

Cannabis Use During Pregnancy: Patterns and Potential Impacts on Offspring and Maternal Health

Summary of Literature

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Table of Contents

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Summary of Literature	
1. Research request	2
2. Patterns of Cannabis Use During Pregnancy	4
2.1 How frequently is cannabis used by women during preconception and pregnancy?	4
2.2 What are the reasons for cannabis use amongst pregnant women?	5
2.3 What is the awareness amongst pregnant women of potential risks of cannabis use while pregnant? .	5
2.4 What is the pattern of ongoing cannabis use amongst pregnant women throughout the stages of pregnancy?	6
2.5 What factors contribute to the discontinuation of cannabis use during pregnancy?	6
2.6 What are the sociodemographic factors influencing cannabis use amongst pregnant women?	7
2.7 What is the age of cannabis users?	7
2.8 Is there a link between Indigeneity and the use of cannabis during pregnancy?	8
3. Potential Impacts of Cannabis Use During Pregnancy	10
3.1 What are the potential impacts of cannabis use during pregnancy on the child?	10
3.2 What are the potential impacts of cannabis use at different stages of gestation on the offspring?	14
3.3 What are the potential risks associated with substance co-use amongst pregnant women?	14
3.4 What are the potential impacts of cannabis use during pregnancy on maternal health?	16
3.5 Is there a link between cannabis use and mental health outcomes during pregnancy?	16
4. Prevention and Risk Reduction	18
4.1 What are potential strategies for prevention and risk reduction?	18
4.2 What are the withdrawal symptoms of discontinued cannabis use and how can these symptoms be managed?	18
5. Implications for Health Care	20
5.1 What are the implications of these findings for health care providers?	20
6. What are the existing gaps in research on cannabis use during pregnancy?	23
7. References	25

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1. Research request

A summary of the literature was sought to explore the effects of cannabis use during pregnancy.

We have searched the literature and prepared this summary of findings from studies about:

2. Patterns of cannabis use during pregnancy
3. The risks associated with cannabis use during pregnancy
4. Strategies for prevention and risk reduction
5. Implications for health care
6. Gaps in research

In the period between 2020 – 2024, we found 54 papers, of which 30 of the most relevant are included in the summary below. In this period, there was only one study that specifically related to Indigenous women in Australia. The cohort included 344 Aboriginal families participating in the Aboriginal Families Study¹ who had a baby in the state of South Australia from July 2011–June 2013, A second wave was conducted when the study children were aged 5–9 years, with 246 families, including 227 mothers (66.0% of the original cohort) taking part. This longitudinal study examined women’s mental health in the first year postpartum and again when children were aged between 5 – 9 years old.

We have included findings from Mensah and colleagues’ study in the summary below. We have also highlighted some of the headline findings from that study:

- One in five women (19.5%) used cannabis during pregnancy (with or without co-use of tobacco).
- Within this group of women, 88.3% experienced 3 or more (3+) stressful events or social health issues.
- Psychological distress (Kessler-5 scale, K-5) in the year postpartum was substantially higher amongst women who had used cannabis or experienced 3+ stressful events or social health issues.
- High proportions of women met criteria for support and referral for depression and/or anxiety (52.5% of women who had used cannabis compared to 20.9% amongst women who had neither used cannabis nor tobacco; 43.2% of women who had experienced 3+ stressful events or social health issues compared to 15.6% amongst women who had not indicated these experiences).

Mensah et al., (2024) provide the following interpretation of the findings from their study which are extracted here:

- Amongst women who had used cannabis in pregnancy, a high burden of psychological distress, depression, and anxiety is evident in the postpartum period and as their children reach 5–9 years.

¹ The Aboriginal Families Study is a prospective mother and child cohort study investigating the health and wellbeing of 344 Aboriginal children and their mothers living in urban, regional and remote areas of South Australia. The study is being conducted in partnership with the Aboriginal Health Council of South Australia and the South Australian Health and Medical Research Institute. The project is ongoing (<https://www.mcrci.edu.au/research/projects/aboriginal-families-study>).

- The overlay of stressful events and social health issues and the high proportion of women meeting criteria for referral for mental health assessment and support indicate an urgent need to offer women opportunities for safe disclosure of cannabis use and opportunities to access sustained holistic services.
- Reducing the harms of cannabis use on Aboriginal and Torres Strait Islander families must be coupled with culturally safe ways of addressing the social, historical, and structural determinants of mental health distress and harmful use of substances.

We identified one other study specifically relevant to Aboriginal and Torres Strait Islander people from 2016. While this was outside the scope of the review, we have included a summary of this study given its relevance, Brown et al., (2016) aimed to assess the extent to which adverse birth outcomes (such as still birth, preterm birth, and low birth weight) were associated with maternal cannabis use and exposure to stressful events and social health issues during pregnancy. This study included 344 women aged between 15 – 43, with a median age of 25 years, who had given birth to an Aboriginal and/ or Torres Strait Islander baby in South Australia between July 2011 and June 2013.

The key findings from this study are highlighted below:

- 1 in 5 women (20.5%) used cannabis during pregnancy, and 52% smoked cigarettes.
- Compared with mothers not using cannabis or cigarettes, mothers using cannabis had babies on average 565g lighter and were more likely to have infants with a low birth weight, and small for gestational age.
- Controlling for education and other social characteristics, including stressful events/social health issues, did not alter the conclusion that mothers using cannabis experience a higher risk of negative birth outcomes.

Brown et al. (2016) provide the following interpretation of the findings:

- The findings provide a compelling case for stronger efforts to address the clustering of risk for adverse outcomes in Aboriginal and Torres Strait Islander communities and point to the need for antenatal care to address broader social determinants of adverse perinatal outcomes.
- Integrated responses—collaboratively developed with Aboriginal communities and organisations—that focus on constellations of risk factors, and a holistic approach to addressing social determinants of adverse birth outcomes, are required.

