesis was conducted using meta-analysis. Of all the outcomes, quantitative data suitable for meta-analysis were available only for preterm birth and small-for-gestational age in a subset of five and six individual studies, respectively. The remaining outcomes were described only in two or fewer individual studies. As a result, we conducted meta-analysis only for preterm birth and small-for-gestational age. The studies that mentioned an effect size for these two outcomes described alcohol and/or several drugs as the exposure variable. Thus, assessing the effect of individual drugs on these



outcomes was not possible; instead effect of *any substance use* was considered the feasible option. Accordingly, if a study had described the effect size of four different drugs, we estimated the pooled effect size using the Mantel-Haenszel method and used that in meta-analysis. We used either fixed or random effects model to pool the effect size. The model was selected based on the heterogeneity assessment ( $I^2$ ). When the test heterogeneity was moderate (50%) or high (75%), the pooled estimates of odds ratio (OR) were computed by using the random effects model.<sup>33</sup> STATA (version 15) was used for this analysis. Studies were weighted to control the differences in sample size. The mean effect size was presented using forest plot.

## Results

### Study characteristic

The total peer-reviewed articles found eligible were 35 (Table 1), 28 were based on studies conducted in Australia (10 in New South Wales, seven in Western Australia, four in Victoria, two in South Australia, one in Queensland, one in Tasmania, one in Australian obstetric metropolitan hospitals and study setting was not specified in the remaining two studies<sup>7,22</sup>) and seven were based on studies conducted in New Zealand.<sup>19,35,39,44,47,55,57</sup> Most articles were published between 2000 and 2016. Some studies focused on multiple while others focused on single substance use. However, studies that focused on single substance use ultimately discovered that most participants used polysubstance (i.e., more than one substance) (Table 1).<sup>6,7,42</sup> Articles were mostly based on quantitative studies on secondary data.

### Short-term outcomes among newborns: Findings from narrative synthesis

#### *Preterm birth/prematurity*

Preterm birth refers to birth that occurs less than 37 weeks of gestation.<sup>36,38,40,42,58</sup> Sixteen studies mentioned an association between substances use during pregnancy and preterm birth.<sup>7-9,13,14,25,36,38,40-43,45,50,53,57</sup> The association was found significant with most of the drugs included in the studies (Table 2). Gestational polysubstance use may double the risk of preterm birth.<sup>13,14</sup> However, babies born to substance-using mothers who were on buprenorphine or methadone treatment,<sup>51</sup> and or whose pregnancies were planned and could access good antenatal care were less likely to

be premature.<sup>52</sup> Delayed methadone treatment may not avert the risk of preterm birth.<sup>37</sup>

#### *Low birthweight*

This refers to neonate weight of less than 2500 g at birth.<sup>9,40</sup> Nine studies reported that the exposure of newborn infants to single or polysubstance use in pregnancy increased the possibility of low birthweight (Table 2).<sup>6,13,14,36,40,42,45,46,58</sup> The use of cannabis, opiate or heavy alcohol consumption was significantly associated with low birthweight.<sup>42,45</sup> There were insufficient evidence of an association between low-level gestational alcohol consumption and neonates' low birthweight.<sup>46,56</sup> Neonates born to women on methadone or buprenorphine maintenance treatment were likely to be of an average weight.<sup>8,51</sup> Similarly, babies born to mothers on long-term methadone have a higher birthweight than babies born to mothers using heroin.<sup>41</sup>

#### *Neonatal abstinence syndrome*

Four studies found more infants of substance-using mothers were diagnosed with neonatal abstinence syndrome than infants of mothers who did not use substance.<sup>11,13,22,37</sup> An audit conducted in a chemical dependency unit in a hospital in Melbourne found more neonatal problems requiring specialized medical and nursing expertise, compared with control infants.<sup>8</sup> Polysubstance use was found to be a significant factor for neonatal abstinence syndrome.<sup>11,34</sup>

#### *Perinatal death*

This refers to a stillbirth or death that occurs within 28 or 30 days of birth.<sup>40</sup> Although perinatal death was reported to be one of the outcomes of newborn infants of substance-using mothers in three studies, no statistical association was reported between the two variables.<sup>7,9,58</sup> Of note, perinatal death of the neonates was mostly associated with preterm birth. For instance, a study of 45 substance-using pregnant women observed only one perinatal death; the infant was stillborn at 21 weeks of gestation and weighed 400 g.<sup>9</sup> Similarly, a significant difference of neonatal mortality was observed between 22 and 26 weeks of gestation (12.8% vs 38.5%) in a prospective state-wide study.<sup>13</sup>

#### *Small-for-gestational age/intrauterine growth retardation*

Small-for-gestational age refers to describe a neonate below the tenth centile of birthweight standard.<sup>59</sup>

**Table 1** Short-term outcomes of newborn infants of substance-using mothers

Author (year of publication)	Study setting	Study design	Type of substance used	Reported short-term outcomes of newborn infants
Abdel-Latif <i>et al</i> (2013) <sup>13</sup>	Australian Capital Territory; and New South Wales, Australia	Retrospective state-wide, multicentre audit (limited to public hospitals)	Opiate; methadone; amphetamines; ecstasy; polydrug	Preterm birth (< 32 weeks); low birthweight (< 2500 g); neonatal abstinence syndrome; congenital heart disease; gastroschisis; Down's syndrome; necrotizing enterocolitis
Abdel-Latif <i>et al</i> (2007) <sup>14</sup>	New South Wales, Australia	Prospective, state-wide study	Marijuana; cocaine; amphetamine; heroin; benzodiazepine; Opioids; Polydrug	Low gestational age; low birthweight, head-circumference; preterm birth; mortality in 22–26 weeks of gestation; prolonged hospitalization
Bartu <i>et al</i> (2012) <sup>34</sup>	Western Australia	Prospective study	Buprenorphine	Low birthweight; gestational age at delivery; Apgar score; neonatal resuscitation; admission to neonatal intensive care unit; neonatal abstinence; Morphine administration; preterm birth
Bell <i>et al</i> (1989) <sup>23</sup>	Victoria, Australia	Audit	Cigarette; Alcohol	Low birthweight; preterm birth; perinatal mortality
Bird <i>et al.</i> (2017) <sup>35</sup>	New Zealand's child cohort	Linked-data study	Alcohol	Small for gestational age
Blandthorn <i>et al.</i> (2011) <sup>22</sup>	Victoria, Australia	Retrospective audit	Buprenorphine; methadone; heroin; tobacco; alcohol; amphetamines; benzodiazepines; morphine; Cannabis	Low birthweight; Preterm birth; Jaundice; Infection; poor weight gain/weight loss; poor feeding and respiratory distress syndrome; neonatal abstinence syndrome; small for gestational age
Bonello <i>et al.</i> (2014) <sup>36</sup>	New South Wales, Australia	Retrospective cohort	Opioids; alcohol; cannabinoids; polydrug	Low birthweight; preterm birth; admission to special care nursery or neonatal intensive care unit
Brown <i>et al</i> (2016) <sup>6</sup>	South Australia	Cross-sectional, population-based survey	Cannabis; tobacco	Low birthweight; small for gestational age; preterm birth
Burns <i>et al.</i> (2007) <sup>37</sup>	New South Wales, Australia	Population linked data study	Methadone	Neonatal abstinence syndrome
Burns <i>et al.</i> (2006) <sup>25</sup>	New South Wales, Australia	Linked data audit	Opioid; Stimulants (not specified); Cannabis	Premature; admission to neonatal intensive care unit and or special care nursery; low Apgar score
Burns <i>et al.</i> (2006) <sup>38</sup>	New South Wales, Australia	Linked data audit	Alcohol; tobacco	Small for gestational age; preterm birth; admission to special care nursery; low Apgar score
Counsell <i>et al.</i> (1994) <sup>39</sup>	Birth cohort from across New Zealand	Longitudinal study	Alcohol	N/A
Davie-Gray <i>et al.</i> (2013) <sup>19</sup>	Christchurch, New Zealand	Longitudinal study	Cannabis; Stimulant; Benzodiazepines; Opiate	N/A

(Continues)

Table 1 Continued

Author (year of publication)	Study setting	Study design	Type of substance used	Reported short-term outcomes of newborn infants
Ellwood <i>et al.</i> (1987) <sup>7</sup>	New South Wales, Australia	Retrospective analysis	Methadone; tobacco; benzodiazepines; alcohol	Preterm birth; small for gestational age; perinatal death
Gibson <i>et al.</i> (1983) <sup>40</sup>	Victoria, Australia	Prospective study	Alcohol; cannabis; tobacco	Prematurity; intrauterine growth retardation; low Apgar score; perinatal death; congenital abnormalities
Giles <i>et al.</i> (1989) <sup>41</sup>	New South Wales, Australia	Prospective study	Narcotics; methadone; heroin	Low birthweight; perinatal mortality; small for gestational age; preterm birth
Hayatbakhsh <i>et al.</i> (2012) <sup>42</sup>	Queensland, Australia	Self-report data	Cannabis	Low birthweight; admission to neonatal intensive care unit; small for gestational age; preterm birth
Kelly <i>et al.</i> (2000) <sup>8</sup>	Victoria, Australia	Cohort study	Methadone; marijuana; amphetamines; cocaine benzodiazepines; heroin	Birthweight; gestational age; admission to special care nursery
Kennare <i>et al.</i> (2005) <sup>43</sup>	South Australia	Cohort study	Marijuana; methadone; amphetamines; heroin; polydrug	Preterm birth; small for gestation age; congenital abnormalities; nursery stay longer than 7 days; neonatal death
LaGasse <i>et al.</i> (2011) <sup>44</sup>	Infants born at Auckland City Hospital, North Shore Hospital, and Waitakere Hospital, New Zealand	Prospective longitudinal study	Marijuana; tobacco; methamphetamine; alcohol	Neurobehavioral effects such as central nervous system stress; lower arousal and excitability
Ludlow <i>et al.</i> (2004) <sup>45</sup>	Western Australia	Retrospective audit	Amphetamine; heroin; methadone; alcohol; benzodiazepines; Tobacco	Preterm birth; low birthweight; small for gestational age; admission to special care nursery; low Apgar score; resuscitation
Lumley <i>et al.</i> (1985) <sup>46</sup>	Tasmania, Australia	State-wide birth survey	Alcohol; tobacco	Low birthweight; congenital malformations; low Apgar score
McLeod <i>et al.</i> (2002) <sup>47</sup>	Wellington City, New Zealand	Cross-sectional survey	Alcohol	N/A
O'Leary <i>et al.</i> (2013) <sup>48</sup>	Western Australia	Cohort study	Alcohol	At risk of sudden infant death syndrome and perinatal death
O'Leary <i>et al.</i> (2012) <sup>49</sup>	Western Australia	Cohort study	Alcohol	Cerebral palsy
O'Leary <i>et al.</i> (2009) <sup>50</sup>	Western Australia	Before and after study	Alcohol	Small for gestational age; preterm birth
Oats <i>et al.</i> (1984) <sup>9</sup>	Victoria, Australia	Case study	Narcotic (details not mentioned)	Fetal growth retardation; premature birth
Patel <i>et al.</i> (2013) <sup>51</sup>	New South Wales and the Australian Capital Territory	Retrospective record review	Buprenorphine; heroin; benzodiazepines	Birthweight; preterm birth

(Continues)



**Table 1** Continued

Author (year of publication)	Study setting	Study design	Type of substance used	Reported short-term outcomes of newborn infants
Quinlivan <i>et al.</i> (2002) <sup>52</sup>	Three obstetric hospitals, Australia (state not mentioned)	Prospective cohort study	Marijuana; multidrug and solvents; heroin; amphetamines; ecstasy	Birthweight; preterm birth
Richardson <i>et al.</i> (2001) <sup>11</sup>	New South Wales, Australia	Audit	Methadone; marijuana; benzodiazepines; heroin	Preterm birth; admission to special care nurseries; neonatal abstinence syndrome
Srikartika <i>et al.</i> (2015) <sup>53</sup>	Western Australia	Population-based cohort	Alcohol	Preterm birth; small for gestational age; low Apgar score
Tetstall <i>et al.</i> (2009) <sup>54</sup>	New South Wales, Australia	Retrospective cohort study	Methadone; tobacco; alcohol; polydrug	Low neonatal abstinence syndrome
Thompson <i>et al.</i> (1994) <sup>55</sup>	11 health districts in New Zealand	Case-control study	Marijuana; Tobacco	Small for gestational age
Walpole <i>et al.</i> (1991) <sup>56</sup>	Western Australia	Cohort study	Alcohol	Tonus associated with birthweight
Wright <i>et al.</i> (1998) <sup>57</sup>	Randomly selected babies from across New Zealand	Case-control study	Marijuana; alcohol; tobacco	Preterm birth

Note: All reviewed studies were of quantitative design.

**Table 2** Short-term health outcomes of newborn infants associated with maternal substance use in Australia and New Zealand

Short-term health outcomes of newborns	Common substance used in pregnancy				
	Opioids	Cannabis	Stimulants	Alcohol†	Polysubstance
Preterm birth <37 weeks	+	+	+	+	+
Low birthweight <2500 g	+	+	+	+	+
Neonatal abstinence Syndrome	?	?	?	?	+
Perinatal death	?	?	?	+	?
Admission to neonatal intensive care unit or special care nursery	+	+	+	+	+
Small for gestational age < 10 percentile	+	+	+	+	+
Low Apgar score at 5 min < 7	+	+	+	+	+
Congenital anomalies	?	?	?	+	?

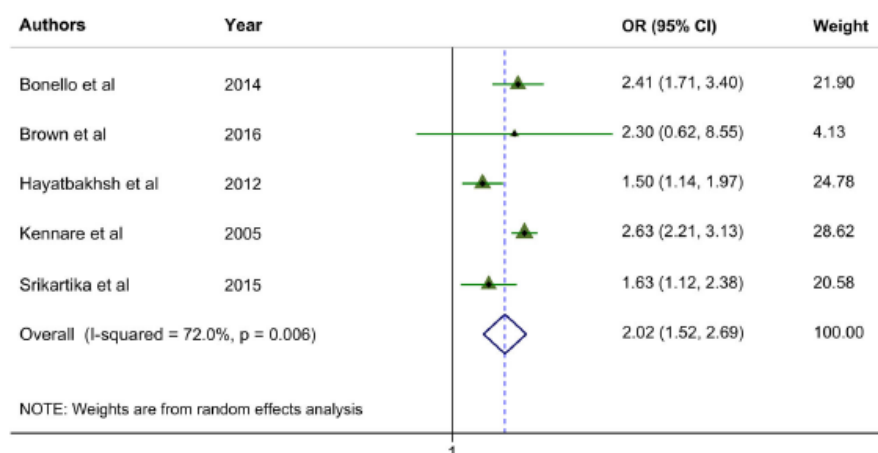
Note: +, reported an association between the particular substance and the neonatal outcome(s); ?, Level of association was not clearly reported. †Neonatal outcomes were only associated with heavy alcohol consumption in pregnancy or when the mothers were admitted due to alcohol-related ICD-10-AM diagnosis.

Significant association between small-for-gestational age and single/polysubstance use in pregnancy was reported by 12 studies in Australia and two studies in New Zealand,<sup>6,7,9,14,35,38,40–43,45,50,53,57</sup> of which 12 were large audit studies and one was a cohort study of 96 infants of drug dependent mothers.<sup>8</sup> Three studies examined the relationship between small-for-gestational age and alcohol consumption.<sup>40,46,50</sup> When smoking was taken into consideration the association became insignificant in one study.<sup>50</sup> Another study

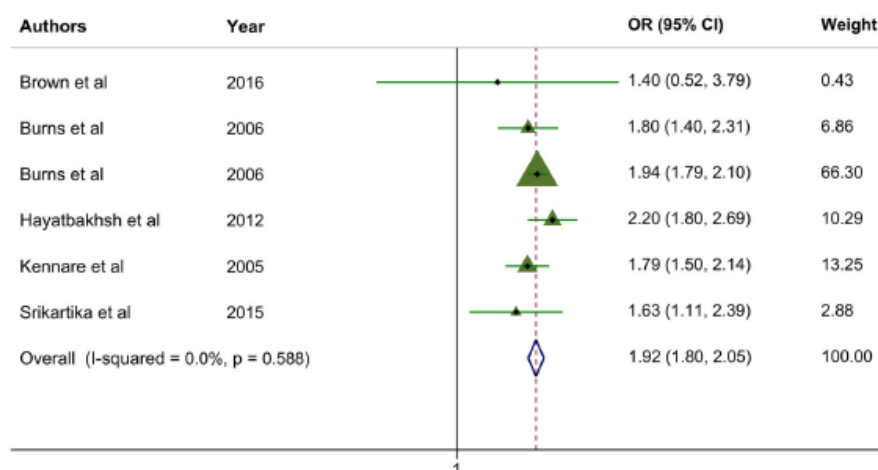
found insignificant association with alcohol consumption; however, this finding was limited as only a small number of women reported heavy consumption.<sup>40</sup>

#### Low Apgar score

Apgar score below 7 at 5 min of neonates exposed to gestational substance use was reported in four papers.<sup>25,38,45,53</sup> A data linkage study of 416 834 deliveries in New South Wales found a significant association between Apgar score < 7 at 5 min and exposure



**Figure 2** Forest plot showing the odds ratio between substance use and preterm birth. Pooled odds ratio is shown using the diamond at the bottom.



**Figure 3** Forest plot showing the odds ratio between substance use and low for gestational age. Pooled odds ratio is shown using the diamond at the bottom.

to opioids, stimulants or cannabis.<sup>25</sup> The percentage (5.6%) of alcohol exposed infants presented with low Apgar score was higher than that of non-exposed infants (1.6%).<sup>38</sup> A significant difference was found in low Apgar score between infants of amphetamine-using mothers and non-users.<sup>45</sup> A New Zealand study found a significant association between neonatal exposure to methamphetamine and neurobehavioral effects such as central nervous system stress and lower arousal and excitability, which contributed to low Apgar score at birth.<sup>44</sup>

#### *Admission to neonatal intensive care unit and or special care nursery*

Significant associations between maternal substance use and admission of neonates to either neonatal intensive care unit or special nurseries were reported in eight studies.<sup>11,25,36,38,42,43,45,60</sup> Opioid-exposed babies were six times; cannabinoids or polysubstance exposed babies were two and four times more likely to have been admitted to these facilities, respectively.<sup>36</sup> Two studies reported the median length of stay in the neonatal intensive care unit and or special

care nursery for the neonates of opioids-, stimulants- and cannabis-using mothers – 8 days for opioids, 5 days for stimulants and 3 days for cannabis.<sup>25,42</sup>

### *Congenital anomalies*

Congenital anomalies were reported by three studies, of which two found no significant association between maternal substance use and congenital anomalies.<sup>13,46</sup> However, a study conducted in Western Australia suggested that heavy alcohol consumption in pregnancy was an indirect cause of postnatally acquired cerebral palsy, and a direct cause of perinatal acquired cerebral palsy.<sup>49</sup> Other conditions such as congenital heart diseases, Down's syndrome and neonatal infections were mentioned but not significantly associated with gestational substance use.