2. Patterns of Cannabis Use During Pregnancy

2.1 How frequently is cannabis used by women during preconception and pregnancy?²

Cannabis is the most frequently used drug during pregnancy and amongst women of a reproductive age. Recent data indicates cannabis use is increasing amongst pregnant women. Cannabis use is the second most common substance used during preconception and is mostly used without other illicit substances. Cannabis use may be increasing due to legalisation in certain regions. This review did not identify any studies that specifically examined this question in the Australian context, however, a systematic review conducted by [Singh et al.](#) (2020) included three Australian studies.

Preconception

- In the in the United States, after alcohol, cannabis was the most common substance used during preconception (28%), considerably more than tobacco (3.1%) or illicit substances (2.6%) (Leng et al., 2023, p. 153).
- Among preconception cannabis users in the United States, most (90.5%) used cannabis alone without illicit substances (Leng et al., 2023, p. 153).

Pregnancy

- According to a systematic review by Singh et al. (2020) – including twenty-nine studies conducted in the USA, three in Australia, three in Canada, two in France, two in the UK, one in the Netherlands, and one multinational study – maternal cannabis use during pregnancy has seen an increasing prevalence in recent decades. Across studies, prenatal cannabis use ranged from 0.24% to 22.6%, with the highest reported use occurring in the first trimester (Singh et al. in Tadesse, Dachew, et al., 2024).
- Cannabis is the illegal drug most frequently used during pregnancy and in women of reproductive age in Spain (Brik et al., 2024, p. 1).
- American research has identified that cannabis use during pregnancy is increasing, with 19–22% of patients testing positive at delivery in Colorado and California (Swenson, 2023, p. 1).
- The majority of surveyed pregnant women in an American study demonstrated poor knowledge about the possible risks of marijuana in pregnancy and indicated that they would be more likely to use marijuana in pregnancy if it were legalised. Overall, pregnant women had poor knowledge about potential risks of marijuana use in pregnancy. Although 234 (29.0%) patients were opposed to legalisation, more than 90% of pregnant subjects indicated that they would be more likely to use marijuana in pregnancy if it were legalised (Ng et al., 2022).
- The most common form of preconception cannabis consumption was edibles, which contrasts with contemporary use by American adults in general, where smoking is the preferred modality (Leng et al., 2023, p. 153).

² The term 'pregnant women' is used throughout this paper to include trans women, gender diverse women and cis women.

2.2 What are the reasons for cannabis use amongst pregnant women?

Pregnant women report using cannabis to mitigate pregnancy symptoms such as nausea, as well as symptoms including anxiety, pain, depression, stress, and sleep problems. Pregnant women may also use cannabis due to a fear of physicians; perceived health benefits, such as the ability to keep food down and provide nutrition for their developing baby; mental health issues, such as depression; and a lack of options to treat nausea.

- Gould et al.'s (2024, p. 6) research echoes previous findings that pregnant patients are using cannabis medicinally to manage pregnancy symptoms such as nausea.
- Some women who use cannabis during pregnancy perceive it to be a relatively safe and effective way to manage mental and physical symptoms, such as depression, stress, sleep problems, pain and morning sickness (Young-Wolff et al., 2024, p. 436).
- Patients report using cannabis to alleviate their nausea and vomiting, anxiety, and pain (Swenson, 2023, p. 1).
- Pregnant people may use cannabis for medical conditions, such as anxiety and depression, these conditions may also independently affect pregnancy outcomes (Metz et al., 2023, p. 2192).
- Mental health plays a role in patterns of use in pregnancy. Women with depression are more than 3 times more likely to use cannabis during pregnancy. Prenatal cannabis use has also been associated with anxiety and trauma diagnoses (Hayer et al., 2023, p. 413).
- Perceived health benefits, fear of physicians, and lack of options to treat their nausea, pain, or anxiety associated with pregnancy explain use (Barbosa-Leiker et al., 2020).
- Feeling that cannabis was the only way they were able to keep food down and worry that they could not provide nutrition for their developing babies without help from cannabis were also reasons given (Barbosa-Leiker et al., 2020).
- One of the main symptoms of pregnancy is nausea, especially during the first trimester of pregnancy. To relieve symptoms more and more pregnant women turn to cannabis use (Ainiti et al., 2023, p. 1).
- There was also a quality-of-life component when cannabis consumption allowed pregnant women to relax, to better care for their existing children, and to decrease their anxiety (Barbosa-Leiker et al., 2020).

2.3 What is the awareness amongst pregnant women of potential risks of cannabis use while pregnant?

There is a general lack of knowledge regarding the potential risks of cannabis use during pregnancy. Cannabis use is sometimes perceived as relatively safe during pregnancy and not posing any risk to the offspring. However, non-smokers may be more aware that cannabis use may be harmful to a pregnancy and have negative health impacts on the offspring.

- Pregnant women have poor knowledge of the potential risks of cannabis use during pregnancy (Swenson, 2023, p. 3).
- People who did not use tobacco (non-smokers) had higher likelihood of agreeing that marijuana use may be harmful to a pregnancy, may hurt the growth of a baby, may cause preterm birth, and may hurt a child's ability to learn (Ng et al., 2022, p. 1).
- Based on data from the American National Survey on Drug Use & Health, approximately 21.6% of pregnant women did not perceive weekly cannabis use to carry any risk. Moreover, cannabis is commonly perceived as beneficial to reduce nausea during pregnancy without any health risk to the offspring (Habersham et al., 2024, p. 2).
- Some pregnant women believe cannabis is safe for the unborn baby because cannabis is a "natural" substance so it must not pose as many risks as pharmaceuticals despite acknowledging risks of

tobacco, another natural substance (Chang et al., 2019). Interviewees explained that compared to other drugs that they deemed to be harmful during pregnancy (e.g., methamphetamines, heroin), cannabis must be more safe because it is not a “hard drug” (Chang et al., 2019; Swenson, 2023, p. 3).

2.4 What is the pattern of ongoing cannabis use amongst pregnant women throughout the stages of pregnancy?

Cannabis use is most common during the first trimester of pregnancy; however, cannabis use continues beyond the first trimester for a considerable proportion of pregnant women. During the post-partum stage, one study suggests that some women continue to use cannabis to help them cope with physical and mental health symptoms, such as stress and pain.