Other less common but equally noteworthy medical conditions resulting from substance-use in pregnancy included gastroschisis, necrotizing enterocolitis, retinopathy of prematurity and patent ductus arteriosus and chronic lung disease.<sup>13,14</sup>

### **Demographic characteristics of substance-using mothers**

The mean age of substance-using mothers varied from early to late twenties. Although some of the studies did not specify mothers' age, they clearly pointed out that substance use in pregnancy was more common among younger women.<sup>6,14,25,45,58</sup> In addition, substance-using was disproportionately high among the mothers of Aboriginal descent in Australia,<sup>13,14,25,38,42,43,45,48,52,54,60</sup> those who were single or separated,<sup>14,19,25,43,44,53</sup> unemployed or studying during pregnancy, of low socio-economic or educational status<sup>6,19,25,38,42,44,46,47</sup>; socially isolated, or homeless. A subset of mothers was found to be victims of domestic violence.<sup>6,52</sup> Only one study, which was conducted in New Zealand, found a significantly positive association between alcohol consumption in pregnancy and women with higher educational and socio-economic status.<sup>39</sup>

### **Findings from meta-analysis**

Pooled OR was computed for two outcomes, *namely* preterm birth and small-for-gestational age. The association between alcohol and or other drug use during pregnancy and preterm birth was mentioned in five studies,<sup>6,36,43,53,61</sup> totaling 160 247 participants. All five studies were of acceptable quality. However, there was significant heterogeneity in effect sizes ( $I^2 = 72\%$ ,  $P < 0.01$ ). As a result, we used random effect meta-

analysis. Alcohol or other drug use during pregnancy was significantly related with preterm birth (OR = 2.02, 95% confidence interval [CI] = 1.52–2.69) (Fig. 2). Six studies could be included in the meta-analysis for small-for-gestational age.<sup>6,25,38,43,53,61</sup> All six articles were of acceptable quality and totaling 561 105 participants. However, in this case, we did not find any evidence of heterogeneity ( $I^2 < 50\%$ ). Therefore, we summarized study findings by using fixed effect model (Fig. 3). The pooled OR was 1.92 (95% CI 1.80–2.05).

## **Discussion**

The results of this review suggest that infants born to substance-using mothers were more likely to be premature, small-for-gestational age, of low birthweight and low Apgar score. Consequently, most of the neonates were admitted to neonatal intensive care unit or special care nursery. The prevalence of morbidity among exposed babies was higher than that of unexposed babies.<sup>1,27,62–65</sup> There was a possible dose-effect relationship between alcohol consumption during pregnancy and adverse clinical outcomes of infants.<sup>24,66</sup> Heavy alcohol consumption during pregnancy increased the risk of low birthweight, small-for-gestational age and preterm birth.<sup>66</sup> However, a significant association between low-moderate gestational alcohol consumption and adverse neonatal outcomes was unconvincing.<sup>24</sup> Another observation is that at the population level, the likelihood of adverse health outcomes was much higher for newborns of polysubstance-using mothers, than newborns of mothers using a single substance. Substance use was more prevalent among the women who were socio-economically disadvantaged than those who were not.

Polysubstance use was common among the substance-using mothers. As a result, it was difficult for some of the studies to determine the effect of single drug.<sup>6,37,64</sup> In addition, type of substances, amount, frequency and dose consumed, point and duration of exposure – all are important factors in determining the health outcome of newborns. Lack of disclosure and under-reporting of substance use-related information – mainly due to social stigma and legal ramification – made the endeavor further challenging. As a result, limited information was available about the effect of any individual substance and specific type of substance on infants' health. Despite all



these complexities, our findings provide some evidence – both from qualitative and quantitative analyses – and identify the most prevalent adverse health outcomes of infants of mothers who used substance during pregnancy in Australia and New Zealand context.

Methadone and buprenorphine are drugs of choice for treating opiate addiction in pregnancy.<sup>22,37,67</sup> This treatment had been found to effectively improve the neonatal outcomes of substance-dependent mothers.<sup>68,69</sup> Consistently, the evidence resulting from this review illustrated that early commencement and adherence to methadone or buprenorphine treatment may reduce the adverse effects of illicit substance use during pregnancy.<sup>34,37</sup>

Pregnancy is a time during which women tend to be motivated to reduce their substance use for the well-being of the fetus.<sup>52,63,70,71</sup> Early detection of substance use by healthcare providers followed by delivery of necessary care can reduce the risk of adverse health outcomes.<sup>25,36,38,40</sup> While screening for substance use during routine checkup is recommended, it requires greater attention to building and maintaining partnerships with key services; and the increased availability of specialist treatment services.<sup>6,41</sup> Assessing the history of substance use with little or no commitment to providing a pathway to care and ongoing monitoring may discourage women to disclose substance-using behaviors and seeking health care. Antenatal care stood out as a major factor that not only can bring about positive changes of certain behaviors among women but also reduce the effect of substance use in pregnancy on neonates.<sup>6,25,38</sup> This is supported by the finding of a prospective study of pregnant teenagers who reported using marijuana (20.3%) throughout their pregnancy and or polysubstance (33.5%) with no significant effects on birthweight or preterm birth.<sup>52</sup> This result was attributed to good antenatal care.<sup>52</sup> Delayed accessibility to antenatal care could be a barrier to good neonatal outcomes.<sup>37</sup>

A common observation was that the vast majority of substance-using mothers were of single or separated, unemployed, low socio-economic status with relatively low level of education, homeless, victims of domestic violence and/or socially isolated.<sup>6,9,14,25,36,38,48,50,56</sup> Clearly, there are consequences for the fetus – directly from the alcohol or drug use and indirectly from the environment and social milieu associated with substance use. While such factors are not new in the literature, the list of

these disadvantages highlights the importance of the social determinants of health.<sup>72</sup> A favorable set of social determinants of health such as ongoing support for employment and stable housing may contribute to reducing the impact of adverse health outcomes on newborns.<sup>13,19,52</sup> The study findings also highlight the need for holistic and multidisciplinary care,<sup>53</sup> which requires an integrated team approach of health care and other professionals such as general practitioners, obstetricians, midwives, mental health specialists and social workers.<sup>11,19,73</sup>

Our study adds value to the literature in that the findings represent the major health outcomes of the infants of mothers who used substance during pregnancy in Australia and New Zealand. It may be difficult to have an appropriate picture of health outcomes of infants of substance-using mothers unless a country or region-specific literature is considered, as there is variation in drug use – both in terms of type and quantity across countries and regions. Moreover, the ultimate health outcomes are influenced not only by the teratogenic effect of drugs but also by a range of host factors such as socio-economic condition, nutrition, health care and comorbid psychiatric illnesses. For instance, some studies in the United States found intrauterine substance exposure to be a significant risk factor for sudden infant death syndrome.<sup>74,75</sup> However, a study conducted in New Zealand found no such association.<sup>76</sup> Our review also found some gaps in the existing literature. One such gap is the effect of detoxification during pregnancy. Assessment of only a limited number of conditions is another gap. Particularly, literature around the neurological aspects of newborn is very limited. Furthermore, the extent to which adverse neighborhood exposures might confound or modify the effect of substance use on birth outcomes has not been adequately explored.

Our study has some limitations. First, heterogeneity in study design and limitations of individual studies might have some impacts on our synthesis. Second, our findings might have been affected by publication bias, as studies with significant results were more likely to have been published. Third, papers included were not evenly distributed across geographical locations. Also, the meta-analysis was possible only for two outcomes. Finally, in some papers statistical associations were not clearly mentioned, rather findings were described using words such as ‘common’, hence, subjective interpretations of the results were required.

In summary, the preponderance of the evidence suggests that infants born to substance-using

mothers – whether they used a single drug or polysubstance – are more likely at risk of adverse outcomes such as preterm birth, low birthweight, small-for-gestational age, low Apgar score and admission to neonatal intensive care unit or special care nursery. Further research is needed to understand the dose effect of specific substance on these health outcomes. Pregnant women who use illicit substance were most likely to be in their twenties, of Aboriginal origin, and or low socio-economic status. Early screening by healthcare providers in antenatal settings using validated screening tools with culturally sensitive support is required. Access to timely antenatal care is essential, as well as individualized treatment plans and ongoing monitoring during pregnancy to improve perinatal health outcomes.

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## Disclosure

None declared.

## References

- Scott K, Lust K. Illicit substance use in pregnancy – a review. *Obstetric Medicine* 2010; **3**: 94–100.
- Collins D, Lapsley HM. *The costs of tobacco, alcohol and illicit drug abuse to Australian society in 2004/05*. Canberra: Canberra, Department of Health and Ageing Canberra, 2008.
- Hoffman RS, Goldfrank L. The impact of drug abuse and addiction on society. *Emerg Med Clin North Am* 1990; **8**: 467–480.
- Australian Institute of Health and Welfare. *National Drug Strategy Household Survey 2016: Detailed Findings. Drug Statistics Series No. 31. Cat. No. PHE 214*. Canberra: AIHW, 2017.
- Ministry of Health. *Alcohol Use 2012/13: New Zealand Health Survey*. New Zealand: Ministry of Health Wellington, 2015.
- Brown SJ, Mensah FK, Kit JA *et al*. Use of cannabis during pregnancy and birth outcomes in an aboriginal birth cohort: A cross-sectional, population-based study. *BMJ Open* 2016; **6**: e010286.
- Ellwood DA, Sutherland P, Kent C, O'Connor M. Maternal narcotic addiction: Pregnancy outcome in patients managed by a specialized drug-dependency antenatal clinic. *Aust N Z J Obstet Gynaecol* 1987; **27**: 92–98.
- Kelly JJ, Davis PG, Henschke PN. The drug epidemic: Effects on newborn infants and health resource consumption at a tertiary perinatal centre. *J Paediatr Child Health* 2000; **36**: 262–264.
- Oats JN, Beischer NA, Breheny JE, Pepperell RJ. The outcome of pregnancies complicated by narcotic drug addiction. *Aust N Z J Obstet Gynaecol* 1984; **24**: 14–16.
- O'Leary CM, Nassar N, Kurinczuk JJ *et al*. Prenatal alcohol exposure and risk of birth defects. *Pediatrics* 2010; **126**: e843–e850.
- Richardson R, Bolisetty S, Ingall C. The profile of substance-using pregnant mothers and their newborns at a regional rural hospital in New South Wales. *Aust N Z J Obstet Gynaecol* 2001; **41**: 415–419.
- Behnke M, Eyler FD. The consequences of prenatal substance use for the developing fetus, newborn, and young child. *Int J Addict* 1993; **28**: 1341–1391.
- Abdel-Latif ME, Oei J, Craig F, Lui K, Nsw, Group ANE. Profile of infants born to drug-using mothers: A state-wide audit. *J Paediatr Child Health* 2013; **49**: E80–E86.
- Abdel-Latif ME, Bajuk B, Lui K, Oei J. Short-term outcomes of infants of substance-using mothers admitted to neonatal intensive care units in New South Wales and the Australian Capital Territory. *J Paediatr Child Health* 2007; **43**: 127–133.
- Oei J, Abdel-Latif ME, Clark R, Craig F, Lui K. Short-term outcomes of mothers and infants exposed to antenatal amphetamines. *Arch Dis Child Fetal Neonatal Ed* 2010; **95**: F36–F41.
- Oei JL, Kingsbury A, Dhawan A *et al*. Amphetamines, the pregnant woman and her children: A review. *J Perinatol* 2012; **32**: 737–747.
- Kipke MD, Montgomery SB, Simon TR, Iverson EF. “Substance abuse” disorders among runaway and homeless youth. *Subst Use Misuse* 1997; **32**: 969–986.
- Martin SL, English KT, Clark KA, Cilenti D, Kupper LJ, JoPH. *Violence and substance use among North Carolina pregnant women* 1996; **86**: 991–998.
- Davie-Gray A, Moor S, Spencer C, Woodward LJ. Psychosocial characteristics and poly-drug use of pregnant women enrolled in methadone maintenance treatment. *Neurotoxicol Teratol* 2013; **38**: 46–52.
- Australian Institute of Health and Welfare. *Australia's Mothers and Babies 2015—In Brief. Perinatal Statistics Series No. 33. Cat No. PER 91*. Canberra: AIHW, 2017.
- Maupin R Jr, Lyman R, Fatsis J *et al*. Characteristics of women who deliver with no prenatal care. *Matern Fetal Neonatal* 2004; **16**: 45–50.
- Blandthorn J, Forster DA, Love V. Neonatal and maternal outcomes following maternal use of buprenorphine or methadone during pregnancy: Findings of a retrospective audit. *Women Birth* 2011; **24**: 32–39.
- Bell JC, Raynes-Greenow C, Turner RM, Bower C, Nassar N, O'Leary CM. Maternal alcohol consumption during pregnancy and the risk of orofacial clefts in infants: A systematic review and meta-analysis. *Paediatr Perinat Epidemiol* 2014; **28**: 322–332.
- Henderson J, Gray R, Brocklehurst P. Systematic review of effects of low-moderate prenatal alcohol exposure on pregnancy outcome. *BJOG* 2007; **114**: 243–252.
- Burns L, Mattick RP, Cooke M. The use of record linkage to examine illicit drug use in pregnancy. *Addiction* 2006; **101**: 873–882.



26. Riddell S, Shanahan M, Degenhardt L, Roxburgh A. A review of the use of US-derived aetiological fractions in an Australian setting for antenatal problems related to cocaine use. *Aust N Z J Public Health* 2008; **32**: 393–394.
27. Behnke M, Smith VC, Committee on Substance Abuse. Prenatal substance abuse: Short- and long-term effects on the exposed fetus. *Pediatrics* 2013; **131**: e1009–e1024.
28. Liberati A, Altman DG, Tetzlaff J *et al.* The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. *PLoS Med* 2009; **6**: e1000100.
29. Pluye P, Gagnon M-P, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research, and concomitantly appraising qualitative, quantitative and mixed methods primary studies in mixed studies reviews. *Int J Nurs Stud* 2009; **46**: 529–546.
30. Pace R, Pluye P, Bartlett G *et al.* Testing the reliability and efficiency of the pilot mixed methods appraisal tool (MMAT) for systematic mixed studies review. *Int J Nurs Stud* 2012; **49**: 47–53.
31. Barnett-Page E, Thomas J. Methods for the synthesis of qualitative research: A critical review. *BMC Med Res Methodol* 2009; **9**: 59.
32. Popay J, Roberts H, Sowden A, *et al.* Guidance on the conduct of narrative synthesis in systematic reviews. A product from the ESRC methods programme Version. 2006; **1**: b92.
33. Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. *BMJ* 2003; **327**: 557–560.
34. Bartu AE, Ilett KF, Hackett LP, Doherty DA, Hamilton D. Buprenorphine exposure in infants of opioid-dependent mothers at birth. *Aust N Z J Obstet Gynaecol* 2012; **52**: 342–347.
35. Bird AL, Grant CC, Bandara DK *et al.* Maternal health in pregnancy and associations with adverse birth outcomes: Evidence from growing up in New Zealand. *Aust N Z J Obstet Gynaecol* 2017; **57**: 16–24.
36. Bonello MR, Xu F, Li Z, Burns L, Austin MP, Sullivan EA. Mental and behavioral disorders due to substance abuse and perinatal outcomes: A study based on linked population data in New South Wales, Australia. *Int J Environ Res Public Health* 2014; **11**: 4991–5005.
37. Burns L, Mattick RP, Lim K, Wallace C. Methadone in pregnancy: Treatment retention and neonatal outcomes. *Addiction* 2007; **102**: 264–270.
38. Burns L, Mattick RP, Cooke M. Use of record linkage to examine alcohol use in pregnancy. *Alcohol Clin Exp Res* 2006; **30**: 642–648.
39. Counsell AM, Smale PN, Geddis DC. Alcohol consumption by New Zealand women during pregnancy. *N Z Med J* 1994; **107**: 278–281.
40. Gibson GT, Baghurst PA, Colley DP. Maternal alcohol, tobacco and cannabis consumption and the outcome of pregnancy. *Aust N Z J Obstet Gynaecol* 1983; **23**: 15–19.
41. Giles W, Patterson T, Sanders F, Batey R, Thomas D, Collins J. Outpatient methadone programme for pregnant heroin using women. *Aust N Z J Obstet Gynaecol* 1989; **29**(Pt 1): 225–229.
42. Hayatbakhsh MR, Flenady VJ, Gibbons KS *et al.* Birth outcomes associated with cannabis use before and during pregnancy. *Pediatr Res* 2012; **71**: 215–219.
43. Kennare R, Heard A, Chan A. Substance use during pregnancy: Risk factors and obstetric and perinatal outcomes in South Australia. *Aust N Z J Obstet Gynaecol* 2005; **45**: 220–225.
44. LaGasse LL, Woudes T, Newman E *et al.* Prenatal methamphetamine exposure and neonatal neurobehavioral outcome in the USA and New Zealand. *Neurotoxicol Teratol* 2011; **33**: 166–175.
45. Ludlow JP, Evans SE, Hulse A. Obstetric and perinatal outcomes in pregnancies associated with illicit substance abuse. *Aust N Z J Obstet Gynaecol* 2004; **44**: 302–306.
46. Lumley J, Correy JF, Newman NM, Curran JT. Cigarette smoking, alcohol consumption and fetal outcome in Tasmania 1981–82. *Aust N Z J Obstet Gynaecol* 1985; **25**: 33–40.
47. McLeod D, Pullon S, Cookson T, Cornford E. Factors influencing alcohol consumption during pregnancy and after giving birth. *N Z Med J* 2002; **115**: U29.
48. O'Leary CM, Jacoby PJ, Bartu A, D'Antoine H, Bower C. Maternal alcohol use and sudden infant death syndrome and infant mortality excluding SIDS. *Pediatrics* 2013; **131**: E770–E778.
49. O'Leary CM, Watson L, D'Antoine H, Stanley F, Bower C. Heavy maternal alcohol consumption and cerebral palsy in the offspring. *Dev Med Child Neurol* 2012; **54**: 224–230.
50. O'Leary CM, Nassar N, Kurinczuk JJ, Bower C. The effect of maternal alcohol consumption on fetal growth and preterm birth. *BJOG* 2009; **116**: 390–400.
51. Patel P, Abdel-Latif ME, Hazelton B *et al.* Perinatal outcomes of Australian buprenorphine-exposed mothers and their newborn infants. *J Paediatr Child Health* 2013; **49**: 746–753.
52. Quinlivan JA, Evans SF. The impact of continuing illegal drug use on teenage pregnancy outcomes—a prospective cohort study. *BJOG* 2002; **109**: 1148–1153.
53. Srikanth VM, O'Leary CM. Pregnancy outcomes of mothers with an alcohol-related diagnosis: A population-based cohort study for the period 1983–2007. *BJOG* 2015; **122**: 795–804.
54. Tetstall E, Liu AJ, An EI, Canalese J, Nanan R. Pregnancy and neonatal characteristics of opioid-dependent indigenous Australians: A rural and metropolitan comparison. *Aust N Z J Obstet Gynaecol* 2009; **49**: 279–284.
55. Thompson JM, Wright SP, Mitchell EA, Clements MS, Becroft DM, Scragg RK. Risk factors for small for gestational age infants: A New Zealand study. New Zealand cot death study group. *N Z Med J* 1994; **107**: 71–73.
56. Walpole I, Zubrick S, Pontre J, Lawrence C. Low to moderate maternal alcohol use before and during pregnancy, and neurobehavioural outcome in the newborn infant. *Dev Med Child Neurol* 1991; **33**: 875–883.
57. Wright S, Mitchell E, Thompson J, Clements M, Ford R, Stewart A. Risk factors for preterm birth: A New Zealand study. *N Z Med J* 1998; **111**: 14–16.
58. Bell R, Lumley J. Alcohol consumption, cigarette smoking and fetal outcome in Victoria, 1985. *Community Health Stud* 1989; **13**: 484–491.
59. Dobbins TA, Sullivan EA, Roberts CL, Simpson JM. Australian national birthweight percentiles by sex and gestational age, 1998–2007. *Med J Aust* 2012; **197**: 291–294.
60. Burns L, Mattick RP. Using population data to examine the prevalence and correlates of neonatal abstinence syndrome. *Drug Alcohol Rev* 2007; **26**: 487–492.