- A systematic review and meta-analysis comprising 53 studies, including seven Australian studies, found that approximately half of pregnant women who use cannabis continue to use throughout pregnancy, particularly in the first trimester during organogenesis when the foetus is most sensitive to adversity (Lo et al., 2024, p. 3).
- Of the 610 participants (6.6%) with cannabis use in an American study, 32.4% (n = 197) had cannabis exposure only during the first trimester and 67.6% (n = 413) had ongoing exposure beyond the first trimester (Metz et al., 2023, p. 2191).
- An American study found prenatal cannabis use is most common during the first trimester of pregnancy, and many pregnant women quit or decrease their use during their second and third trimesters (Young-Wolff et al., 2024, p. 436).
- This study also found few participants described plans to use cannabis immediately after birth to help cope with physical and mental health symptoms, such as stress and pain. Initial research suggests that postpartum women report using cannabis for the same reasons they used before pregnancy, including for fun or to get high, for symptom management (e.g., depression, anxiety, chronic pain), and to cope with postpartum depression or the stress of having an infant (Young-Wolff et al., 2024, p. 441).

2.5 What factors contribute to the discontinuation of cannabis use during pregnancy?

Few studies have investigated what influences the discontinuation of cannabis use during pregnancy, however, one study indicates that this can be driven by early detection of cannabis use and referral to mental health support services. In contrast, dynamics that can contribute to the ongoing use of cannabis during pregnancy include social and demographic factors, the use of other illicit drugs, and a perceived negligible risk of cannabis harming the foetus.

- Discontinuation of cannabis use occurs during pregnancy in more than half of regular cannabis users, however, little has been studied about factors predicting discontinuation of cannabis use during pregnancy (Brik et al., 2024, p. 5).
- Several factors increased the rate of cannabis discontinuation during pregnancy: no previous births (including stillbirths), early detection of cannabis use and referral to a perinatal mental health specialist in the first trimester, and cannabis use detection at any time during pregnancy (Brik et al., 2024, p. 5).
- Social and demographic factors (unemployment, pre-pregnancy use of tobacco, perceived low risk of prenatal cannabis use, higher frequency of pre-pregnancy cannabis use, being unmarried, having less than 12 years of education), use of other illegal drugs, and a perceived low risk of foetal harm have been identified as factors associated with continuing using cannabis during pregnancy (Brik et al., 2024, p. 2).
- Women with mental health disorders showed more discontinuation during pregnancy. This could be explained by the fact that patients suffering mental health disorders used cannabis as a self-

medication treatment, especially during the pregnancy and postpartum period. In this case, the dual pathology (mental health disorders plus substance use disorder) was treated at the same time, and therefore they discontinued cannabis use as a treatment for the mental symptoms (anxiety and depression mostly) (Brik et al., 2024, p. 7).

- Most participants had quit cannabis use by the time of study recruitment, and they reported varied plans for using cannabis postpartum. Several participants planned to maintain the abstinence commenced during pregnancy indefinitely (Young-Wolff et al., 2024, p. 441).
- Others were ambivalent or undecided about whether they would use cannabis postpartum, questioning whether cannabis use would be less pleasurable or would be inconsistent with their role as a parent (Young-Wolff et al., 2024, p. 441).

2.6 What are the sociodemographic factors influencing cannabis use amongst pregnant women?

Sociodemographic factors that can contribute to the use of cannabis during pregnancy include unemployment, pre-pregnancy substance co-use (tobacco, alcohol, other illicit drugs), lower levels of education, lower household income, poor access to healthcare, and stressful life events.

- Sociodemographic factors that may put women at greater risk for continued cannabis use during pregnancy include: unemployment, pre-pregnancy use of tobacco, perceived low risk of prenatal cannabis use, higher frequency of pre-pregnancy cannabis use, being unmarried and having less than 12 years of education (Brik et al., 2024, p. 6).
- Cannabis use in pregnancy is more prevalent in women who are younger and who have lower levels of education and household income. For pregnant women who co-use other substances such as tobacco, alcohol, and illicit drugs, these disparities are more pronounced, indicating that socioeconomic factors are associated with these higher-risk behaviours (Hayer et al., 2023, p. 413).
- Women who use cannabis during pregnancy may have different socioeconomic backgrounds and/or access to healthcare, which can also contribute to adverse birth outcomes, including congenital birth defects (Tadesse, Dachew, et al., 2024, p. 7).
- Mensah et al's (2024, p. 7) findings reflect the findings of previous studies that stressful life events cluster with cannabis use during pregnancy.
- In an American study, pre-pregnancy, 16.4% (997/6061) of respondents endorsed using cannabis, with 36.4% (363/997) continuing cannabis use during pregnancy. Among the 63.6% (634/997) who did not report use during pregnancy, 23.2% (147/634) relapsed to cannabis use during the postpartum. Nine of the 14 possible stressful life events were associated with increased odds of pre-pregnancy cannabis use (e.g. husband/partner or mother went to jail) and four were associated with increased odds of continued cannabis use during pregnancy (e.g. husband/partner lost job) (Allen et al., 2020, p. 1707).
- The odds of postpartum relapse to cannabis were significantly associated with two stressful life events (husband/partner said they did not want pregnancy; husband/partner or mother went to jail). Stressful life events during the year prior to childbirth appear to be linked to greater odds of women's cannabis use during the perinatal period, especially during pre-pregnancy (Allen et al., 2020, p. 1707).

2.7 What is the age of cannabis users?

Cannabis use amongst pregnant women can occur across all ages; however, evidence suggests there is a higher proportion of use amongst younger women.

- A longitudinal study conducted between 2009 and 2013 in the United States, found that among participants analysed, 13.1% used cannabis were generally younger (25.9 vs 27.9 years) (Habersham et al., 2024, p. 2).
- Another American study found birthing women with prenatal cannabis use disorder were more likely to be younger, which is consistent with the existing literature (Prewitt et al., 2023, p. 194).

2.8 Is there a link between Indigeneity and the use of cannabis during pregnancy?

There is a dearth of recent studies examining the cannabis use amongst pregnant women who identify as Indigenous. However, one study (Mensah et al, 2024), that examined cannabis use amongst 344 Aboriginal families in South Australia that had a baby between 2011 – 2013, found that use can occur in up to one in five women during pregnancy. This study identified a link between cannabis use and mental health (e.g., depression and/ or anxiety); various stressful life events such as housing issues, issues with families and partners, family, or community violence; legal or financial stress; social health issues; and mental distress associated with the ongoing impacts of colonisation and intergenerational trauma.