61. Hayaabakhsh MR, Kingsbury AM, Flenady V, Gilshenan KS, Hutchinson DM, Najman JM. Illicit drug use before and during pregnancy at a tertiary maternity hospital 2000-2006. *Drug Alcohol Rev* 2011; **30**: 181-187.
62. Addis A, Moretti ME, Syed FA, Einarson TR, Koren G. Fetal effects of cocaine: An updated meta-analysis. *Reprod Toxicol* 2001; **15**: 341-369.
63. Forray A, Foster D. Substance use in the perinatal period. *Curr Psychiatry Rep* 2015; **17**: 91.
64. Metz TD, Stickrath EH. Marijuana use in pregnancy and lactation: A review of the evidence. *Am J Obstet Gynecol* 2015; **213**: 761-778.
65. Huizink AC. Prenatal cannabis exposure and infant outcomes: Overview of studies. *Prog Neuropsychopharmacol Biol Psychiatry* 2014; **52**: 45-52.
66. Patra J, Bakker R, Irving H, Jaddoe VW, Malini S, Rehm J. Dose-response relationship between alcohol consumption before and during pregnancy and the risks of low birthweight, preterm birth and small for gestational age (SGA)—A systematic review and meta-analyses. *BJOG* 2011; **118**: 1411-1421.
67. Burns L, Conroy E, Mattick RP. Infant mortality among women on a methadone program during pregnancy. *Drug Alcohol Rev* 2010; **29**: 551-556.
68. Jones HE, Finnegan LP, Kaltenbach K. Methadone and buprenorphine for the management of opioid dependence in pregnancy. *Drugs* 2012; **72**: 747-757.
69. Jones HE, Heil SH, Baewert A *et al*. Buprenorphine treatment of opioid-dependent pregnant women: A comprehensive review. *Addiction* 2012; **107** (Suppl 1): 5-27.
70. Laws P, Grayson N, Sullivan EA. *Smoking and Pregnancy*. Sydney: Citeseer, 2006.
71. De Bortoli L, Coles J, Dolan M. Linking illicit substance misuse during pregnancy and child abuse: What is the quality of the evidence? *Child Fam Soc Work* 2014; **19**: 136-148.
72. Little M, Shah R, Vermeulen MJ, Gorman A, Dzendoletas D, Ray JG. Adverse perinatal outcomes associated with homelessness and substance use in pregnancy. *CMAJ* 2005; **173**: 615-618.
73. Poulton BC, West MA. Effective multidisciplinary teamwork in primary health care. *J Adv Nurs* 1993; **18**: 918-925.
74. Fares I, McCulloch KM, Raju TN. Intrauterine cocaine exposure and the risk for sudden infant death syndrome: A meta-analysis. *J Perinatol* 1997; **17**: 179-182.
75. Ward SL, Bautista D, Chan L *et al*. Sudden infant death syndrome in infants of substance-abusing mothers. *J Pediatr* 1990; **117**: 876-881.
76. Galland BC, Mitchell EA, Thompson JM, Woudes T, Group NIS. Auditory evoked arousal responses of 3-month-old infants exposed to methamphetamine in utero: A nap study. *Acta Paediatr* 2013; **102**: 424-430.

## Appendix B: Article 2

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Review article

### Barriers to screening pregnant women for alcohol or other drugs: A narrative synthesis



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#### ABSTRACT

**Background:** Maternal alcohol or other drug use during pregnancy is associated with a range of adverse health outcomes for mothers and their unborn child. The antenatal period presents an opportunity for health professionals to offer routine screening for alcohol or other drugs, to then provide intervention and referral for treatment and/or specialised support services. However, literature indicates that limited screening practices currently exist in maternity care settings.

**Aim:** To identify barriers to screening pregnant women for alcohol or other drugs in maternity care settings, from the perspectives of healthcare professionals.

**Methods:** A comprehensive literature search was conducted in October 2017 to identify relevant studies. Seven databases that index health and social sciences literature, and google scholar, were searched. Eligible articles were subjected to critical appraisal. Extracted data from the eligible studies were synthesised using narrative synthesis.

**Findings:** Nine studies were eligible for this review. The review identified seven key barriers to screening for alcohol or other drugs in pregnancy, namely competing priorities and time constraint; lack of adequate screening skills and clear protocol; relationship between healthcare providers and pregnant women; healthcare providers' perceptions; under-reporting or none/false disclosure; inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy; and concerns about guilt and anxiety.

**Conclusions:** The narrative review revealed a range of barriers to screening for alcohol or other drugs in pregnancy. Further research in minimising the barriers is required to establish women-centred, evidence-base screening practices.

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#### Statement of significance

##### Problem

Alcohol or other drug use during pregnancy is a serious public health concern due to adverse impacts on the developing fetus and maternal health.

##### What is already known

Health professionals play a major role in the routine screening, counselling, and referral of substance-using pregnant women for treatment and/or specialised support services. However literature suggests that many do not prioritise screening in antenatal care.

#### What this paper adds

To our knowledge, this is the first review that systematically summarises studies on the barriers to screening women during pregnancy regarding alcohol or other drug use in maternity care settings from the healthcare providers' perspectives.

#### 1. Background

Maternal alcohol or other drug use is associated with adverse neonatal/child outcomes, including fetal alcohol syndrome, and an increased risk of spontaneous abortion, stillbirth, low birthweight, prematurity, congenital anomalies.<sup>1,2</sup> Further, there is a potential lifelong biopsychosocial effect on infants of mothers who use alcohol or other drugs in pregnancy.<sup>1–4</sup> The use of alcohol or other

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drugs can also impair a woman's role as a parent, partner or spouse, and is correlated with domestic violence, thus can create an unsafe environment for the physical, mental and emotional development of children.<sup>3</sup> As the evidence suggests, in Australia no statistically significant difference was identified in the proportion of pregnant women abstaining from alcohol between 2013 (53%) and 2016 (56%).<sup>5</sup> The recent estimate shows about 1 in 4 pregnant women consumed a similar amount of alcohol before and after they were aware of their pregnancy.<sup>5</sup> Estimates from the National Survey on Drug Use and Health – USA show among women who are pregnant, 16.4% continue to smoke; 11.6% and 4.5%, respectively, are current alcohol and binge drinkers; and 5.1% use illegal drug (s).<sup>6</sup> Although some women stop using these substances during pregnancy, many continue to use.<sup>7</sup>

In recent years, clinical practice guidelines have been developed to facilitate early detection of alcohol or other drug use, and provide interventions and specialist support.<sup>3,8</sup> To date, administration of brief screening tools (e.g., Drug Abuse Screening Test 10, and Alcohol Use Disorders Identification Test – Consumption (AUDIT-C)) have been considered the most efficient method to detect alcohol or other drug use.<sup>9</sup> To this effect, it is considered best-practice to screen every pregnant woman routinely, using a recommended validated tool such as AUDIT-C,<sup>10,11</sup> and refer for treatment and/or specialised support services afterward – if deemed necessary.

Screening and interventions to reduce the risks of alcohol or other drug exposed pregnancy can be initiated during routine antenatal care.<sup>10</sup> Although health professionals in maternity care settings can play a major role in screening, counselling and referral to specialised care, literature shows that many do not make this part of their antenatal consultation practices.<sup>12–14</sup> While existing research has identified obstacles that women who use alcohol or other drugs in pregnancy encounter when negotiating antenatal care,<sup>15</sup> little research has been conducted from the perspectives of primary care workers (e.g., midwives who provide clinical care and support to pregnant women). Therefore, this review aims to identify barriers to screening pregnant women for alcohol or other drugs in maternity care settings, from the perspectives of healthcare professionals.

## 2. Methods

A comprehensive literature search was conducted in October 2017 to identify studies that reported on barriers to routine screening pregnant women for alcohol or other drugs in primary care settings, from the perspectives of healthcare professionals. Studies were identified by searching comprehensive

electronic databases, CINAHL, Cochrane Library, MEDLINE Ovid, PsycARTICLES, EMBASE Ovid, PsycINFO, Web of Science and Google Scholar using different combinations of keywords. These databases were selected because they comprise extensive maternity related literature. Population, Intervention, Comparison and Outcomes (PICO) approach<sup>16</sup> was used to generate groups of medical subject heading (MeSH) search terms and keywords: (1) population: primary healthcare professionals, (2) intervention: alcohol or other drug use in pregnancy, (3) comparison: not applicable, (4) outcomes: barriers to screening for alcohol or other drugs in pregnancy. A further search was conducted by scanning the reference lists of all relevant articles. The keywords used are presented in Table 1.

Of note, due to the scarcity of studies addressing the aim of this literature review and to maximise our chances of retrieving all relevant articles, year of publication limitation was not imposed. Boolean operators “OR”, “AND”, and “NOT” were used to include, restrict, and eliminate search terms, respectively.

### 2.1. Inclusion and exclusion criteria

The inclusion criteria were as follows: (1) articles that report the results of an empirical study; (2) articles written in English and clearly address the aim of this study; (3) studies focusing on health care providers' perceived barriers to screening for alcohol or other drug use in pregnancy.

Conversely, the excluded studies were those with a primary focus on healthcare providers' perceived barriers to drug treatment in pregnancy such as methadone and buprenorphine; studies focussing on health care professionals' perceived barriers to screening and interventions for non-pregnant women who use alcohol or other drugs. Further, studies were excluded if they had a primary focus on medical students, smoking or tobacco use in pregnancy, and those conducted in developing countries. This is due to the availability and accessibility of antenatal care in these countries that differ socially, culturally, politically and historically from developed countries such as Australia, United States of America, and Canada. Finally, books, book chapters, review articles and commentaries, as well as abstracts with no full-text were also excluded.

### 2.2. Study selection and quality appraisal

Two authors (HO and MB) independently screened titles and abstracts of all retrieved studies to assess for eligibility. Full-text articles were retrieved if eligibility could not be determined from the title or abstract (Fig. 1). Due to a relatively small number of

**Table 1**  
Search strategy for the review.

Population	Exposure	Outcomes
Concept 1 • Health professionals • Midwives/midw* • Health care workers • Nurses • Doctors • General practitioners • Obstetric health care workers/staff • Health care providers • Obstetrician/Obste* • Social workers	Concept 2 • Pregnant wom?n • Pregnancy Expectant • Mothers • Expectant mother* • Expectant wom?n • Antenatal • Perinatal • Prenatal	• Substance-related disorders • Alcohol-related disorders • Alcoholism • Alcohol • Marijuana • Cannabis • Heroin • Cocaine • Stimulants • Illicit drug abuse/use/misuse/addicts/abus* • Drug abuse • Pregnant drug users • Smoke • Tobacco
		• Barriers to screening • Screening for alcohol • Screening for drug use • Interventions for alcohol or other drug use • Management of alcohol or other drug use • Perinatal health care delivery • Antenatal health care practices • Primary health care delivery • Perception • Stigma/stigm*

(\*or? for truncation).

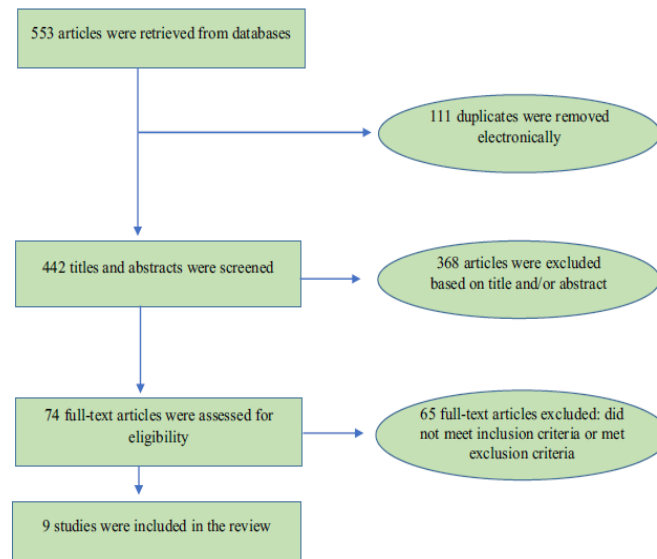


Fig. 1. Flow diagram of the study selection.

documents found on this topic, the authors decided to include both qualitative and quantitative studies that address the aim of the review. Narrative synthesis was used as a method of synthesizing findings of individual studies. Narrative synthesis can synthesise findings from both qualitative and quantitative method studies.<sup>17,18</sup>

Quality appraisal of the eligible studies was conducted using the Mixed Methods Appraisal Tool 2011 Version (MMAT).<sup>19</sup> This tool has been designed to assess the methodological quality of qualitative, quantitative and mixed-design studies for systematic mixed study reviews.<sup>19,20</sup> It consists of two screening criteria applied to all study types, and four other criteria applied to qualitative and quantitative studies, and three criteria for mixed methods studies. For qualitative and quantitative studies, the score is computed by the number of criteria met. For mixed methods research studies, the premise is that the overall quality of a combination cannot exceed the quality of its weakest component. Thus, the overall quality score is the lowest score of the study components. The score is 25% when qualitative = 1 or quantitative = 1 or mixed method = 0; 50% when qualitative = 2 or quantitative = 2 or mixed method = 1; 75% when qualitative = 3 or quantitative = 3 or mixed method = 2; and it is 100% when qualitative = 4 and

quantitative = 4 and mixed method = 3. Details of grading criteria are shown in Table 2.

### 2.3. Data extraction and analysis

Two authors (HO, MB) collected data and assessed the appropriateness of the studies. All citations were independently reviewed by HO and MB. Titles and abstracts were screened during October 2017 and full-texts were obtained for all articles that met the criteria. HO and MB independently assessed the research articles (November 2017) for potential selection, performance, and attrition bias.

The analysis process involved answering the objectives of this review. Given the heterogeneity of the studies in terms of methods, sampling, design and measures, a narrative synthesis<sup>17,18</sup> was adopted to synthesise and summarise extracted data from the eligible studies.

## 3. Results

### Description of the eligible studies

A total of 553 articles were identified during the search process. After removing the duplicates ( $n = 111$ ), titles and abstracts were

**Table 2**  
Mixed Methods Appraisal Tool (MMAT) – Version 2011 indicators (adapted from Pluye et al.<sup>19</sup>).

Screening questions for all study types	Qualitative study	Quantitative descriptive study	Mixed methods study
<ul style="list-style-type: none"> <li>Are there clear qualitative or quantitative or mixed methods research questions or objectives?</li> <li>Does the collected data address the research questions?</li> </ul>	<ul style="list-style-type: none"> <li>The sources of collected data relevant to address the research question.</li> <li>The process for data analysing is relevant to address the research question.</li> <li>Appropriate consideration given to how findings relate to the context of the study.</li> <li>Appropriate consideration given to how findings relate to researchers' influence.</li> </ul>	<ul style="list-style-type: none"> <li>The sampling strategy is relevant to address the research question.</li> <li>The sample represented the population under study.</li> <li>Measurements are appropriate (clear origin or validity is known, or standard instrument).</li> <li>Acceptable response rate (60% or above).</li> </ul>	<ul style="list-style-type: none"> <li>The mixed methods research design is relevant to address the qualitative and quantitative research questions.</li> <li>The integration of qualitative and quantitative data is relevant to address the research question.</li> <li>Appropriate consideration is given to the limitations associated with this integration.</li> </ul>

Note: studies were of acceptable quality when the first two screening questions for all study types and at least one of the other indicators were met.

Table 3

Key findings of the studies reporting barriers to screening of pregnant women for alcohol or other drugs, from the perspective of primary healthcare professionals.