- Cannabis is a concern for Australian Aboriginal and Torres Strait Islander communities, it is widely accessible and often used daily (Mensah et al., 2024, p. 6).
- The women in Mensah et al.'s (2024, p. 7) study tended to be young, underlining the need for awareness and prevention approaches in adolescence and early adulthood. However, cannabis use during pregnancy was reported by women across all ages highlighting that awareness and support must be made universally accessible to families.
- One in five women (19.5%) used cannabis during pregnancy (with or without co-use of tobacco). Within this group of women, 88.3% experienced 3 or more (3+) stressful events or social health issues (Mensah et al., 2024, p. 6).
- High proportions of women met criteria for support and referral for depression and/or anxiety (52.5% of women who had used cannabis compared to 20.9% amongst women who had neither used cannabis nor tobacco; 43.2% of women who had experienced 3+ stressful events or social health issues compared to 15.6% amongst women who had not indicated these experiences) (Mensah et al., 2024).
- The overlay of stressful events and social health issues experienced by almost all women who had used cannabis in pregnancy suggests a cyclical pattern in which using cannabis to try to lessen distress may have longer term impacts on women's mental health (Mensah et al., 2024).
- Almost nine of every ten women who had used cannabis in pregnancy were experiencing three or more stressful events or social health issues. Half were experiencing housing problems, and almost half reported that their partner was having problems with drugs or alcohol. Other frequently experienced social health issues included family or community violence, legal, and financial stress. A high need for referral for mental health assessment and support is evident for women experiencing these impacts, with sustained provision needed across the pregnancy and postpartum period and as their children are beginning school (Mensah et al., 2024, p. 6).
- In the context of the adversities that are frequently faced by Aboriginal and Torres Strait Islander communities, cannabis use may be a coping response drawn upon by women with limited access to other supports and resources. The patterns of experiences associated with cannabis use in this study may be explained by cannabis being used as an approach to cope with mental health distress stemming from the impacts of colonisation and ongoing intergenerational trauma (Mensah et al., 2024, p. 7).
- Holistic prevention and support to minimise the use and reduce the harms of cannabis use in pregnancy amongst Aboriginal and Torres Strait Islander families must recognise the intersections with and between stressful events, social health issues, and mental health difficulties (Mensah et al., 2024).

- It is critical to provide opportunities for safe disclosure of cannabis use within antenatal, family and child, mental health, primary, and social care settings and to ensure that women and their families have access to multi-faceted support options. Reducing harms of cannabis use on Aboriginal and Torres Strait Islander families must be coupled with culturally safe ways of addressing the social, historical, and structural determinants as root causes of mental health distress and substance use (Mensah et al., 2024, p. 9).
- Reducing the harms of cannabis use on Aboriginal and Torres Strait Islander families must be coupled with culturally safe ways of addressing the social, historical, and structural determinants of mental health distress and harmful use of substances (Mensah et al., 2024).

An earlier study conducted by Brown et al. (2016) aimed to assess the extent to which adverse birth outcomes (such as still birth, preterm birth, and low birth weight) were associated with maternal cannabis use and exposure to stressful events and social health issues during pregnancy. This study included 344 women aged between 15 – 43, with a median age of 25 years, who had given birth to an Aboriginal and/ or Torres Strait Islander baby in South Australia between July 2011 and June 2013.

- 1 in 5 women (20.5%) used cannabis during pregnancy, and 52% smoked cigarettes (Brown et al., 2016) (Brown et al., 2016).
- Compared with mothers not using cannabis or cigarettes, mothers using cannabis had babies on average 565g lighter and were more likely to have infants with a low birth weight, and small for gestational age (Brown et al., 2016).
- Controlling for education and other social characteristics, including stressful events/social health issues did not alter the conclusion that mothers using cannabis experience a higher risk of negative birth outcomes (Brown et al., 2016).

3. Potential Impacts of Cannabis Use During Pregnancy

3.1 What are the potential impacts of cannabis use during pregnancy on the child?

There are numerous potential risks that cannabis use during pregnancy poses to the child. These risks can present at birth, during childhood or later in life. A summary of the findings is presented below, followed by a list of key findings from the relevant studies.

Potential risks to the foetus

Cannabis products pass through the placenta. Potential physical health impacts on the foetus include cardiovascular/heart, gastrointestinal, central nervous and genitourinary birth defects, perinatal mortality, small for gestational age, low birth weight, premature birth, respiratory distress syndrome, neonatal intensive care unit admission, lower head circumference and infant death.

Cannabis use during pregnancy may also impact foetal brain development, including interruption of normal brain maturation, which may increase the risk for later in life neurocognitive and neuropsychiatric disorders, and modifications in the brain, especially in the amygdala. Use may also result in “withdrawal”-like syndrome in newborns, disorders in the sleep cycle, memory problems and hyperactivity.

Other risks include neurodevelopmental abnormalities, functional consequences for gene expression including genes involved in the development of autism spectrum disorder (ASD), attention-deficit/ hyperactivity disorder (ADHD), schizophrenia, addiction, and other psychiatric diseases.

Potential risks to the child and later in life

Cannabis use during pregnancy may also impact the offspring at various developmental stages and later in life. At the age of about two years old, risks include increased fat mass percentage; higher rates of anxiety, depression, behavioural problems, and attention deficits, with more frequent occurrences of attention deficits in girls. At the age of 10 years old, risks can include increased rates of depression and problems in learning and concentration. At the age of puberty risks can include ADHD, and anxiety. Finally, later in life use can increase the risk of cannabis and tobacco use and addiction vulnerability, as well as mental health issues. The risk of later-life negative outcomes following early exposure is particularly high in persons who have specific genetic variants.

Structural birth defects

- Offspring exposed to maternal prenatal cannabis are at greater risks of a wide range of structural birth defects: cardiovascular/heart, gastrointestinal, central nervous, genitourinary and any (unclassified) birth defects (Tadesse, Ayano, et al., 2024, p. 1)

Neurodevelopment

- Adverse pregnancy outcomes have been linked to cannabis use during pregnancy, such as neurodevelopmental abnormalities (Brik et al., 2024, p. 1).
- Cannabis exposure during pregnancy results in varied and significant consequences in neural development in affected offspring. Changes associated with neural development due to cannabis usage during pregnancy would be expected to influence infant/ toddler behaviours. Changes in the behaviours of affected newborns could be due to a chemical insult to the brain, and these impacts would have a long-term importance later in life. To determine the full impact of cannabis consumption on the developing brain and how cannabis-mediated changes interact to impact later life behaviours, further imaging, molecular and behavioural research is necessary (Motamedi et al., 2023, p. 1339).
- The children of mothers who consumed large amounts of cannabis in the first trimester of pregnancy, experienced higher rates of anxiety, depression as well as behavioural problems at the age of about

2 years. In addition, at the age of 10 years there were increased rates of depression, as for the education level these children faced problems in learning and concentration. It is worth noting that the appearance of depression at the age of 10 years was strongly associated with crime at the age of 14 years (Ainiti et al., 2023, p. 1).

- As regards infancy and later infancy, it was found that at the age of 18 months, cannabis is an aggravating factor for the development of behavioural problems, as well as attention deficits, with more frequent occurrences of these in girls (Ainiti et al., 2023, p. 8).
- Maternal prenatal cannabis exposure is associated with a higher risk of ADHD symptoms and ASD in offspring. Adjustment for maternal mental health problems, maternal alcohol use, and tobacco smoking did not substantially alter the observed associations (Tadesse et al., 2024, p. 147).
- There is growing evidence of THC-associated adverse effects for foetal and neonatal developmental outcomes. In utero exposure to THC has been found to impact foetal brain development, including interruption of normal brain maturation, which may increase the risk for later in life neurocognitive and neuropsychiatric disorders. Maternal cannabis use has also been associated with “withdrawal”-like syndrome in newborns and increased aggressive behaviour and attention deficits in offspring as early as 18 months of age (Hayer et al., 2023, p. 420).
- The extant literature consists of 3 large, longitudinal prospective studies examining the effects of prenatal cannabis exposure on offspring neurocognitive development; all controlling for several different covariates. Overall, these 3 studies demonstrated an association between prenatal cannabis exposure and adverse offspring neurodevelopmental and behavioural outcomes, despite a relatively small sample size of exposed offspring and limited data on the amount and potency of cannabis exposure in each study (Hayer et al., 2023, p. 421).
- There is evidence that prenatal cannabis exposure may increase the risk of offspring cannabis and tobacco use later in life and addiction vulnerability (Hayer et al., 2023, p. 423).
- Furthermore, retrospective studies show that cannabis exposure during foetal development increases chances of ADHD and anxiety in the child as they reach puberty (Grant et al. 2018) (Swenson, 2023, p. 2).
- Epidemiological studies examining the influence of cannabis across the lifespan show that exposure to cannabis during gestation or during the perinatal period is associated with later-life mental health issues that manifest during childhood, adolescence, and adulthood (Motamedi et al., 2023, p. 1327).
- The risk of later-life negative outcomes following early exposure is particularly high in persons who have specific genetic variants, implying that cannabis usage interacts with genetics to heighten mental health risks (Motamedi et al., 2023, p. 1327).
- The use of cannabis during the gestation period by the mother aggravates the physical and mental development of the foetus, the newborn and the later childhood. From the systematic review of the literature, the study included 13 primary research studies in which it was found that the children of mother-user faced: disorders in the sleep cycle, memory problems, hyperactivity, increased chances of low birth weight, prematurity with lower Apgar score in the 1st and 5th minutes and hospitalization in an Neonatal Intensive Care Unit, DNA methylation at the position CpG.32, and modifications in the brain, especially in the amygdala. In addition, girls had more aggressive behaviour at the age of 18 months, shorter breastfeeding period, and neonatal death (Ainiti et al., 2023, p. 1).

Pre-term birth, small for gestational age, low birth weight

- Prenatal cannabis use was associated with greater odds of Pre-term birth (PTB), or being small for gestational age, and perinatal mortality even after accounting for prenatal tobacco use. However, our confidence in these findings is limited. Limitations of most existing studies was the failure to not include timing or quantity of cannabis use (Lo et al., 2024, p. 2).