Authors	Country	Study aims	Study design	Sample size	Barriers and conclusions	MMAT score
Doi et al. <sup>23</sup>	Scotland	To explore how midwives' skills, knowledge and attitudes to alcohol consumption during pregnancy influence their practice.	Qualitative study. Thematic analysis.	21 healthcare workers: 15 midwives, 6 midwifery team leaders.	<ul style="list-style-type: none"> <li>• Competing workload priorities.</li> <li>• Difficulty in converting different types of alcoholic drinks into standard unit.</li> <li>• Social stigmatisation of alcohol use among pregnant women.</li> <li>• Insufficient rapport between the health care providers and the pregnant women.</li> </ul>	75%
Doi et al. <sup>24</sup>	Scotland	To use realist evaluation to describe how and in what circumstances screening and alcohol brief interventions work in routine antenatal care.	Qualitative study. Thematic analysis.	36 participants: 4 policy implementation officers, 17 pregnant women, and 15 midwives.	<ul style="list-style-type: none"> <li>• Inadequate rapport with pregnant women at the first antenatal consultation.</li> <li>• Competing priorities at the first antenatal appointment due to time constraints.</li> </ul>	75%
France et al. <sup>25</sup>	Australia	To identify the barriers that health professionals encounter in addressing alcohol use during pregnancy and to elucidate the strategies they use to overcome them.	Qualitative study. Thematic analysis.	53 health professionals: 17 Aboriginal health workers, 10 allied health professionals, 14 nurses, and 12 physicians (7 general practitioners, 2 obstetricians, and 3 paediatricians)	<ul style="list-style-type: none"> <li>• Perception that most women do not drink much alcohol during pregnancy.</li> <li>• Perception that pregnant women know not to drink.</li> <li>• Perception that women who drink at high-risk levels during pregnancy have other contextual issues that need to be addressed.</li> <li>• Competing priorities during antenatal consultation.</li> <li>• Lack of time due to huge burden of consultation.</li> <li>• Perception that asking about alcohol could add to a woman's anxiety or guilt.</li> <li>• Perception that asking about alcohol could appear judgmental.</li> <li>• Lack of skills and resources to support women.</li> <li>• Lack of information about the risks of cannabis use during pregnancy.</li> <li>• Lack of means to inform and take care of these women.</li> </ul>	100%
Gerardin et al. <sup>26</sup>	France	To evaluate practices of detection and care for pregnant women who use cannabis.	Quantitative study. Descriptive analysis.	382 healthcare professionals: 200 general practitioners, 55 gynaecologists 69 midwives, and 58 obstetricians.	<ul style="list-style-type: none"> <li>• Lack of information about the risks of cannabis use during pregnancy.</li> <li>• Lack of means to inform and take care of these women.</li> </ul>	75%
Holland et al. <sup>21</sup>	USA	To identify obstetric care providers' attitudes, beliefs and counselling practices regarding marijuana use during pregnancy.	Qualitative study. Thematic analysis.	51 obstetric care providers.	<ul style="list-style-type: none"> <li>• Perception that marijuana use is not dangerous as other illicit drug use in pregnancy.</li> <li>• Lack of definitive evidence regarding potential risks related to perinatal marijuana use.</li> <li>• Limited time to spend with substance-using pregnant women.</li> </ul>	75%
Taylor et al. <sup>22</sup>	USA	To identify effective strategies for influencing and improving screening and referral of pregnant women for violence and substance abuse (alcohol, drugs and tobacco).	Qualitative study. Thematic analysis	8 physicians who practice obstetric care.	<ul style="list-style-type: none"> <li>• Difficulty in identifying, influencing behavioural change, and referring women who use alcohol or other drugs.</li> <li>• Presence of family members during prenatal visits.</li> <li>• Women's fear of reprisal from child protective services.</li> </ul>	75%
van der Wulp et al. <sup>27</sup>	Netherlands	To explore the advice Dutch midwives give, and the information Dutch pregnant women and partners of pregnant women receive about alcohol consumption in pregnancy.	Qualitative study. Content analysis.	10 midwives.	<ul style="list-style-type: none"> <li>• Lack of good screening skills.</li> <li>• Concern about confronting clients and obtaining truthful information about clients' alcohol use.</li> <li>• Inadequate skills and insufficient knowledge about the consequences of antenatal alcohol use.</li> </ul>	75%

Wangberg <sup>12</sup>	Norway	To assess midwives' perceived barriers to current screening and brief intervention for alcohol use in pregnancy	Quantitative (A questionnaire with some open-ended questions on barriers to screening) Descriptive analysis. Quantitative study. Descriptive analysis.	103 registered municipal midwives.	75%
Woudes <sup>28</sup>	New Zealand	To identify potential barriers to screening and effectively managing the care of women who report alcohol, tobacco and other drug use.		241 health professionals: two-thirds were midwives who provided antenatal and other postnatal care to mothers and their babies.	75%

- Low perceived competency on brief intervention.
- Difficulty in discussing alcohol use with women of diverse ethnicity.
- Time constraints.
- Lack of organizational support.
- Inadequate rapport with the women.
- Perception about women's ethnicity, cultural or socio-economic background.
- Lack of clear procedure in the clinical environment for managing women who use alcohol or other drugs.
- Presence of a family member during the antenatal consultation.

screened for 442 documents. Finally, 74 full-texts were reviewed, of which nine publications met the inclusion criteria of this review (Fig. 1). As outlined in Table 3, most of the studies were of qualitative design (n=6) in which semi-structured interview, in-depth interview and focus group discussions were used for data collection, and thematic analysis was performed for data synthesis. Two studies were of quantitative design in which data were collected using questionnaire and the results were presented in percentages. Two studies were conducted in the United States of America,<sup>21,22</sup> two in Scotland<sup>23,24</sup> and one each from Australia,<sup>25</sup> France,<sup>26</sup> Netherlands,<sup>27</sup> Norway,<sup>12</sup> and New Zealand.<sup>28</sup> The two studies from Scotland outlined the findings of a larger study – but described two different aspects.

The participants of the studies included various healthcare professionals in maternity settings including midwives, obstetricians, paediatricians, nurses and general practitioners (Table 3). Five studies focused on alcohol screening and brief interventions,<sup>12,23–25,27</sup> one aimed to evaluate practices of detection and care for pregnant women who use cannabis,<sup>26</sup> one focused on perinatal marijuana use<sup>21</sup> and the remaining two studies focused on maternal alcohol or other drug use.<sup>22,28</sup>

#### Methodological quality of the eligible studies

All nine studies were deemed of high quality. All of the studies answered the first two questions and fulfilled at least three quality criteria of MMAT. Of the six qualitative studies, one met all the criteria (100%) and the remaining studies met three (75%) of the four criteria. Of the three quantitative studies, all met three (75%) criteria (Table 3).

#### 3.1. Barriers to screening pregnant women for alcohol or other drugs

The nine studies included in this review examined research from seven countries, a total of 869 health professionals, surrounding barriers to screening women for alcohol or other drug use during pregnancy. Although the included papers differed in their approach to exploring the barriers to screening pregnant women, the findings were summarised in seven cluster themes: (i) competing priorities and time constraint; (ii) lack of adequate screening skills and clear protocol for managing women who use alcohol or other drugs in pregnancy; (iii) relationship between healthcare providers and pregnant women; (iv) healthcare providers' perceptions of alcohol or other drug use by pregnant women; (v) under-reporting or none/false disclosure; (vi) inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy; and (vii) concerns about guilt and anxiety.

#### 3.2. Competing priorities and time constraint

Competing priorities and time constraint were highlighted as barriers in five articles.<sup>12,21,23–25</sup> In four of the articles<sup>12,23–25</sup> the health care professionals indicated that due to competing workload priorities and time constraint during the antenatal visit, alcohol screening remained a low priority for them. Below is an illustrative quote from a health professional in an included study:

*"We've got to do domestic violence, alcohol use, smoking, you know and all the stuff. If somebody says I smoke then we have to give them all the literature, the DVD, arrange for referrals. So you can imagine, alcohol is only one of the aspects and sadly it is not the most important one because there is not a lot of evidence there that we have a lot of children who have fetal alcohol syndrome" (25, p7).<sup>23</sup>*

Another study on perinatal marijuana use found that providers often waived asking their clients about marijuana use and conserved time to address other issues thought more important.<sup>21</sup>



### **Lack of adequate skills and clear protocol for screening pregnant women who use alcohol or other drugs**

In six articles<sup>12,22,25–28</sup> a lack of skills and clear protocol for screening women who use alcohol or other drugs in pregnancy were identified as barriers to screening. Two studies<sup>22,28</sup> found that health care professionals were reluctant to screen pregnant women for alcohol or other drug use due to inadequate skill or resources for ongoing management.<sup>22,28</sup> In three studies<sup>25–27</sup> a lack of clear protocol and resources to support women were described as the main barriers.<sup>25–27</sup> Below is an illustrative quote from a health professional in one of the studies:

*"Maybe it would be easier (to ask a client about their alcohol consumption) if you knew what to do if the question was answered. If you were well resourced, knew how to facilitate it, give the right information, in the right way" (27, p1482).<sup>25</sup>*  
*"Not enough training. Use of screening tools not decided on from management/on a system level" (13, p188).<sup>12</sup>*

### **3.3. Relationship between healthcare providers and pregnant women**

In three studies<sup>23,24,28</sup> some of the maternity care workers felt that the rapport between them and the pregnant women was not sufficient enough to establish a trusting relationship. Therefore, these providers were uncomfortable in addressing maternal alcohol or other drug use, especially at the first antenatal consultation. Below is an illustrative quote from a health professional in one of the studies:

*"The other thing that makes it difficult is that at booking you have only just met the person. So, you are already asking a lot of personal questions. You probably haven't ever met her before and then you are required to take action whether it will be for alcohol or gender based violence. It is very difficult but I don't know when the good time will be, you know. Because by the time you have met her for three or four times, she is already well on in her pregnancy. And that is the longest appointment that you have so that is the most time you have with somebody" (25, p6).<sup>23</sup>*

Existing literature regards the relationship between healthcare providers and their clients as being critical for eliciting information about alcohol or other drug use. Two different studies conducted in New Zealand and Scotland found that building rapport with women during their first antenatal visit was central to disclosure of substance use and thus perinatal outcomes.<sup>24,28</sup>

### **3.4. Healthcare providers' perceptions of alcohol or other drug use by pregnant women**

Three studies<sup>21,25,28</sup> reported on some perceptions held by maternity healthcare workers that act as barriers to effective screening and interventions for alcohol or other drug use. Some common perceptions were that most women did not drink much alcohol during pregnancy; pregnant women knew not to drink; and asking about alcohol could appear judgmental.<sup>25</sup> Below is an illustrative quote from a health professional of one of the eligible studies:

*"Most of my patients are pretty well-informed. Well that's how it seems . . . but I haven't formally asked them about how much they're drinking, which I probably should do" (27, p1480).<sup>25</sup>*

Not too dissimilarly, another study focusing on perinatal marijuana use found that healthcare providers did not recognize marijuana as dangerous as other illicit drug use in pregnancy.<sup>21</sup> Finally, clinicians' perceptions played a substantial role in effective care as evidence shows that often some pregnant women were assumed to be at "no" or "low" risk for alcohol, tobacco and other drug use because of their ethnic, culture and/or socio-economic background.<sup>28</sup>

### **3.5. Under-reporting or none/false disclosure**

Health professionals in maternity care settings identified none or false disclosure – not truthfully disclosing the quantity of alcohol or other drug use – as one of the barriers to effective screening and provision of interventions in pregnancy. In three studies,<sup>22–24</sup> healthcare providers perceived this as a barrier due to various factors. For instance, one study<sup>22</sup> found the presence of family members during antenatal visits and clients' fear of reprisal from child protection services created a barrier to disclosing alcohol or other drug use.<sup>22</sup> In Scotland, midwives indicated that pregnant women who experienced poor provider-client rapport at the first antenatal appointment tended to refrain from disclosing their true alcohol consumption levels.<sup>24</sup> Finally, social expectation such as "pregnant women are not supposed to drink", was thought to result in under-reporting and none/false disclosure.<sup>23</sup> Below is an illustrative quote from a midwife in one of the eligible studies:

*"People know that it is not good to drink in pregnancy and therefore they don't always tell you the truth because they know that maybe you disapprove or it will make them feel guilty if they knew that they are honest and told you" (25, p3).<sup>23</sup>*

### **3.6. Inconclusive evidence regarding the risk of alcohol or other drug use in pregnancy**

Inconclusive evidence about the consequences of alcohol or other drug use in pregnancy was identified as a barrier in three studies.<sup>21,23,27</sup> In a study undertaken surrounding perinatal marijuana use,<sup>21</sup> healthcare providers expressed their unfamiliarity and unawareness of conclusive evidence regarding potential risks associated with maternal marijuana use as a barrier.<sup>21</sup> A qualitative investigation of alcohol use advice during pregnancy among the Dutch midwives revealed that the uncertainty about the consequences of alcohol use in pregnancy was an impediment to screening women for alcohol use in pregnancy.<sup>27</sup> Below is an illustrative quote from a midwife:

*"marijuana, I try to encourage people to stop, but not really all that strongly... We always talk about methadone and problems with [opiate] use in pregnancy and... cocaine obviously is another really important one that I would spend a lot of time on... I mean, outcomes [for marijuana use during pregnancy] are not as important. There are no syndromes caused by marijuana that we know of. It doesn't affect the pregnancy, health outcomes the same way [as other drugs]" (23, p1448).<sup>21</sup>*

### **Concerns about guilt and anxiety**

Two studies identified health care providers' concerns about women's reactions to screening for alcohol or other drug use as a barrier.<sup>25,27</sup> Both studies affirmed that providers were concerned about anxiety and guilt their clients may experience if they asked about alcohol or other drug use.<sup>25,27</sup> Below is an illustrative quote from a midwife:

*"Women often feel guilty when they drink alcohol before they knew they were pregnant. I try to downgrade their feelings of guilt by telling them that alcohol is not dangerous when there is no blood contact between mother and child" (27, p94).<sup>27</sup>*

## **4. Discussion**

The aim of this narrative review was to explore the barriers to screening pregnant women for alcohol or other drugs in maternity care settings. During antenatal consultations offering routine screening and providing interventions to pregnant women who use alcohol or other drugs may improve maternal and neonatal outcomes.<sup>9,11</sup> However, healthcare professionals' endeavours to

offer such services are often hindered by a range of barriers. Although models of care may vary across countries, barriers to screening and subsequent interventions for alcohol or other drug use are not dissimilar.

The purpose of antenatal care is to monitor and improve the wellbeing of the women and their fetuses. Despite this, while most healthcare providers are committed to the provision of holistic support and care, many are often forced to prioritise certain aspects of care due to increased workload and time constraint.<sup>23,24,29,30</sup> In the face of the rapidly changing population, providers are faced with the challenge of meeting the health and social care needs of their clients.<sup>29</sup> This includes managing complex circumstances such as poverty and unemployment,<sup>29</sup> homelessness,<sup>31</sup> domestic violence,<sup>32</sup> child protection issues,<sup>33</sup> extensive documentation and referral protocols.<sup>25</sup> These psychosocial aspects often come hand-in-hand with alcohol or other drug use, become time-consuming and stressful, thus discourage the healthcare providers to address this during antenatal consultations.<sup>24</sup> Some providers believe these are beyond their professional practice. Even those who are willing to intervene, often end up with receiving little or no support from the relevant agencies.<sup>28,34</sup> Thus, this identified system failure results in reluctance to screening and referrals for further management.<sup>22,35</sup>

The relationship between healthcare providers and their clients is fundamental to optimal maternity care service delivery.<sup>36</sup> It is also well known that establishing effective communication between a woman and her provider is essential towards not only establishing culturally safe care, but also developing rapport.<sup>36,37</sup> In the current review, findings illustrated inadequate rapport was a barrier to consultation about potentially sensitive topics such as alcohol or other drug use. Most antenatal screenings occur during the initial consultation,<sup>29,38</sup> when the pregnant woman may likely be in face-to-face contact with the practitioner for the first time. This phase is referred to as 'orientation phase', in which the practitioner is getting to know and build a rapport with the women.<sup>37</sup> Although building a trusting relationship may take time, various practices can be implemented to support healthcare workers to improve their interpersonal skills so that they can strategically elicit relevant information from their clients. More importantly, screening at multiple points or subsequent visits should be encouraged to identify substance-using pregnant women and to offer support for making behavioural change.<sup>39</sup> The perception that most women who use alcohol or other drugs during pregnancy are unlikely to disclose during the first antenatal consultation<sup>24</sup> further discourages routine screening. Provision of screening all women for alcohol or other drugs in general health assessment as a routine practice may facilitate an unbiased approach and potentially create a culture in which women can feel empowered by knowledge and informed choice, leading to positive behaviour change.

Under-reporting or none/false disclosure of alcohol or other drug use was identified as a barrier to screening and providing interventions during pregnancy.<sup>22,24,27</sup> Effective communication skills of healthcare providers is necessary to obtain sensitive information and support behavioural change. Therapeutic communication skills, e.g., motivational interviewing techniques to support a woman-centred and non-judgemental approach may encourage pregnant women to disclose alcohol or other drug use and get help. While on the one hand fears of being judged can deter women from disclosing sensitive information and seeking antenatal care, on the other hand, becoming pregnant can also be a motivating factor for seeking treatment. This highlights the need for health professionals in maternity care settings to be trained in managing complex care needs, in addition to optimal service provision, to ensure an effective integration to specialist treatment and ongoing monitoring.

As identified repeatedly in the current review, health professionals in maternity care settings perceived a lack of necessary skills to competently support pregnant women who are at risk. This may be remedied through ongoing specific education and training at the primary care level to increase confidence in discussing alcohol or other drug use and sensitively posing the appropriate questions. Again, while literature notes many organisational barriers, and that not all these barriers are removable in the short-term, having appropriate assessment tools and guidelines that outline process and protocols for managing women requiring specialized care in antenatal settings may facilitate routine screening and intervention practices.<sup>22</sup>

#### 4.1. Strengths and limitations

To our knowledge, this is the first review that systematically summarised studies on barriers to screening for maternal alcohol or other drug use in maternity care settings from the healthcare providers' perspectives. This review has been strengthened by its extensive and multiple database searches and the quality appraisal of the included articles. This review has also some limitations. Firstly, only a few studies met the inclusion criteria, of which the majority (55%) focused on alcohol screening and brief interventions. Since the literature search and selection process was conducted in English language, relevant article(s) in other languages were not identified. Exclusion of unpublished reports, review articles, commentaries and studies conducted in developing countries might have led to the omission of certain relevant information. Secondly, all the studies were from Europe, USA and Australia; thus, the findings of this review might not reflect the barriers to screening for alcohol or other drug use in developing countries or resource-limited settings. Moreover, the heterogeneity of the study population could have resulted in response bias, as there is a possibility that some of the healthcare providers – such as allied health professionals – might not have been directly involved in providing antenatal care services.

#### 4.2. Conclusions and recommendations

This narrative review found a range of barriers to screening pregnant women for alcohol or other drugs. Given the adverse impacts of alcohol or other drug use on perinatal outcomes, and the opportunity to reach many women during this period, necessary efforts should be made to adequately screen all pregnant women. Further research is needed in this area – particularly on the educational needs of healthcare workers, including effective communication skills for screening. Likewise, at the organisational level, validated screening tools and policy development to facilitate best screening practice is required for referral and ongoing monitoring of at-risk women to minimise harm and improve perinatal health outcomes.

#### Conflict of interest

The authors have no conflict of interest to declare.

#### Authors' contributions

All the authors (HO, MB, MI and MA) contributed to the conceptualization and methodology of this manuscript. HO and MB performed the data extraction and quality appraisal of the eligible studies. HO took the lead in writing the first draft of the manuscript. All authors provided critical feedback and helped shape the data analysis and synthesis of the results and to the final version of the manuscript.



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## References

- Abdel-Latif ME, Bajuk B, Lui K, Oei J. Short-term outcomes of infants of substance-using mothers admitted to neonatal intensive care units in New South Wales and the Australian Capital Territory. *J Paediatr Child Health* 2007;43(3):127–33.
- Burns L, Mattick RP, Cooke M. The use of record linkage to examine illicit drug use in pregnancy. *Addiction* 2006;101(6):873–82.
- World Health Organization. *Guidelines for the identification and management of substance use and substance use disorders in pregnancy*. Geneva: WHO; 2014.
- Burns L, Mattick RP, Cooke M. Use of record linkage to examine alcohol use in pregnancy. *Alcohol Clin Exp Res* 2006;30(4):642–8.
- Australian Institute of Health and Welfare. Australia's health 2016. *Australia's health series no 15*. Canberra: AIHW; 2016 Cat no AUS 199.
- Center for Behavioral Health Statistics and Quality. *National survey on drug use and health: detailed tables*. Rockville, MD, USA: Substance Abuse and Mental Health Services Administration; 2017; 2016.
- Australian Institute of Health and Welfare. National drug strategy household survey 2016. *Drug statistics series no 31*. Canberra: AIHW; 2017 Detailed findings. Cat no PHE 214.
- Hussein Rassool G, Oyefeso AO. The need for substance misuse education in health studies curriculum: a case for nursing education. *Nurse Educ Today* 1993;13(2):107–10.
- Morse B, Gehshan S, Hutchins E. *Screening for substance abuse during pregnancy: improving care, improving health*. Arlington, Virginia, USA: National Center for Education in Maternal and Child Health; 2000.
- National Drug & Alcohol Research Centre. Supporting pregnant women who use alcohol or other drugs: A Guide for Primary Health Care Professionals. <https://ndarc.med.unsw.edu.au/resource/quick-guide-identifying-women-risk-alcohol-smoking-or-other-drug-use-during-pregnancy> [Accessed 14 October 2017].
- World Health Organization. *The involvement of nurses and midwives in screening and brief interventions for hazardous and harmful use of alcohol and other psychoactive substances*. Geneva: WHO; 2010.
- Wangberg SC. Norwegian midwives' use of screening for and brief interventions on alcohol use in pregnancy. *Sex Reprod Healthc* 2015;6(3):186–90.
- Crawford-Williams F, Steen M, Esterman A, Fielder A, Mikocka-Walus A. If you can have one glass of wine now and then, why are you denying that to a woman with no evidence: Knowledge and practices of health professionals concerning alcohol consumption during pregnancy. *Women Birth* 2015;28(4):329–35.
- McLeod D, Benn C, Pullon S, Viccars A, White S, Cookson TT, et al. The midwife's role in facilitating smoking behaviour change during pregnancy. *Midwifery* 2003;19(4):285–97.
- Stone R. Pregnant women and substance use: fear, stigma, and barriers to care. *Health Justice* 2015;3(1):2.
- Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gotzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: explanation and elaboration. *PLoS Med* 2009;6(7):e1000100.
- Barnett-Page E, Thomas J. Methods for the synthesis of qualitative research: a critical review. *BMC Med Res Methodol* 2009;9(1):59.
- Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, et al. Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version 1*. Lancaster: Institute for Health Research; 2006 b92.
- Pluye P, Robert E, Cargo M, Bartlett G, O'Cathain A, Griffiths F, et al. *Proposal: a mixed methods appraisal tool for systematic mixed studies reviews*. Montréal: McGill University; 2011. p. 1–8.
- Pluye P, Gagnon M-P, Griffiths F, Johnson-Lafleur J. A scoring system for appraising mixed methods research: and concomitantly appraising qualitative, quantitative and mixed methods primary studies in Mixed Studies Reviews. *Int J Nurs Stud* 2009;46(4):529–46.
- Holland CL, Nkumah MA, Morrison P, Tarr JA, Rubio D, Rodriguez KL, et al. Anything above marijuana takes priority: Obstetric providers' attitudes and counseling strategies regarding perinatal marijuana use. *Patient Educ Couns* 2016;99(9):1446–51.
- Taylor P, Zaichkin J, Pilkey D, Leconte J, Johnson BK, Peterson AC. Prenatal screening for substance use and violence: findings from physician focus groups. *Matern Child Health J* 2007;11(3):241–7.
- Doi L, Cheyne H, Jepson R. Alcohol brief interventions in Scottish antenatal care: a qualitative study of midwives' attitudes and practices. *BMC Pregnancy Childbirth* 2014;14:170.
- Doi L, Jepson R, Cheyne H. A realist evaluation of an antenatal programme to change drinking behaviour of pregnant women. *Midwifery* 2015;31(10):965–72.
- France K, Henley N, Payne J, et al. Health professionals addressing alcohol use with pregnant women in Western Australia: barriers and strategies for communication. *Subst Use Misuse* 2010;45(10):1474–90.
- Gerardin M, Victorri-Vigneau C, Louvigne C, Rivoal M, Jolliet P. Management of cannabis use during pregnancy: an assessment of healthcare professionals' practices. *Pharmacoepidemiol Drug Saf* 2011;20(5):464–73.
- van der Wulp NY, Hoving C, de Vries H. A qualitative investigation of alcohol use advice during pregnancy: experiences of Dutch midwives, pregnant women and their partners. *Midwifery* 2013;29(11):e89–98.
- Woudes T. *What health professionals know & do about alcohol and other drug use during pregnancy: a research report in collaboration with Alcohol Healthwatch*. Auckland: University of Auckland; 2009.
- Chief Nursing Officers of England, Northern Ireland, Scotland and Wales. *Midwifery 2020: Delivering expectations*. 2010 <https://www.gov.uk/government/publications/midwifery-2020-delivering-expectations> (accessed 31/10 2017).
- Deery R. An action-research study exploring midwives' support needs and the affect of group clinical supervision. *Midwifery* 2005;21(2):161–76.
- Little M, Shah R, Vermeulen MJ, Gorman A, Dzendoletas D, Ray JG. Adverse perinatal outcomes associated with homelessness and substance use in pregnancy. *CMAJ: Can Med Assoc J = journal de l'Association medicale canadienne* 2005;173(6):615–8.
- Marcellus L, MacKinnon K, Benoit C, Phillips R, Stengel C. Reenvisioning success for programs supporting pregnant women with problematic substance use. *Qual Health Res* 2015;25(4):500–12.
- Jakes SC, Kingsbury A, Henshcke P, Chomchai C, Clews S, Falconer J, et al. Cannabis, the pregnant woman and her child: weeding out the myths. *J Perinatol* 2014;34(6):417–24.
- Corse SJ, McHugh MK, Gordon SM. Enhancing provider effectiveness in treating pregnant women with addictions. *J Subst Abuse Treat* 1995;12(1):3–12.
- Nygaard P, Aasland OG. Barriers to implementing screening and brief interventions in general practice: findings from a qualitative study in Norway. *Alcohol Alcohol* 2011;46(1):52–60.
- Lundgren I, Berg M. Central concepts in the midwife–woman relationship. *Scand J Caring Sci* 2007;21(2):220–8.
- Peplau HE. *Interpersonal relations in nursing: a conceptual frame of reference for psychodynamic nursing*. Springer Publishing Company; 1991.
- Diekman ST, Floyd RL, Decoufle P, Schulkin J, Ebrahim SH, Sokol RJ. A survey of obstetrician–gynecologists on their patients' alcohol use during pregnancy. *Obstet Gynecol* 2000;95(5):756–63.
- Corse SJ, McHugh MK, Gordon SM. Enhancing provider effectiveness in treating pregnant women with addictions. *J Subst Abuse Treat* 1995;12(1):3–12.



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# Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience

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## ABSTRACT

**Background:** Screening pregnant women for substance use is highly recommended in antenatal care settings. Although midwives provide routine screening for substance use and referral for treatment in pregnancy, little is known about the barriers and facilitators they experience.

**Aim:** The study explored barriers and facilitators experienced by midwives in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs.

**Design/setting:** A semi-structured interview was adopted to explore barriers and facilitators experienced by midwives in screening and referring pregnant women for alcohol or other drugs specialised services. Eighteen midwives were recruited from urban, regional and rural antenatal settings in Victoria. Interviews were tape recorded and transcribed verbatim. Themes were generated by thematic analysis, the process of identifying patterns within the data.

**Findings:** Of the seven themes identified under barriers, five could be categorised as "institution and provider-related", namely: (i) lack of validated screening tool, (ii) inadequate support and training, (iii) discomfort in screening, (iv) lack of multidisciplinary team and specialised treatment in regional and rural areas, and (v) workload and limited consultation time. Conversely, two themes could be classified as 'client-related', namely (i) non- or partial-disclosure of substance use, and (ii) reluctance and non-adherence to referrals. All five themes under facilitators were "institution and provider-related." They are (i) a woman-centred philosophy of care, (ii) evidence of harms from substance use on neonates, (iii) experience and training, (iv) continuity of care, and (v) availability of multidisciplinary team and funding.

**Key conclusions and implications for practice:** To the best of our knowledge, this is the first study of its kind conducted in Victoria. This study not only adds to the limited body of knowledge on barriers experienced by midwives but also identifies facilitators in antenatal settings that promote screening and referral of pregnant women who use substance. Most of the barriers and facilitators are interrelated. Despite midwives' willingness to screen all pregnant women for substance use and provision of referral, they often felt limited in their capacity. Availability and accessibility to validated screening tool(s), in addition to regular, ongoing training for all midwives to maintain clinical competence and provide effective communication are imperative. Availability of a multidisciplinary team, funds and specialised care facilities such as detoxification and mental health services, especially in regional and rural areas, are necessary to effectively support at-risk pregnant women.

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## Introduction

Drinking alcohol and or using illicit drugs (referred as 'substance' hereafter) in pregnancy is associated with a wide range

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of adverse maternal and child outcomes (Jansson et al., 2008). Thus women are recommended to abstain from substance use when they are pregnant or planning to become pregnant (Centre for Population Health, 2014; World Health Organization, 2014). Screening for substance use and referral of pregnant women who use substance are highly recommended in antenatal care settings (Ford et al., 2009; French, 2013; Miles et al., 2014).

In Australia, four in ten pregnant women consumed alcohol, and 2.2% had used an illicit substance during pregnancy in 2013 (Australian Institute of Health and Welfare, 2014). In 2016, approximately 1 in 4 pregnant women consumed a similar amount of alcohol before and after they were aware of their pregnancy (Australian Institute of Health and Welfare, 2017). Factors such as being single or separated, unemployed, low socio-economic status and low level of education, homelessness, unplanned pregnancy, and domestic violence contribute to substance use in pregnancy (Breen et al., 2014; Oni et al., 2019).

Pregnant women are regarded as a high priority for substance use screening and referral to health and social care services in Australia (Miles, 2012; Centre for Population Health, 2014; The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018). To facilitate this, national clinical guidelines for the management of drug use during pregnancy, birth and the early development years of the newborn was developed in 2006, and updated in 2014 (Centre for Population Health, 2014; New South Wales Department of Health, 2006). The most recent guidelines highlight three core services, namely (i) referral to specialised services in conjunction with midwifery and obstetric care, (ii) consistent access to a case manager and care team throughout pregnancy, and (iii) specialised support services that promote harm minimisation and relapse prevention such as counselling and pharmacotherapies (New South Wales Department of Health, 2006).

Midwives are often the primary carer provider, and central to screening and informing women about the consequences of substance use in pregnancy (Miles et al., 2014). Although previous studies have examined healthcare professionals' attitudes of working with pregnant women who use substance (Fonti et al., 2016; Miles et al., 2014), little is known about the barriers and facilitators in antenatal settings to screening and referral of experienced by Australian midwives (France et al., 2010). Considering the optimum yet challenging opportunity for midwives to screen and refer pregnant women who use substance, and facilitate harm minimisation during the antenatal period, exploring barriers and facilitators that midwives experience is crucial for understanding the current practice in antenatal care settings. Therefore, this study aimed to explore midwives' experiences of barriers and facilitators in antenatal settings to screening and referral of pregnant women who use substance.

## Methods

### Study design

This study adopted an exploratory qualitative research design (Brink and Wood, 1998). Interviews were conducted to elicit information about midwives' experience of the barriers and facilitators to screening and referral of pregnant women who use substance. Convenience sampling technique was used to recruit participants (Polit and Beck, 2010). To participate in this study, the inclusion criteria were: the participant must be a midwife, and currently working with pregnant women in maternity care settings within Victoria, a state in south-eastern Australia. To recruit participants, an email invitation along with the study proposal was sent to the maternity healthcare managers in both metropolitan, regional and rural maternity care settings in Victoria.

In the current study, barriers and facilitators were defined as any organisational, provider or patient-level factors that prevent or promote screening and referral of women who use substance (Johnson et al., 2010) in pregnancy.

### Study setting and participants

A convenience sample of six publicly funded health facilities (two metropolitan hospitals, two regional hospitals and two remote/rural health centres) that render antenatal services were invited to participate. Addressed to maternity healthcare managers, email invitations were sent for further distribution among staff seeking midwives' interest in participation.

The interviews were conducted in Victoria where antenatal care can be provided by a midwife, hospital doctor, general practitioner or obstetrician or a combination of these professionals. The type of antenatal care depends on the woman's health, risk of complications, location and the woman's choice. Some common maternity models of care available across Victoria include shared care model: *care is shared between two health professionals, in most cases a midwife and a doctor sharing the carer role*; caseload midwifery model: *involves one midwife in a primary or lead role in caring for the woman*; team midwifery care model: *involves a small team of midwives care for the woman*. However, in some rural and regional areas, a woman choice may be limited by the services available (Bryant, 2009; Department of Health & Human Services Victoria, 2012).

We conducted interviews with midwives involved in the care of women during pregnancy in Victoria, Australia. Eighteen midwives were interviewed, of which 12 worked in outpatient clinics with relatively low-risk pregnant women. Majority of this subset who worked in antenatal clinics were relatively less experienced in screening and providing referral to pregnant women who use substance. These midwives are involved in screening women at their first antenatal visit and in referring them for further support or specialised care when necessary. The remaining six midwives were working in specialised units – such as those where midwives provide one-on-one antenatal education with a specific focus on substance use.

The average age of all the midwives was 42 years and the average duration of midwifery practice was 14 years. All 18 midwives were female, 10 were from metropolitan and eight were from rural and regional health facilities.

### Data collection

Interviews were conducted by the first author between September and November 2018. Face-to-face interviews were conducted with 13 participants who were residing around metropolitan areas and telephone interviews with the remaining five residing in regional areas.

A semi-structured interview guide (available in appendix) was developed with minor modifications after the first few interviews to incorporate additional information from the field notes. Participants were given the opportunity to choose a quiet and private venue. Interviews took 30–45 min and were tape recorded with participants' consent and transcribed verbatim by the first author. All participants were informed that they would remain anonymous and no facility name would be mentioned in the report. Each participant was assigned a pseudonym while transcribing the data to maintain confidentiality.

The interviews covered a broad range of questions relating to barriers and facilitators experienced by midwives in screening and offering referrals to pregnant women who use substance. Data saturation was achieved after 13 interviews.

### Data analysis

The NVIVO QSR International Qualitative Analysis software (Version 12) for Windows was used to facilitate the coding process and generate themes. Interview transcripts were analysed using thematic analysis based on the guidelines outlined in qualitative methodology literature (Aronson, 1995; Attride-Stirling, 2001; Braun and Clarke, 2006; Braun et al., 2014; Joffe and Yardley, 2004).

Verbatim transcripts of the audiotaped interviews were read several times before coding. All 18 transcripts were coded by two coders in relation to the research questions and codes were adjusted when necessary. Similar codes were clustered to generate themes. To ensure the validity of the analysis, generated themes were reviewed independently by two researchers. Disagreement was resolved by face-to-face discussion.

### Ethical considerations

The study was approved by the University Human Ethics Committee (Approval number: HEC18095). The interviews were carried out in accordance with the Helsinki Declaration (World Medical Association, 2001). A written copy of the participant information sheet and a description of the study were given to each midwife and informed consent was obtained. The voluntary nature of participation, confidentiality and anonymity, and the freedom to withdraw at any point in the study were made clear to the midwives.

### Results

This study aimed to identify barriers and facilitators experienced by midwives in screening and referral of pregnant women

who use substance. In total, seven themes were derived under barriers and five themes were generated under facilitators. Of the seven themes identified under barriers, five could be categorised as “institution and provider-related.” They are: (i) *lack of validated screening tool*, (ii) *inadequate support and training*, (iii) *discomfort in screening*, (iv) *lack of multidisciplinary team and specialised treatment in regional and rural areas*, and (v) *workload and limited consultation time*. Conversely, two themes could be classified as ‘client-related’, namely (i) *non- or partial-disclosure of substance use*, and (ii) *reluctance and non-adherence to referrals*. All five themes identified under facilitators could be categorised as “institution and provider-related.” They are (i) *a woman-centred philosophy of care*, (ii) *evidence of harms from substance use on neonates*, (iii) *experience and training*, (iv) *continuity of care*, and (v) *availability of multidisciplinary team and funding* seven barriers (Fig. 1).