- Prenatal exposure to cannabis is consistently associated with small for gestational age and low birth weight (Moore, 2024, p. 154).
- Adverse pregnancy outcomes have been linked to cannabis use during pregnancy, such as preterm birth. Although these data do not establish causality, recent long-term studies have linked cannabis use to preterm birth and giving birth to a small for gestational age neonate as the bigger risks (Brik et al., 2024, p. 1).
- Preterm delivery (<37 weeks and <32 weeks) and severe maternal morbidity were higher with cannabis or nicotine use, but not with co-use. Neonatal outcomes including Neonatal Intensive Care Unit admission, small for gestational age, respiratory distress syndrome, infant deaths, and others were also higher with cannabis and nicotine use (Crosland et al., 2024, p. 349).
- Patients with cannabis related diagnosis were more likely to experience severe maternal morbidity, non-transfusion severe maternal morbidity, preterm delivery < 37 weeks, preterm delivery < 32 weeks and hypertensive disease. Neonatal outcomes were also significantly higher for those with a cannabis related diagnosis, including Neonatal Intensive Care Unit admission, small for gestational age, respiratory distress syndrome, and infant death (Ryan et al., 2024, p. 420).
- For the developing foetus, disorders are expected as cannabis products pass through the placenta. The main effects found were: low birth weight, prematurity (childbirth before the 37th week of gestation), young newborns for gestational age or lower head circumference, and increased chances of hospitalization in Neonatal Intensive Care Units (Ainiti et al., 2023, p. 1).
- In Australia, a major survey found that women users were more likely to give preterm birth. The result did not change even when the parallel effect of tobacco and alcohol was examined (Ainiti et al., 2023, p. 1).
- Prenatal cannabis use disorder was also associated with an increased risk of neonatal outcomes including respiratory distress syndrome, small for gestational age, neonatal intensive care unit admission, and infant death. There was no statistically significant difference in stillbirth and hypoglycaemia (Prewitt et al., 2023, p. 192).
- From all the primary studies included in the present review, it was found that cannabis use during pregnancy has a multifaceted aggravating effect on the newborn and its subsequent development. In terms of physical health, the intrauterine exposure to cannabis is an important risk factor for the birth of a newborn with a lower weight, premature for gestational age, as well as for their hospitalization in a Neonatal Intensive Care Unit (Ainiti et al., 2023, p. 1).
- Available studies on cannabis use in pregnancy and during lactation were reviewed and support an association with increased risk of preterm birth, neonatal intensive care unit admission, low birth weight, and small-for-gestational-age infants (Hayer et al., 2023, p. 411).
- Currently, the evidence suggests that prenatal cannabis exposure is associated with small for gestational age, defined as a birth weight less than the 10th percentile. Although some studies did not adjust for confounders such as prenatal nicotine exposure, the most recently published systematic review observed that prenatal cannabis use significantly increased the likelihood of small for gestational age (Hayer et al., 2023, p. 421).
- Cannabis use during pregnancy has often been shown to be associated with an increased risk for low birth weight. Although we did not find a significant increase in the risk of low birth weight, preterm birth, or neonatal intensive care unit admission in our unadjusted models evaluating cannabis use, there was a significant risk for low birth weight when cannabis use was factored in along with other predictor variables. Therefore, this finding indicates that there may be a more complex relationship between cannabis use during pregnancy and low birth weight (Habersham et al., 2024, p. 7).
- Many studies have consistently reported that prenatal cannabis use is associated with an increased risk of preterm birth, defined as delivery before 37 weeks' gestation, even after adjusting for confounders such as tobacco use (Hayer et al., 2023, p. 421).

- The literature consistently supports an association between prenatal cannabis exposure and a significantly higher likelihood of Neonatal Intensive Care Unit admissions (Hayer et al., 2023, p. 421).
- Of 364,924 infants, 22,624 (6.2%) were exposed to cannabis in utero. After adjustment for potential confounders, including in utero exposure to other substances, in utero exposure to cannabis was associated with greater odds of low birthweight, small for gestational age, preterm birth (<37 weeks), and neonatal intensive care unit admission. There was a suggestive association with early preterm birth (<34 weeks), but no significant association with respiratory support. In utero cannabis exposure was associated with increased likelihood of low birthweight, small for gestational age, preterm birth, and neonatal intensive care unit admission (Avalos et al., 2023, p. 1).
- In human retrospective studies, children exposed to cannabis in-utero are more likely to be admitted to the neonatal intensive care unit, have lower birth weights, and increased preterm delivery (Marchand et al. 2022).

Foetal or perinatal mortality

- Unadjusted analysis indicated a seven-fold increased risk of foetal death with cannabis, which persisted after adjustments. Adjusted models also suggested increased low birth weight risk (Habersham et al., 2024, p. 2).
- The association between cannabis use and foetal death observed in this study is consistent with existing literature that suggests detrimental effects of cannabis on foetal outcomes (e.g., spontaneous abortion, ectopic pregnancy, embryo and placental development). Even after adjusting for modifiable (nicotine use, marital status) and non-modifiable covariates (maternal age and race), the risk associated with cannabis use remained markedly elevated (Habersham et al., 2024, p. 7).
- Adverse neonatal outcomes such as infant death was higher with cannabis and nicotine use (Crosland et al., 2024, p. 349).
- Patients with cannabis related diagnosis had higher risks of infant death (Ryan et al., 2024, p. 420).
- These findings suggest that co-occurring maternal use of cannabis and nicotine products in pregnancy is associated with an increased risk of infant and neonatal death and maternal and neonatal morbidity compared with use of either substance alone (Crosland et al., 2024, p. 1).
- There is no consistent association among existing studies between prenatal cannabis use and perinatal death (Hayer et al., 2023, p. 421).

Rapid weight gain

- After birth, these offspring gain weight rapidly and have increased adiposity and higher glucose (fat mass percentage) in childhood (Moore, 2024, p. 154).

Epigenetic changes

A review of cannabis use and pregnancy conducted by Hayer et al., (2023) found:

a growing body of literature has demonstrated that environmental stimuli, including maternal substance use, can alter epigenetic regulation and impact gene transcription. Epigenetic mechanisms are increasingly recognized as a key link between early life experiences and risk of longer-term psychopathology. Cannabis exposure preconception or during pregnancy has been shown to alter epigenetic processes (e.g., DNA methylation and histone modifications) with functional consequences for gene expression including genes involved in the development of autism spectrum disorder, attention-deficit/ hyperactivity disorder, schizophrenia, addiction, and other psychiatric diseases (Hayer et al., 2023, p. 420).

3.2 What are the potential impacts of cannabis use at different stages of gestation on the offspring?

The use of cannabis at different gestation periods may result in various health impacts in offspring. For instance, early gestation exposure may alter pancreatic development, whereas late gestation exposure may have a more profound effect on birth weight, admission to neonatal intensive care units, and child adiposity. There is evidence that discontinuing cannabis use during pregnancy can lead to better obstetric and neonatal outcomes compared to cannabis use throughout pregnancy.