### Barriers to screening and referral of pregnant women who use substance in antenatal settings

#### Lack of validated screening tools

Midwives stated that screening of all pregnant women for substance use is routinely performed, as it is a requirement of midwifery service. The majority further highlighted that most screening takes place at the initial appointment. No tool was specified by the midwives when asked to detail the screening tool(s) for substance use in the antenatal clinic. Rather a subset of questions was reported to be used, and these questions come from the Victorian Maternity Record, Birthing Outcome System and or Pre-booking Appointment Questionnaire. The Victorian Maternity Record provides a complete record of pregnancy care and progress. The Birthing Outcome System database offers the care summaries of clients' pregnancy and birth episode. The Pre-booking

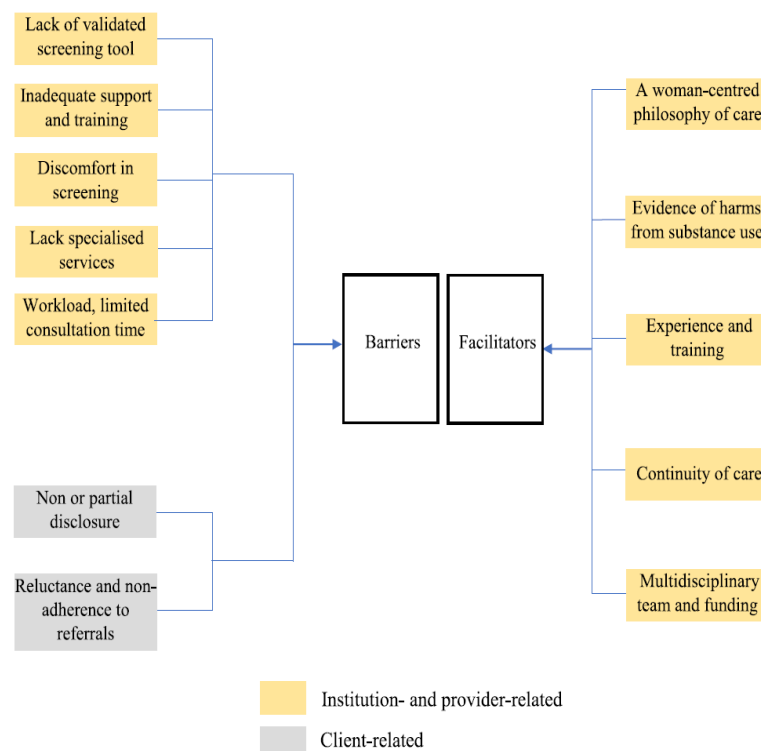


Fig. 1. Themes of barriers and facilitators in antenatal setting to screening and referral of pregnant women who use substance.



Appointment Questionnaire was designed for assessing pregnant women before the booking appointment. Some midwives stated that these questions were not doing a good job in eliciting adequate information from the women. They also stated that having an appropriate and validated screening tool might enhance the effectiveness of substance use screening in maternity care settings. A midwife said: *"The standard questions we asked are: 'do you drink alcohol, smoke cigarettes or use any other drug throughout pregnancy?'. There isn't an actual tool"* (Midw9).

#### *Inadequate support and training*

The majority of the midwives indicated that screening pregnant women for substance use as part of their role. Nevertheless, some expressed a lack of support and training on how to effectively screen and ask pregnant women questions pertinent to substance use. Further, they reported to have no formal training or education on substance use screening in pregnancy, as illustrated by this quote: *"We don't receive any support from the organisation. We haven't had proper training on substance use in pregnancy, except my initial training as a student midwife"* (Midw9).

Although there are opportunities to attend training and education sessions for the midwives working in metropolitan areas, a distinct lack of ongoing educational opportunities was identified by the midwives working in regional and rural areas. The latter group also expressed that often the trainings were organised in the metropolitan context, rarely considering what was available and accessible for midwives and their clients in regional and rural areas. A midwife said: *"We have training in the city every three months but again the training is all about what the pregnant women (who use substance) in the city have access to more than what we've got access to (in the regional areas) and some of our pregnant women are not gonna travel all the way to the city"* (Midw15).

#### *Discomfort in screening*

Some midwives explained that they sometimes felt uncomfortable. A wide range of reasons was mentioned for this including feeling discomfort, fear of being judgmental, fear of offending and embarrassment. For example, a participant said, *"sometimes it's really difficult to ask the women these questions because you feel like you're passing judgement..."* (Midw3). Another midwife stated, *"I do feel uncomfortable asking the question sometimes because especially with the alcohol question, ummm I know the answer especially if the women are Muslim, they don't drink alcohol and so when I ask the question they get really offended"* (Midw1). Some were embarrassed in raising such a sensitive topic as illustrated by this quote *"I think all pregnant women should be screened but I don't think it happens properly, maybe the reason is that a lot of the midwives feel embarrassed about asking substance-related questions"* (Midw2). Some were also uncomfortable with screening due to lack of a clear protocol of what to do or where to refer the women after disclosure of substance use. A midwife said: *"So, I feel very uncomfortable, there is no guidelines or protocol written to be followed on what to do when they (pregnant women) disclosed alcohol and drug use"* (Midw4).

#### *Lack of multidisciplinary team and specialised treatment in regional and rural areas*

Midwives discussed the lack of multidisciplinary care and specialised treatment as being barriers they experience in regional and rural areas. A few midwives expressed concerns about pregnant women not being able to access services such as detoxification. Additionally, they noted a lack of health professionals, central to supporting individuals using substance, such as psychiatrists and social workers in their organisations. It was perceived that this shortage directly impacts the midwife's ability in referring women to appropriate care. As mentioned by a midwife, *"All*

*hospitals should have a multidisciplinary team, especially in the Aboriginal areas...there's nothing in those areas and yet the drug use and the poverty and the disadvantages in those areas are huge"* (Midw16).

In the metropolitan areas, midwives can refer pregnant women who use substance for specialised treatment. These services are mostly offered within the hospital, hence accessible by the women. However, midwives in regional and rural areas identified limited or no such services for women. As a result, women were referred to the pharmacotherapy or alcohol and drug support service facilities located elsewhere and often at distant locations. A midwife said: *"I used to work in the city and we had an excellent alcohol and drug program....it was really easy to refer women but there're no such services in this area (regional) and I think that's a big gap"* (Midw11).

#### *Workload and limited consultation time*

Midwives working in the antenatal clinic are the first point of contact for many women who access antenatal care services. They are responsible for filling out the Victorian Maternity Record or Birthing Outcome System by taking a wide range of information including the family, gynecological obstetric and health-related histories. Within a limited consultation time, midwives are also expected to perform clinical observations such as checking vital signs of the women, fetal heart rate; and referring the women for specialised care and support, if deemed necessary. Given all these, some midwives felt there was not enough time to screen for substance use. A midwife said, *"Time is one of those things we don't just have.... we don't have time to screen for everything properly... our booking visits are roughly about half-an-hour and we are supposed to screen and find out about their (pregnant women) medical history, the previous pregnancy history, family violence, mental health, and the list just goes on"* (Midw5).

#### *Non- or partial-disclosure of substance use*

Despite having the provision of routine screening, some pregnant women were not ready to disclose their substance use. Midwives observed that usually most women partially disclose usage because they are worried about losing their babies to child protection services. A midwife said, *"I think a lot of women who aren't disclosing aren't disclosing because they are worried they are going to get reported to the child protection services of the Department of Human Services"* (Midw5). Non- or partial-disclosure was also associated with feelings of guilt and shame about usage as illustrated in this quote *"It's pretty rare that women disclose drug use, probably because they feel ashamed"* (Midw12). A lack of continuity of care and insufficient rapport between the midwives and the women were other important reasons identified by some midwives, as illustrated by the following quote: *"where I work, the midwives rarely see the same woman twice, so most women would come through the maternity system each time seeing someone different and the only continuity is the history, how would they disclose?"* (Midw4). Insufficient knowledge about the potential risks of substance use in pregnancy and fear of being judged by midwives and the community, especially in the regional and rural areas, were also perceived as contributing factors to women's non- or partial-disclosure.

#### *Reluctance and non-adherence to referrals*

Some women are reluctant to accept referrals for specialist care such as mental health and alcohol and drug services. Midwives found this challenging and expressed their frustration. However, in a situation when the midwives are genuinely concerned about the health of the baby, the unit supervisor or the doctor is notified immediately, as exemplified by this quote, *"Sometimes they don't want a referral, I can't do anything really...if I was to put a referral in, they will be unhappy with it"* (Midw8).

Disengagement from maternity services poses a significant barrier to referral of pregnant women who use substance. Midwives

described a variety of strategies that have been put in place to facilitate attendance, these include provision for transportation and taxi vouchers; counselling and education; psychosocial and emotional support; and availability of on-call and follow-up services. Despite all these efforts, some pregnant women would disappear for months. Lack of motivation to change was identified as the dominant reason for such disengagement, as illustrated by the following quote: "...the issues come around the women themselves... they're often not ready.... they often don't even remember they've got appointments" (Midw13). A chaotic lifestyle was also identified by a few midwives. For instance, a midwife stated, "I think one of the biggest problems is that very often these women are very chaotic in their lifestyles, thus they fail to attend appointments (Midw14). Stigma was identified as an important factor for disengagement, as illustrated in the quote, "Stigma around illicit drug use is affecting our work with these women. Women carry a lot of shame especially when they are pregnant and using (substance)" (Midw16). Other contributing factors include guilt and shame, partner's influence, and denial of the adverse impact of substance use on their babies.

#### *Facilitators to screening and referral to pregnant women who use substance*

Five main themes emerged from the interviews surrounding facilitators. Of note, some of the factors highlighted as barriers by some midwives were also considered as facilitators by other midwives. The five themes are outlined below:

##### *A woman-centred philosophy of care*

One of the strongest facilitators to screening and referral of pregnant women who use substance was midwives' sense of responsibility and willingness to help and reduce harm to the women and their babies. Midwives considered this subgroup as being vulnerable and in need of support. Here is a quote from a midwife: "I also think these women need our support. They are usually vulnerable people. So, it's about looking out for them and their babies." (Midw9) Another midwife stated: "I think mostly is about trying to help people and these women are probably in lots of way more in need of help that most normal healthy women, also is never just having a drugs issue is always having everything going on" (Midw4).

##### *Evidence of harms from substance use on neonates*

Exposure to substance use during pregnancy is associated with a significantly increased risk of adverse neonatal health. Midwives who had worked in the neonatal setting attested that witnessing the effects of substance use in pregnancy on neonates motivated them to screen and refer. A midwife said: "Actually, looking at the evidence of what happens when women use alcohol and drugs during pregnancy and the effects on the babies... making sure we (midwives) prevent those sorts of things as best as we can and educate women about those sorts of things are important to me. I want the best outcomes for women and their babies at the end of it" (Midw5).

##### *Experience and training*

For some of the midwives, experience and training on how to initiate a conversation around alcohol or other drug use in a non-judgmental manner was a facilitator. Here is an illustrative quote from a midwife: "I definitely think, as I become more experienced, I feel more comfortable with screening women for substance use" (Midw4).

##### *Continuity of care*

Some midwives who were working in the continuity of care model stated that the continuity of care strengthens their relationships with the women, promotes trust and encourages disclosure of sensitive information like substance use. A midwife stated:

*"I love the long-time relationship, the continuity of care, and women love it too" (Midw13).*

##### *Availability of multidisciplinary team and funding*

Availability and accessibility to multidisciplinary health professionals and funding are perceived as facilitators in the metropolitan areas. Midwives working in the metropolitan area work together with health professionals of different disciplines – such as psychologists, obstetricians, social workers and mental health specialists – to more holistically meet the needs of the women. They also have access to funding and can link the women with necessary services such as detoxification, pharmacotherapy and mental health. Here is a quote from a midwife working in the city: "We are very lucky in the city, we actually have our own separate funding. We also have a multidisciplinary team" (Midw14).

## **Discussion**

Screening all women for alcohol or other drugs and providing referrals over the antenatal period may pose a challenge yet offer a significant opportunity for harm minimisation and access to appropriate care. This study adds to the limited body of literature surrounding the barriers experienced by midwives and suggests a range of factors that currently hinder screening practices and referrals. Common barriers experienced by midwives included a lack of validated screening tools, inadequate support and training, lack of multidisciplinary team and specialised treatment, workload and limited consultation time, and discomfort in screening. In relation to pregnant women, non- or partial-disclosure of substance use and reluctance, and or non-adherence to referrals were considered barriers to care and optimal treatment. The study also identified several facilitators that promote screening and referral of pregnant women who use alcohol or other drugs. Main themes included experience and on-going training, continuity of care, availability of a multidisciplinary team and funding.

The role of midwives in antenatal settings is broad and demanding (Doi et al., 2014). Despite midwives' willingness to provide quality care, they felt a lack of continuity, and limited time spent with women during antenatal consultations to be a significant barrier to comprehensive care that entails a biopsychosocial approach. In this study, most midwives highlighted the importance of continuity of care. Traditionally, continuity of care is idealised in the patient's experience of a 'continuous caring relationship' with an identified healthcare professional (e.g., one woman one midwife) (Gulliford et al., 2006). While the evidence for continuity of care is favourable (Homer, 2016; Sandall, 2014; Sandall et al., 2015), this model may not be always feasible due to workforce shortages, lack of funding, and lack of opportunity to practice across the full spectrum of maternity care (Brodie, 2002; Homer, 2006; Jansson et al., 2008; Leap, 2002; Leap et al., 2003). Although this model of care has been adopted in Australia, it is not as widespread as should be. To further expand this model, a certain degree of restructuring of maternity services and collaboration among medical professionals involved in the care of pregnant women is necessary (Homer, 2006, 2016).

Discomfort to screening for substance use was found to be a considerable barrier among midwives with relatively less experience in screening and providing a referral of pregnant women. This discomfort is mostly associated with the fear of being judgmental or offending the clients by raising and discussing sensitive topics such as substance use in pregnancy. This was particularly common when midwives work with women from minority groups. This is consistent with previous literature that illustrates that some midwives believe a Muslim woman neither drinks alcohol nor uses drugs, a belief which may cause further discomfort and create a barrier to screening all pregnant women at the initial and



all subsequent antenatal visits (Australian Government Department of Health, 2017; Centre for Population Health, 2014; New South Wales Department of Health, 2006; The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018; World Health Organization, 2014). However, when examined from clients' perspective, a previous Australian study found a high level of acceptability to screening for alcohol consumption and being advised not to consume alcohol during pregnancy (McElwaine et al., 2013). A survey in an antenatal clinic revealed that Australian women do not feel judged by midwives when screened for alcohol and drug use in pregnancy (Seib et al., 2012). These findings suggest that the fear of discomfort in addressing substance use (Payne et al., 2014; Watkins et al., 2015) and its impact on the client-clinician relationship may be overrated by the midwives. Strategies to address such perceptions include a combination of education and training and the provision of a supportive working environment that will assist midwives to have complex conversations about what could be described sensitive and non-traditional topics in pregnancy (Anderson et al., 2004; Payne et al., 2014; Richmond and Anderson, 1994; Rush et al., 1995; Shaw et al., 1978).

The problem of partial- or non-disclosure of substance use was perceived to be a result of a wide range of internal and external factors including fear of involvement of child protection services, inadequate rapport between the clients and the midwives, stigma and lack of awareness of women about the health risks of substance use in pregnancy. Fear of stigma was perceived to be considerable in smaller communities where 'everyone knows everyone' and pregnant women who use substance can easily be labelled as 'bad woman or mother', which can further impede disclosure and accessing treatment facilities (Beckman, 1994; Jackson and Shannon, 2012a, b). Public education and awareness are crucial in eliminating internal and external barriers such as shame and stigma against the women especially in regional and rural areas (Beckman, 1994).

The reluctance of women to follow-up with referrals for treatment was of concern to midwives in the current study, and the reasons for such behaviours are complex and multifaceted (Avilla et al., 2017). Although this study revealed midwives' views of external and internal impetuses hindering willingness and adherence to referrals, further research is needed to better understand the complexity. The wider literature suggests several factors act behind this inertia to referrals such as stigma (Bradley et al., 1998; Jackson and Shannon, 2012a); homelessness (Forrester and Harwin, 2006; Little et al., 2005), fear of child protection services (Taylor et al., 2007), and chaotic lifestyles (Gueta, 2017). While it is outside the scope of this study to assess the complexity from the pregnant women's perspective, it is likely that to improve referral uptake, consideration of the social determinants of health and wellbeing is required (Gueta, 2017; LeBel et al., 2008; Small et al., 2010).

In this study, training on screening and referral was identified both as a barrier and a facilitator. This observation is consistent with that in the literature (Bland et al., 2001; Oni et al., 2018; Seybold et al., 2014). Training is crucial especially for the non-specialised and less experienced midwives on how to empathetically initiate a conversation, and effectively communicate about substance use in a non-judgmental manner (Khadivzadeh et al., 2015). Paluzzi and her colleagues emphasised extensive training on substance use in pregnancy for midwives-educators but also continuing education programs for practicing midwives as well (Paluzzi et al., al.). Further, provision of regular training services and professional development for all midwives, particularly those in regional and rural areas, is required as there are continuous changes that occur in the use of drugs, including the way drugs are taken. This has implications for practice. To truly understand the phenomena and be one step ahead, midwives need to be abreast

of common practices that relate to substance-use (Australian Institute of Health and Welfare, 2016; Seybold et al., 2014).

A lack of validated screening tool(s) was identified as a barrier, and the use of evidence-based screening tool(s) was suggested as a way forward. Unfortunately, few screening tools have been evaluated for use among pregnant women and most are designed to screen for alcohol consumption. The T-ACE (Take, Annoyed, Cut-down, Eye opener); TWEAK (Tolerance, Worried, Eye-opener, Amnesia, and K/Cut down); and AUDIT (Alcohol Use Disorder Identification Test) are three such tools found suitable for identifying alcohol consumption in pregnancy (Chang, 2001; Keegan et al., 2010; National Drug & Alcohol Research Centre, 2016; US Preventive Services Task Force, 2004). The WHO developed an abbreviated version of ASSIST (Alcohol, Smoking, and Substance Involvement Screening) known as ASSIST-Lite (World Health Organization Assist Working Group, 2002). This tool is now being used in many settings (Diseth, 2001; Gryczynski et al., 2015; Hotham et al., 2016). Also, 4 P's Plus was found suitable for screening substance use in pregnancy in some settings (Chasnoff et al., 2005). Further research is recommended to examine the comparative effectiveness of these validated tools and the current practice of using a set of questions from Victorian Maternity Record or Birthing Outcome System or Pre-booking Appointment.