- Existing studies have indicated that the impact of prenatal cannabis exposure in the first trimester of gestations increased the risk of attention-deficit/hyperactivity disorder symptoms like impulsivity, inattention, and hyperactivity problems in offspring (Tadesse, Dachew, et al., 2024, p. 147).
- Timing may be an important factor in the associations between prenatal exposure to cannabis and offspring adiposity and cardiometabolic health. For instance, early gestation exposure may alter pancreatic development, whereas late gestation exposure, when the majority of fat accretion occurs, may have a more profound effect on birth weight and child adiposity. Few studies have attempted to examine whether early vs. late gestation exposure impacts offspring birth outcomes (Moore, 2024, p. 160).
- Beyond the prenatal period, pre-conception exposure may predispose offspring to later-life obesity and cardiometabolic disease, but the evidence is inconsistent (Moore, 2024, p. 160).
- Brik et al.'s (2024, p. 7) study showed that women discontinuing antenatal cannabis use had better obstetric and neonatal outcomes than those who continued. Rates of preterm birth, lower birth weight, admission to special care baby unit and neonatal intensive care unit and bottle-feeding at hospital discharge were higher in the group that continued.
- There is literature showing that self-reported cannabis use throughout the third trimester is associated with an increased risk of low birth weight and neonatal intensive care unit admission. This study shows that discontinuing cannabis during pregnancy improves obstetric and neonatal outcomes as compared to continuing cannabis use throughout the pregnancy (Brik et al., 2024, p. 7).
- In a multicentre observational cohort, a composite adverse pregnancy outcome (small-for-gestational-age birth, medically indicated preterm birth, stillbirth, or hypertensive disorders of pregnancy) was more frequent in pregnant women with cannabis exposure ascertained by a urine drug assay (25.9%; n = 610) compared with unexposed women (17.4%; n = 8647). The risk for an adverse outcome was higher among those who continued to use cannabis beyond the first trimester (Metz et al., 2023, p. 2192).

3.3 What are the potential risks associated with substance co-use amongst pregnant women?

Pregnant women who use cannabis may be more likely to co-use other substances such as tobacco, alcohol, and illicit drugs. Substance co-use can increase the risk of adverse birth outcomes (e.g., low birth weight, prematurity, and stillbirth) and poor maternal health. While some studies suggest that concurrent use of tobacco and cannabis did not create additional risks for birth outcomes compared to the use of tobacco alone, there is also emerging evidence that indicates cannabis use may exacerbate the negative impacts of nicotine exposure including on maternal health outcomes and foetal outcomes. One of the challenges in the studies of co-use has been separating out the birth impacts that are related to only tobacco or only cannabis or both together.

- A subgroup analysis also indicated the risk of birth defects in offspring was higher in studies that did not account for at least one important confounder such as prenatal tobacco smoking than their counterparts. This could be explained by numerous confounding factors such as tobacco and alcohol use that can independently contribute to congenital birth defects, making it difficult to understand the specific impact of cannabis (Tadesse, Ayano, et al., 2024, p. 7).

- Importantly, studies suggested that pregnant women who use cannabis are more likely to use other substances such as alcohol, tobacco, and other illicit drugs, which may confound the effect prenatal cannabis use on neurodevelopmental disorders in offspring (Tadesse, Dachew, et al., 2024, p. 148).
- Rates of adverse birth outcomes were high among women who used tobacco compared to what would be expected in unexposed pregnancies. However, tobacco and marijuana co-use during pregnancy was not associated with an additional risk of adverse birth outcomes compared to tobacco use alone. This indicates that the concurrent use of tobacco and marijuana did not confer an additional risk of adverse birth outcomes for infants compared to infants of women who used tobacco alone during pregnancy (Waddell et al., 2023).
- However, it is important to note that the risk of adverse outcomes for these infants was still increased compared to what would be expected in infants of women who did not use either substance during pregnancy, as the average size parameters for both groups in our study were well below the fiftieth percentile, and the average length of hospital stay was well above the national median of less than 2 days (Waddell et al., 2023, p. 6).
- Infants born to women who concurrently used both substances showed no differences in birth outcomes such as birth length, birth weight, prematurity, or APGAR scores compared to women who used tobacco only (Waddell et al., 2023, p. 5).
- Prenatal exposure to cannabis and nicotine products has been associated with decreased birth weight and altered infant neurobehavior compared with unexposed infants (Crosland et al., 2024, p. 2).
- Our study suggests that prenatal cannabis and nicotine products, both independently and with co-use are associated with increased odds of maternal and neonatal morbidity compared to non-users (Crosland et al., 2024, p. 349).
- Half of women who use cannabis in pregnancy also use tobacco or nicotine products, and combined use of cannabis and nicotine products in pregnancy has increased over time. Numerous studies have demonstrated the detrimental effects of prenatal tobacco exposure, primarily nicotine exposure, on perinatal outcomes, including prematurity, low birth weight, and stillbirth (Crosland et al., 2024, p. 2).
- Emerging evidence indicates that cannabis use exacerbates the negative impacts of nicotine product exposure, and dual abstinence may result in better outcomes following cessation (Crosland et al., 2024, p. 2).
- The limited existing literature suggests that combined use of cannabis and nicotine products is associated with adverse maternal health outcomes, including an increased risk of cannabis use disorder, and worsened mental health (Crosland et al., 2024, p. 2).
- Although the goal is abstinence from both cannabis and nicotine products in pregnancy, for patients who are unable to achieve this, our study suggests that at least cessation of 1 substance would still be beneficial and may help inform public health policy and clinician counselling (Crosland et al., 2024, p. 10).
- While neonates exposed to cannabis alone did not differ from unexposed neonates, those exposed to both cannabis and nicotine were at increased risk of small for gestational age (Trammel et al., 2024, p. 2).
- A total of 3 129 259 pregnant women were included (mean maternal age 29.3), of whom 23 007 (0.7%) had a cannabis-related diagnosis, 56 811 (1.8%) had a nicotine-use diagnosis, and 10 312 (0.3%) had both in pregnancy. Compared with nonusers, those with cannabis or nicotine use diagnoses alone had increased rates of infant (0.7% for both) and neonatal (0.3% for both) death, small for gestational age (14.3% and 13.7%, respectively), and preterm delivery (<37 weeks) (12.2% and 12.0%, respectively). Moreover, risks in those with both cannabis and nicotine use were higher for infant death, neonatal death, small for gestational, and preterm delivery (Crosland et al., 2024, p. 1).

3.4 What are the potential impacts of cannabis use during pregnancy on maternal health?

There is conflicting evidence regarding cannabis use during pregnancy and the impact on maternal health. However, some studies suggest there may be an increased risk of hypertensive disorders, gestational hypertension, preeclampsia, severe maternal morbidity, preterm delivery, and anaemia. Co-use of cannabis and tobacco has also been linked to an increased risk of preeclampsia and maternal asthma. (For impacts on the foetus/child, see above 3.1 – 3.2).