The problem of inadequate resources is salient in regional and rural areas. As a result, pregnant women often need to be referred to the health facilities located elsewhere and often in metropolitan areas. A commitment of pregnant women, who use substance and reside in regional and rural areas, to specialised services delivered in the metropolitan areas may be non-viable, given the distance, their chaotic lifestyle and the financial cost involved (Jackson and Shannon, 2012a, b). Development of such specialised care facilities in strategically and geographically suitable areas, identifying and promoting some "champions" among midwives or doctors who have necessary training and experience to act as resource persons, along with offering transport support to the vulnerable women are, perhaps, a feasible solution to enhance service provision and care for pregnant women who use substance.

### Strengths and limitations of the study

This study adds to the limited body of knowledge on barriers and facilitators experienced by midwives in the screening and referral of pregnant women who use substance. The qualitative method used in this study is appropriate for exploring midwives' experiences about their daily practices. A limitation of this study is that it is not known as to what extent these barriers and facilitators impact on delivering care. Further research is recommended to explore this. Also, while the study covered metropolitan, rural and regional health facilities, it did not cover the entire spectrum of facilities e.g. private health facilities. Another limitation is that all participants were recruited from one state in Australia. Hence, the findings may not be generalisable to other locations. However, some of the barriers and facilitators identified in this study, such as non- or partial-disclosure (Doi et al., 2014; Taylor et al., 2007); significant workloads and limited consultation time (Holland et al., 2016; Wangberg, 2015), and continuous training and education (Oni et al., 2018; Taylor et al., 2007) have been documented in various geographical settings with diverse economic and political conditions. Thus, these findings may have 'conceptual generalisability' (Green and Thorogood, 2013) and be applicable to other settings.

### Conclusion

In summary, this study identified a range of barriers and facilitators that midwives experience in antenatal care settings to screening and providing referrals to pregnant women who use

substance. These barriers and facilitators were identified based on their day-to-day experience in working with pregnant women who use substance. Midwives acknowledged the significant and strategic role they play in substance use screening and provision of referral, yet they felt limited in their capacity to effectively support at-risk pregnant women. Inadequate support and training, a lack of validated screening tools and a shortage of targeted resources in regional and rural areas were identified as the major barriers. Willingness to help, experience and training, continuity of care, and presence of multidisciplinary team to refer women were considered strategic facilitators to increasing service provision for at-risk pregnant women.

### Implications for practice

Relevant training should be given to non-specialised and less experienced midwives to increase their screening skills, competence on effective communication, and education in substance use relating to pregnant women. At an organisational level, more work needs to be conducted to develop a fluid multidisciplinary approach to service provision for women that includes continuity of care. At the community level, attention to the topic via mass media campaigns should also be considered to educate the community about harms from substance use during pregnancy. At the governmental level, funding and necessary support should be provided to build specialised care services for pregnant women who use substance, especially in the regional and rural areas.

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### Ethical approval

The study was approved by the La Trobe University Human Ethics Committee (Approval number: HEC18095).

### Declaration of Competing Interest

None.

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### Supplementary material

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.midw.2019.102595.

### References

- Anderson, P., Kaner, E., Wutzke, S., Funk, M., Heather, N., Wensing, M., Grol, R., Gual, A., Pas, L., 2004. Attitudes and managing alcohol problems in general practice: an interaction analysis based on findings from a WHO collaborative study. *Alcohol Alcohol.* 39 (4), 351–356.
- Aronson, J., 1995. A pragmatic view of thematic analysis. *Qual. Rep.* 2 (1), 1–3.
- Attridge-Stirling, J., 2001. Thematic networks: an analytic tool for qualitative research. *Qual. Res.* 1 (3), 385–405.
- Australian Government Department of Health, 2017. National drug strategy 2017–2026. Canberra: Australian Government Department of Health. (Accessed 22/01/2019).
- Australian Institute of Health and Welfare, 2014. National drug strategy household survey detailed report 2013. Drug Statistics Series no. 28. Cat. no. PHE 183. AIHW, Canberra.
- Australian Institute of Health and Welfare, 2016. Australia's health 2016. Australia's Health Series no. 15. Cat. no. AUS 199. AIHW, Canberra <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129556761>.
- Australian Institute of Health and Welfare, 2017. National drug strategy household survey 2016: detailed findings. Drug Statistics series no. 31. Cat. no. PHE 214. AIHW, Canberra.
- Avilla, R.M., Surjan, J., de Fátima Ratto Padin, M., Canfield, M., Laranjeira, R.R., Mitsuhiro, S., 2017. Factors associated with attrition rate in a supportive care service for substance using pregnant women in Brazil. *Am. J. Addict.* 26 (7), 676–679.
- Beckman, L.J., 1994. Treatment needs of women with alcohol problems. *Alcohol Health Res. World* 18, 206.
- Bland, E., Oppenheimer, L.W., Oppenheimer, L., Brisson-Carroll, G., Morel, C., Holmes, P., Gruslin, A., 2001. Influence of an educational program on medical students' attitudes to substance use disorders in pregnancy. *Am. J. Drug Alcohol Abuse* 27 (3), 483–490.
- Bradley, K.A., Boyd-Wickizer, J., Powell, S.H., Burman, M.L., 1998. Alcohol screening questionnaires in women: a critical review. *JAMA* 280 (2), 166–171.
- Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. *Qual. Res. Psychol.* 3 (2), 77–101.
- Braun, V., Clarke, V., Terry, G., 2014. Thematic analysis. *Qual. Res. Clin. Health Psychol.* 24, 95–114.
- Breen, C., Awbery, E., Burns, L., 2014. Supporting Pregnant Women Who Use Alcohol or Other Drugs: a Review of the Evidence. National Drug Alcohol Research Centre, Canberra.
- Brink, P.J., Wood, M.J., 1998. Advanced Design in Nursing Research. Sage.
- Brodie, P., 2002. Addressing the barriers to midwifery – Australian midwives speaking out. *Aust. J. Midwifery* 15 (3), 5–14.
- Bryant, R., 2009. Improving Maternity Services in Australia: the Report of the Maternity Services Review. Commonwealth of Australia, Canberra Australia Co, ed.
- Centre for Population Health, 2014. Clinical Guidelines for the Management of Substance Use During Pregnancy, Birth and the Postnatal Period. [www.health.nsw.gov.au](http://www.health.nsw.gov.au) (Accessed 3/11/2018).
- Chang, G., 2001. Alcohol-screening instruments for pregnant women. *Alcohol Res. Health* 25 (3), 204–210.
- Chasnoff, I.J., McGourty, R.F., Bailey, G.W., Hutchins, E., Lightfoot, S.O., Pawson, L.L., Fahey, C., May, B., Brodie, P., McCulley, L., 2005. The 4P's plus© screen for substance use in pregnancy: clinical application and outcomes. *J. Perinatol.* 25 (6), 368.
- Department of Health & Human Services Victoria, 2012. Future directions for Victoria's maternity services. <https://www2.health.vic.gov.au/about/publications/policiesandguidelines/Future-directions-for-Victoria's-maternity-service>. (Accessed 23/09/2019).
- Diseth, A., 2001. Validation of a Norwegian version of the Approaches and Study Skills Inventory for Students (ASSIST): application of structural equation modelling. *Scand. J. Educ. Res.* 45 (4), 381–394.
- Doi, L., Cheyne, H., Jepson, R., 2014. Alcohol brief interventions in Scottish antenatal care: a qualitative study of midwives' attitudes and practices. *BMC Pregnancy Childbirth* 14 (170). doi:10.1186/1471-2393-14-170.
- Fonti, S., Davis, D., Ferguson, S., 2016. The attitudes of healthcare professionals towards women using illicit substances in pregnancy: A cross-sectional study. *Women Birth* 29 (4), 330–335.
- Ford, R., Bammer, G., Becker, N., 2009. Improving nurses' therapeutic attitude to patients who use illicit drugs: workplace drug and alcohol education is not enough. *Int. J. Nurs. Pract.* 15 (2), 112–118.
- Forrester, D., Harwin, J., 2006. Parental substance misuse and child care social work: findings from the first stage of a study of 100 families. *Child. Fam. Soc. Work* 11 (4), 325–335.
- France, K., Henley, N., Payne, J., D'Antoine, H., Bartu, A., O'Leary, C., Elliott, E., Bower, C., 2010. Health professionals addressing alcohol use with pregnant women in Western Australia: barriers and strategies for communication. *Subst. Use Misuse* 45 (10), 1474–1490.
- French, E., 2013. Substance abuse in pregnancy: compassionate and competent care for the patient in labor. *Clin. Obstet. Gynecol.* 56 (1), 173–177.
- Green, J., Thorogood, N., 2013. Qualitative Methods for Health Research. SAGE publication, London.
- Gryczynski, J., Kelly, S.M., Mitchell, S.G., Kirk, A., O'grady, K.E., Schwartz, R.P., 2015. Validation and performance of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) among adolescent primary care patients. *Addiction* 110 (2), 240–247.
- Gueta, K., 2017. A qualitative study of barriers and facilitators in treating drug use among Israeli mothers: an intersectional perspective. *Soc. Sci. Med.* 187, 155–163.
- Gulliford, M., Naithani, S., Morgan, M., 2006. What is 'continuity of care'? *J. Health Serv. Res. Policy* 11 (4), 248–250.
- Holland, C.L., Rubio, D., Rodriguez, K.L., Kraemer, K.L., Day, N., Arnold, R.M., Tarr, J.A., Chang, J.C., 2016. Obstetric health care providers' counseling responses to pregnant patient disclosures of marijuana use. *Obstet. Gynecol.* 127 (4), 681–687.
- Homer, C.S., 2006. Challenging midwifery care, challenging midwives and challenging the system. *Women and Birth* 19 (3), 79–83.
- Homer, C.S., 2016. Models of maternity care: evidence for midwifery continuity of care. *Med. J. Aust.* 205 (8), 370–374.
- Hotham, E.D., Ali, R.L., White, J.M., 2016. Analysis of qualitative data from the investigation study in pregnancy of the assist version 3.0 (the alcohol, smoking and substance involvement screening test). *Midwifery* 34, 183–197.
- Jackson, A., Shannon, L., 2012a. Barriers to receiving substance abuse treatment among rural pregnant women in Kentucky. *Matern. Child Health J.* 16 (9), 1762–1770. doi:10.1007/s10995-011-0923-5.

- Jackson, A., Shannon, L., 2012b. Examining barriers to and motivations for substance abuse treatment among pregnant women: does urban-rural residence matter? *Women Health* 52 (6), 570–586.
- Jansson, L.M., Choo, R., Velez, M.L., Lowe, R., Huestis, M.A., 2008. Methadone maintenance and long-term lactation. *Breastfeed. Med.* 3 (1), 34–37.
- Joffe, H., Yardley, L., 2004. Content and thematic analysis. *Res. Method. Clin. Health Psychol.* 56, 68.
- Johnson, M., Jackson, R., Guillaume, L., Meier, P., Goyder, E., 2010. Barriers and facilitators to implementing screening and brief intervention for alcohol misuse: a systematic review of qualitative evidence. *J. Public Health* 33 (3), 412–421.
- Keegan, J., Parva, M., Finnegan, M., Gerson, A., Belden, M., 2010. Addiction in pregnancy. *J. Addict. Dis.* 29 (2), 175–191.
- Khadivzadeh, T., Katebi, M.S., Sepehri Shamlou, Z., Esmaily, H., 2015. Assessment of midwives' communication skills at the maternity wards of teaching hospitals in mashhad in 2014. *J. Midwifery Reprod. Health* 3 (3), 394–400.
- Leap, N., 2002. Identifying the midwifery practice component of Australian midwifery education programs. Results of the Australian midwifery action project (AMAP) education survey. *Aust. J. Midwifery* 15 (3), 15–23.
- Leap, N., Barclay, L., Sheehan, A., 2003. Results of the Australian midwifery action project education survey, paper 2: barriers to effective midwifery education as identified by midwifery course coordinators. *Aust. Midwifery* 16 (3), 6–11.
- LeBel, T.P., Burnett, R., Maruna, S., Bushway, S., 2008. The chicken and egg of subjective and social factors in desistance from crime. *Eur. J. Criminol.* 5 (2), 131–159.
- Little, M., Shah, R., Vermeulen, M.J., Gorman, A., Dzendoletas, D., Ray, J.G., 2005. Adverse perinatal outcomes associated with homelessness and substance use in pregnancy. *CMAJ: Can. Med. Assoc. J. = journal de l'Association medicale canadienne* 173 (6), 615–618. doi:10.1503/cmaj.050406.
- McElwaine, K.M., Freund, M., Campbell, E.M., Knight, J., Bowman, J.A., Doherty, E.L., Wye, P.M., Wolfenden, L., Lecathelinais, C., McLachlan, S., Wiggers, J.H., 2013. The delivery of preventive care to clients of community health services. *BMC Health Serv. Res.* 13 (1), 167.
- Miles, M., 2012. Caring for pregnant women who use illicit drugs. *Aust. Nurs. J.* 20 (3), 41–42.
- Miles, M., Chapman, Y., Francis, K., Taylor, B., 2014. Midwives experiences of establishing partnerships: working with pregnant women who use illicit drugs. *Midwifery* 30 (10), 1082–1087.
- National Drug & Alcohol Research Centre, 2016. Supporting pregnant women who use alcohol or other drugs: a guide for primary health care professionals. UNSW Australia. <https://ndarc.med.unsw.edu.au/resource/quick-guide-identifying-women-risk-alcohol-smoking-or-other-drug-use-during-pregnancy>. (Accessed 14/10/2017).
- New South Wales Department of Health, 2006. National clinical guidelines for the management of drug use during pregnancy, birth and the early development years of the newborn. Sydney, NSW: New South Wales Department of Health. <https://www.drugsandalcohol.ie/6297/>. (Accessed 5/11/2018).
- Oni, H.T., Khan, M.N., Abdel-Latif, M., Bultjens, M., Islam, M.M., 2019. Short-term health outcomes of newborn infants of substance-using mothers in Australia and New Zealand: a systematic review. *J. Obstet. Gynaecol. Res.* 45 (9), 1783–1795.
- Oni, H.T., Bultjens, M., Abdel-Latif, M.E., Islam, M.M., 2018. Barriers to screening pregnant women for alcohol or other drugs: a narrative synthesis. *Women and Birth* 32 (6), 479–486.
- Paluzzi, P., Deggins, N., Hutchins, E., Burkhardt, P., 2002. The role of midwives in caring for women with substance use disorders: implications for training. *Subst. Abuse* 23 (3 Suppl), 223–233.
- Payne, J.M., Watkins, R.E., Jones, H.M., Reibel, T., Mutch, R., Wilkins, A., Whitlock, J., Bower, C., 2014. Midwives' knowledge, attitudes and practice about alcohol exposure and the risk of fetal alcohol spectrum disorder. *BMC Pregnancy Childbirth* 14 (1), 377.
- Polit, D.F., Beck, C.T., 2010. Generalization in quantitative and qualitative research: myths and strategies. *Int. J. Nurs. Stud.* 47 (11), 1451–1458.
- Richmond, R.L., Anderson, P., 1994. Lessons from conducting research in general practice for smokers and excessive drinkers: the experience in Australia and the United Kingdom. 3. Implementation of intervention programmes. *Addiction* 89, 49–62.
- Rush, B.R., Crowe, T.G., Powell, L.Y., Ellis, K., 1995. Substance abuse facilitator model: health promotion training for family physicians. *J. Contin. Educ. Health Prof.* 15 (2), 106–116.
- Sandall, J., 2014. The Contribution of Continuity of Midwifery Care to High Quality Maternity Care. The Royal College of Midwives, London.
- Sandall, J., Soltani, H., Gates, S., Shennan, A., Devane, D., 2015. Midwife-led Continuity Models Versus Other Models of Care For Childbearing Women. *Database Syst Rev* 9, Cochrane.
- Seib, C.A., Daglish, M., Heath, R., Booker, C., Reid, C., Fraser, J., 2012. Screening for alcohol and drug use in pregnancy. *Midwifery* 28 (6), 760–764.
- Seybold, D., Calhoun, B., Burgess, D., Lewis, T., Gilbert, K., Casto, A., 2014. Evaluation of a training to reduce provider bias toward pregnant patients with substance abuse. *J. Soc. Work Pract. Addict.* 14 (3), 239–249.
- Shaw, S.J., Cartwright, A.K.J., Spratley, T.A., Harwin, J., 1978. Responding to Drinking Problems. Croom Helm, London, UK.
- Small, J., Curran, G.M., Booth, B., 2010. Barriers and facilitators for alcohol treatment for women: are there more or less for rural women? *J. Subst. Abuse Treat.* 39 (1), 1–13.
- Taylor, P., Zaichkin, J., Pilkey, D., Leconte, J., Johnson, B.K., Peterson, A.C., 2007. Prenatal screening for substance use and violence: findings from physician focus groups. *Matern. Child Health J.* 11 (3), 241–247.
- The Royal Australian and New Zealand College of Obstetricians and Gynaecologists, 2018. Substance use in pregnancy (C-Obs 55). East Melbourne, Victoria, Australia. <https://www.ranzcog.edu.au> (Accessed 22/09/2019).
- US Preventive Services Task Force, 2004. Screening and behavioral counseling interventions in primary care to reduce alcohol misuse: recommendation statement. *Ann. Intern. Med.* 140 (7), 554.
- Wangberg, S.C., 2015. Norwegian midwives' use of screening for and brief interventions on alcohol use in pregnancy. *Sex. Reproductive Healthcare* 6 (3), 186–190.
- Watkins, R.E., Payne, J.M., Reibel, T., Jones, H.M., Wilkins, A., Mutch, R., Bower, C., 2015. Development of a scale to evaluate midwives' beliefs about assessing alcohol use during pregnancy. *BMC Pregnancy Childbirth* 15 (1), 353.
- World Health Organization Assist Working Group, 2002. The alcohol, smoking and substance involvement screening test (ASSIST): development, reliability and feasibility. *Addiction* 97 (9), 1183–1194.
- World Health Organization, 2014. Guidelines for identification and management of substance use and substance use disorders in pregnancy. [https://www.who.int/substance\\_abuse/publications/pregnancy\\_guidelines/en/](https://www.who.int/substance_abuse/publications/pregnancy_guidelines/en/) (Accessed 3/11/2018).
- World Medical Association, 2001. World medical association declaration of Helsinki. Ethical principles for medical research involving human subjects. *Bull. World Health Organ.* 79 (4), 373.



## **Appendix D: Interview guide**

### **Barriers and facilitators in antenatal settings to screening and referral of pregnant women who use alcohol or other drugs: A qualitative study of midwives' experience**

#### **1) General questions on screening:**

- a. Can you please tell me your age? A range will do, e.g., 30-40 or 40-50?
- b. How long have you been practicing as a midwife?
- c. Can you briefly tell me about your work? What is your role in the antenatal clinic?
- d. Are all pregnant women screened for alcohol and/or drug use during their initial antenatal appointment?

#### **2) Questions on barriers and facilitators to screening and referral of pregnant women who use alcohol and/or drugs.**

- a. (if the answer is 'no' to question 'd') When do you screen women who use alcohol and/or drugs and refer for specialised care?
- b. What screening tool do you use for screening alcohol and/or drug use in pregnancy?
- c. Can you outline what occurs after screening a pregnant woman for alcohol and/or drug use?
- d. If a woman identifies as a pregnant woman who uses alcohol and/or drugs, what guideline do you follow to refer the woman for specialised care?
- e. What support do you receive from the organisation you work for in screening and referral of pregnant women who use alcohol and/or drugs?
- f. What are the challenges/difficulties you have experienced in screening and referral of pregnant woman who use alcohol and/or drugs? How have you managed those challenges?



## Appendix E: Participant Information Statement and Consent Form



### Participant Information Statement and Consent Form

The research is being carried out by the following researchers:

**Ms. Helen Tosin Oni, Dr Mofi Islam, Dr Melissa Buultjens, Prof Mohamed Abdel-Latif and Professor Deborah Davis**

The research is being carried out in partial fulfilment of a Doctor of Philosophy under the supervision of Dr Mofi Islam, Dr Melissa Buultjens, Prof Mohamed Abdel-Latif and Prof Deborah Davis. The following researchers will be conducting the study:

Role	Name	Organisation
Chief Investigator	Dr Mofi Islam	La Trobe University
Associate investigator	Dr Melissa Buultjens	La Trobe University
Associate investigator	Prof Mohamed Abdel-Latif	Canberra Hospital
Associate investigator	Professor Deborah Davis	University of Canberra
Postgraduate Student	Helen Tosin Oni	La Trobe University
<b>Research funder</b>	This research is supported in kind by La Trobe University.	

#### 1. What is the study about?

You are invited to participate in a study title “Facilitators and barriers to screening and management of women who use alcohol and drug in pregnancy: Midwives’ perspectives.” We aim to identify barriers and facilitators to screening, treatment and management of women who use alcohol and/or drugs during pregnancy.

#### 2. Do I have to participate?

Being part of this study is voluntary. If you want to be part of the study we ask that you read the information below carefully and ask us any questions.

You can read the information below and decide at the end if you do not want to participate. If you decide not to participate this will not affect your relationship with La Trobe University or any other listed organisations.

### **3. Who is being asked to participate?**

You have been asked to participate because:

- You are a midwife currently working with pregnant women in an antenatal or a perinatal setting.

### **4. What will I be asked to do?**

You will be asked to participate in a telephone or face-to-face interview. The interview will take approximately 45 minutes. The interview will be audio recorded and transcribed.

### **5. What are the benefits?**

Though the study may be of no benefit to an individual participant, the outcomes of the study may inform guidelines and frameworks that will strengthen routine screening, treatment and effective management of women who use alcohol and/or drugs during pregnancy. The expected benefits to society in general are that the policy makers will have an understanding of the current practice in regard to the screening and management of women who use alcohol and/or drugs during pregnancy and this will inform future guidelines. The outcome of this study may also inform a framework that promote detection of alcohol and/or drug use during pregnancy and minimise adverse health consequences of both mothers and their newborns.

### **6. What are the risks?**

There is no harm foreseen to you for participating in this study. However, you may experience emotional distress when discussing the potential adverse pregnancy and neonatal outcomes such as fetal alcohol syndrome and increased risk of maternal and infant morbidity and mortality rate - associated with alcohol and /or drug use in pregnancy. In the above instance or if you experience something that you aren't sure about, please contact us immediately so we can discuss the best way to manage your concerns.

Name/Organisation	Position	Telephone	Email
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Dr Mofi Islam	Chief	0394792639	<a href="mailto:mofi.islam@latrobe.edu.au">mofi.islam@latrobe.edu.au</a>
Dr Melissa Buultjens Miss Helen Oni	Investigator Associate investigator Postgraduate student	0394796502	m.buultjens@latrobe.edu.au

## 7. What will happen to information about me?

We will collect and store information about you in ways that will not reveal who you are. This means you cannot be identified in any type of publication from this study.

We will keep your information for 5 years after the project is completed. After this time we will destroy all of your data.

We will collect, store and destroy your data in accordance with La Trobe Universities Research Data Management Policy which can be viewed online using the following link: <https://policies.latrobe.edu.au/document/view.php?id=106/>.

The information you provide is personal information for the purposes of the Information Privacy Act 2000 (Vic). You have the right to access personal information held about you by the University, the right to request correction and amendment of it, and the right to make a complaint about a breach of the Information Protection Principles as contained in the Information Privacy Act.

## 8. Will I hear about the results of the study?

We will let you know about the results of the study by sending you a copy of the peer reviewed papers, if you are interested.

## 9. What if I change my mind?

At any time you can choose to no longer be part of the study. You can let us know by:

1. Completing the 'Withdrawal of Consent Form' (provided at the end of this document);
2. Calling us;
3. Emailing us

Your decision to withdraw at any point will **not** affect your relationship with La Trobe University or any other organisation listed.

When you withdraw we will stop asking you for information. Any identifiable information about you will be withdrawn from the research study. However, once the results have been analysed we can only withdraw information, such as your name and contact details. If results haven't been analysed you can choose if we use those results or not.

#### 10. Who can I contact for questions or want more information?

If you would like to speak to us, please use the contact details below:

Name/Organisation	Position	Telephone	Email
Dr Mofi Islam,	Chief	0394792639	<a href="mailto:mofi.islam@latrobe.edu.au">mofi.islam@latrobe.edu.au</a>
Dr Melissa Buultjens	Investigator Associate	0394796502	m.buultjens@latrobe.edu.au
Miss Helen Oni	investigator		
	Postgraduate student		

#### 11. What if I have a complaint?

If you have a complaint about any part of this study, please contact:

Ethics Reference Number	Position	Telephone	Email
2000001068	Senior Research Ethics Officer	+61 3 9479 1443	<a href="mailto:humanethics@latrobe.edu.au">humanethics@latrobe.edu.au</a>

#### Consent Form – Declaration by Participant

I (the participant) have read (or, where appropriate, have had read to me) and understood the participant information statement, and any questions have been answered to my satisfaction. I agree to participate in the study, I know I can withdraw at any time. I agree information provided by me or with my permission during the project may be included in a thesis, presentation and published in journals on the condition that I cannot be identified.

I would like my information collected for this research study to be:

☐ Only used for this specific study;

☐ Used for future related studies;

☐ Used for any future studies

☐ I agree to have my interview audio and/or video recorded

☐ I would like to receive a copy of the results via email or post. I have provided my details below and ask that they only be used for this purpose and not stored with my information or for future contact.

Name	Email (optional)	Postal address (optional)

### Participant Signature

☐ I have received a signed copy of the Participant Information Statement and Consent Form to keep

Participant's printed name	
Participant's signature	
Date	

### Declaration by Researcher

☐ I have given a verbal explanation of the study, what it involves, and the risks and I believe the participant has understood;

☐ I am a person qualified to explain the study, the risks and answer questions

Researcher's printed name	
---------------------------	--

Researcher's signature	
Date	

\* All parties must sign and date their own signature

## Withdrawal of Consent

I wish to withdraw my consent to participate in this study. I understand withdrawal will not affect my relationship with La Trobe University and any other organisation or professionals listed in the Participant Information Statement. I understand the researchers cannot withdraw my information once it has been analysed, and/or collected as part of a focus group.

### **I understand my information will be withdrawn as outlined below:**

- ✓ Any identifiable information about me will be withdrawn from the study
- ✓ The researchers will withdraw my contact details so I cannot be contacted by them in the future studies unless I have given separate consent for my details to be kept in a participant registry.
- ✓ The researchers cannot withdraw my information once it has been analysed, and/or collected as part of a focus group

*\*\*if you have consented for your contact details to be included in a participant registry you will need to contact the registry staff directly to withdraw your details.*

I would like my already collected and unanalysed data

☐ Destroyed and not used for any analysis

☐ Used for analysis

## Participant Signature

Participant's printed name	
Participant's signature	
Date	

**Please forward this form to:**

CI Name	Helen Oni
Email	
Phone	
Postal Address	La Trobe University, Health Science Building 2, Room 210 Vic 3086.



## **Appendix F: Ethics approval (qualitative study)**

Dear Mofizul Islam,

The following project has been assessed as complying with the National Statement on Ethical Conduct in Human Research. I am pleased to advise that your project has been granted ethics approval and you may commence the study.

Application ID: HEC18095

Application Status/Committee: Science, Health & Engineering College Human Ethics Sub-Committee

Project Title: Facilitators and barriers to screening and management of women who use alcohol and/or drugs in pregnancy: Midwives' perspectives

Chief Investigator: Mofizul Islam

Other Investigators: Melissa Buultjens, Professor Mohamed E Abdel-Latif, Professor Deborah Davis, Helen Tosin Oni

Date of Approval: 27/05/2018

Date of Ethics Approval Expiry: 27/05/2023

The following standard conditions apply to your project:

- Limit of Approval. Approval is limited strictly to the research proposal as submitted in your application.
- Variation to Project. Any subsequent variations or modifications you wish to make to your project must be formally notified for approval in advance of these modifications being introduced into the project.
- Adverse Events. If any unforeseen or adverse events occur the Chief Investigator must notify the UHEC immediately. Any complaints about the project received by the researchers

must also be referred immediately to the UHEC.

- Withdrawal of Project. If you decide to discontinue your research before its planned completion, you must inform the relevant committee and complete a Final Report form.

- Monitoring. All projects are subject to monitoring at any time by the University Human Ethics Committee.

- Annual Progress Reports. If your project continues for more than 12 months, you are required to submit a Progress Report annually, on or just prior to 12 February. The form is available on the Research Office website. Failure to submit a Progress Report will mean approval for this project will lapse.

- Auditing. An audit of the project may be conducted by members of the UHEC.

- Final Report. A Final Report (see above address) is required within six months of the completion of the project.

You may log in to ResearchMaster (<https://rmenet.latrobe.edu.au>) to view your application.

Should you require any further information, please contact the Human Research Ethics Team on:

T: +61 3 9479 1443| E: [humanethics@latrobe.edu.au](mailto:humanethics@latrobe.edu.au).

Warm regards,

Human Research Ethics Team

Ethics, Integrity & Biosafety, Research Office

## **Appendix G: Ethics approval (quantitative study)**

**From:** Tinny Hon [<mailto:Tinny.Hon@cancerinstitute.org.au>] **On Behalf Of** ETHICS

**Sent:** Friday, 27 April 2018 4:57 PM

**To:** Mofi Islam <[Mofi.Islam@latrobe.edu.au](mailto:Mofi.Islam@latrobe.edu.au)>; [Abdel-Latif.Mohamed@act.gov.au](mailto:Abdel-Latif.Mohamed@act.gov.au)

**Subject:** RE: Ethics application for a data linkage project - maternal substance use during pregnancy and its impact on newborns and children: durational, temporal and spatial variation

Hello Mofi and Abdel-Latif,

**Reference:** 2018HRE0206

**AU/RED Ref:** HREC/18/CIPHS/6

**Study Title:** Maternal substance use during pregnancy and its impact on newborns

Thank you for your recent submission to the PHSREC. The Committee reviewed your response on 11 April and have granted ethical approval.

Best regards,

Tinny

**REGIS** will replace AU RED and Online Forms in 2018. For information about the transition, visit the [REGIS](#) website.

**Tinny Hon | Manager, Research Ethics | Executive Officer, Population and Health Services Research Ethics Committee**

**T** (02) 8374 5662 **F** (02) 8374 3600 **E** [tinny.hon@cancerinstitute.org.au](mailto:tinny.hon@cancerinstitute.org.au)

**Cancer Institute NSW**

Level 9, 8 Central Avenue, Australian Technology Park, Eveleigh NSW 2015

PO Box 41, Alexandria NSW 1435

**[cancer.nsw.gov.au](http://cancer.nsw.gov.au)**

## Appendix H: Poster presentation

### A SYSTEMATIC REVIEW OF SHORT-TERM OUTCOMES OF NEWBORN INFANTS BORN TO SUBSTANCE-USING MOTHERS

Helen Tosin Oni<sup>1</sup>, Mohamed Abdel-Latif<sup>2</sup>, Melissa Buultjens<sup>1</sup>, & M Mofizul Islam<sup>1</sup>

1) Department of Public Health, School of Engineering and Health Sciences, La Trobe University, Melbourne Victoria 3086  
2) Canberra Hospital, Garran, Australian Capital Territory 2605

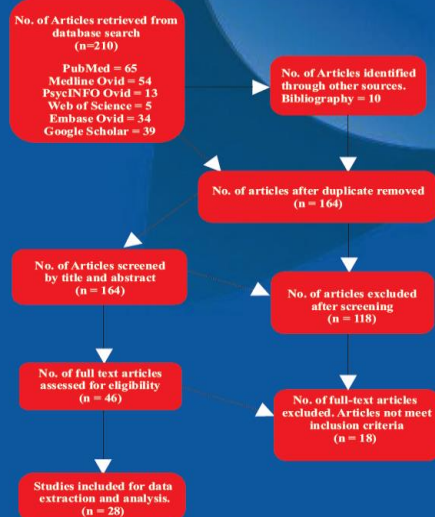


#### Background

Substance use is not unusual among women of childbearing age. According to the National Drug Strategy Household Survey 2013, four in ten pregnant women consume alcohol and 2.2% used an illicit substance in pregnancy. The subgroup of mothers who use a substance and the subsequent impact on a newborn vary across studies and settings.

**Objective:** This review investigates short-term outcomes of newborn and demographic characteristics of substance-using mothers in Australia.

#### Method & Materials



**Figure 1:** Flow chart of systematic review procedure for identifying articles reporting short-term outcome of newborn infants born to substance-using mothers in Australia

**Quality assessment:** Quality assessment was performed using the Mixed Method Appraisal Tool (MMAT) version 2011.

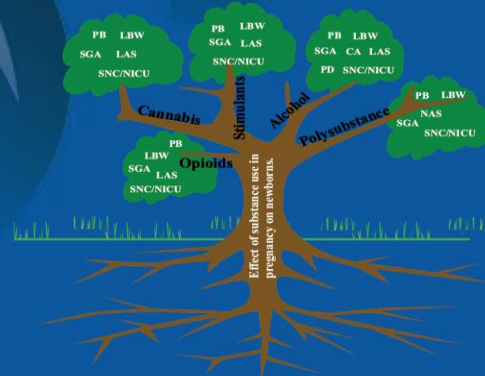


**Figure 2:** Quality appraisal of eligible article.

#### Results

##### Short-term outcomes of newborn infants and demographic characteristics substance-using mothers

Compared to the unexposed group, neonates of substance-using mothers are at higher risk of short term outcomes such as preterm birth, low birth weight, neonatal abstinence syndrome, low Apgar score, small for gestational age and congenital anomalies.



**Figure 3:** Short-term outcomes of newborn infants associated with maternal substance use in Australia

**LAS:** Low Apgar Score at 5 mins < 7  
**SGA:** Small for Gestational Age < 10 percentile  
**PB:** Preterm Birth < 37 weeks  
**CA:** Congenital Anomalies  
**LBW:** Low Birth Weight < 2500g  
**PD:** Perinatal Death  
**NAS:** Neonatal Abstinence Syndrome  
**SNC/NICU:** Special Nursery Care/ Neonatal Intensive Care Unit

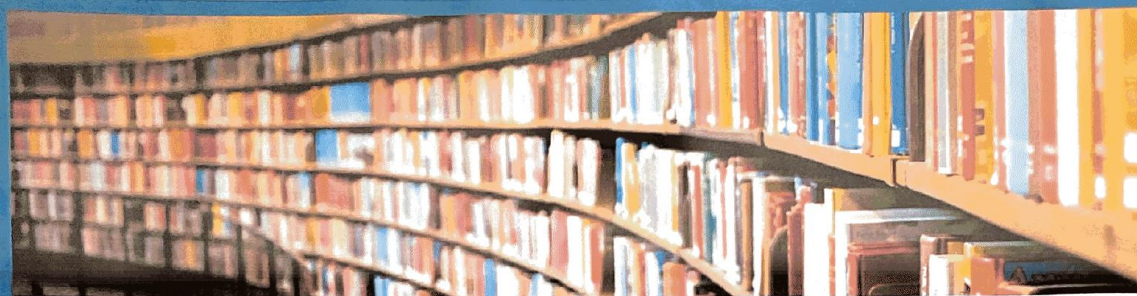


**Figure 4:** Common demographic characteristics of substance-using mothers

#### Discussion & Conclusion

The prevalence of adverse health outcomes among exposed babies is higher than that of unexposed babies. Comprehensive prevention and treatment programs targeting the susceptible population should be incorporated in primary care. This includes a multidisciplinary and integrated approach towards service provision that ensure supportive social determinants may result in a better outcome for newborn and positive behavioral change among mothers.

**Appendix I: Award**



**TOP DOWNLOADED PAPER 2018-2019**

**CONGRATULATIONS TO**

**Helen Oni**

whose paper has been recognized as  
one of the most read in

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