- The data on prenatal cannabis use on maternal health are limited, but overall do not consistently support any pregnancy-related adverse maternal outcomes. Several prior studies have examined the association between cannabis use in pregnancy and hypertensive disorders with conflicting results. Some studies have reported no association, whereas others, including a retrospective cohort study of singleton deliveries in California from 2011 to 2017, noted that cannabis-related diagnoses were associated with an increased odd of hypertensive disorders. Similarly, another retrospective cohort study also found increased odds of gestational hypertension, preeclampsia, and severe maternal morbidity with maternal cannabis use. Co-use of cannabis with cigarette smoking in pregnancy has also been linked to increased odds of preeclampsia and maternal asthma (Hayer et al., 2023, p. 419).
- A total of 3,356,676 pregnant women were included: 25,168 used cannabis only, 62,199 used nicotine-products only and 11,401 co-used cannabis and a nicotine-product during pregnancy. After adjusting for maternal demographics, with 'no-use' as the reference group, hypertensive disease was significantly higher in patients with cannabis use, nicotine use and co-use of cannabis and nicotine (Crosland et al., 2024, p. 349).
- Data on associations of cannabis use with gestational diabetes are similarly mixed. With regard to other maternal outcomes, a previous retrospective cohort study of births in the United States from 1999 to 2013 found increased odds of prolonged hospital stay and a former meta-analysis of 24 studies determined higher odds of anaemia with cannabis use during pregnancy (Hayer et al., 2023, p. 419).
- A total of 2,380,446 patients were included, and 9144 (0.38%) were identified as using cannabis during pregnancy. There was a significantly increased risk for adverse birthing person outcomes, including gestational hypertension, preeclampsia, preterm delivery, and severe maternal morbidity (Prewitt et al., 2023, p. 192).
- Women who continued cannabis use were significantly more likely to have elevated generalised anxiety disorder (GAD) and Edinburgh Postnatal Depression Scale (EPDS) scores, respectively as compared to those with no use. Both anxiety and depression symptoms were found to be associated with cannabis use and continued use during pregnancy (Mark et al., 2021, p. 528).

3.5 Is there a link between cannabis use and mental health outcomes during pregnancy?

Cannabis use during pregnancy can increase the risk of experiencing anxiety and depression amongst pregnant women. This risk increases with daily cannabis use, compared to women who used cannabis less frequently (for example, a few days a week).

- Findings showed a heightened risk for symptoms of anxiety and depression during pregnancy among women who used cannabis every day in the 3 months prior to pregnancy (Leng et al., 2023, p. 152).
- Daily cannabis use and the presence of cannabis use disorder (CUD) were each associated with an increase in depression and anxiety symptoms in pregnancy (Leng et al., 2023, p. 152).
- The odds of having a Center for Epidemiologic Studies Depression Scale score in the range concerning for clinical depression was 5 times greater for those who used cannabis daily in the 3 months prior to pregnancy compared to those who used cannabis less than once a month. This poses a public health concern due to the serious consequences of peripartum depression on maternal and infant morbidity and mortality, including offspring neurodevelopment (Leng et al., 2023, p. 152).

- In contrast, occasional cannabis use, at a frequency of a few days a week or less, was not associated with an increase in depression or anxiety symptoms (Leng et al., 2023, p. 153).

4. Prevention and Risk Reduction

4.1 What are potential strategies for prevention and risk reduction?

Potential strategies for prevention and risk reduction may include preventing use during adolescence, providing integrated care, postpartum home visits, and addressing underlying symptoms leading to cannabis use. Reducing the frequency and potency of use may also reduce potential risks.

- Legislative policies have reduced the initiation of harmful substance use, especially amongst the adolescent population. Many individuals initiate their marijuana use during adolescence and continue through their reproductive years. Therefore, one key strategy for preventing marijuana use in pregnancy is preventing marijuana use during adolescence (DeJong et al., 2022, p. 413).
- Another method for preventing marijuana use in the perinatal period is to employ prevention efforts that have been shown to be generally effective in reducing substance use in pregnancy. Integrated clinics for pregnancy and parenting that provide prenatal care, primary care, substance use and mental health care, and address other social supports (i.e., housing, transportation, etc.) have been shown to (1) reduce substance misuse before, during and after pregnancy; (2) increase engagement in treatment and prenatal care for persons who use marijuana; (3) improve general infant and child wellbeing; (4) decrease rates of breastfeeding discontinuation; and (5) increase use of effective postpartum contraception (DeJong et al., 2022, p. 414).
- Similarly, postpartum home visits by health professionals have been shown to improve maternal and family health by providing medical and social support at a time where increased stressors contribute to risk of relapse, postpartum mood disorders and less positive parenting practices (DeJong et al., 2022, p. 414).
- Exploration of underlying symptoms that a patient may be attempting to self-medicate, education, and proactive medical or psychological management of individual symptoms may also contribute to prevention and risk reduction of substance use (DeJong et al., 2022, p. 414).
- Reducing use (ie, amount and/or frequency) and avoiding high potency THC strains may also help ameliorate some cannabis-associated adverse effects (DeJong et al., 2022, p. 414).
- Identification and treatment of underlying factors contributing to use, such as anxiety, mental health disorders, nausea or reduced appetite, are important aspects of care (DeJong et al., 2022, p. 414).

4.2 What are the withdrawal symptoms of discontinued cannabis use and how can these symptoms be managed?

Discontinuation of cannabis use can lead to withdrawal symptoms including anxiety, irritability, insomnia, unpleasant dreams, depressed mood, decreased appetite, restlessness, abdominal pain, tremors, fever, chills, and headache. Treatment of mild symptoms may include physical exercise, meditation or prayer, relaxation techniques, herbal preparations, over-the-counter analgesics, and other medications. Treatment of more severe withdrawal symptoms may include motivational enhancement therapy, cognitive behavioural therapy, and contingency management.

- It is now well-recognised that regular cannabis use leads to a physical dependence and that abrupt reduction or termination of long term, frequent use is associated with a withdrawal syndrome. This withdrawal syndrome consists of behavioural, emotional, and physical symptoms, such as anxiety, irritability, insomnia, unpleasant dreams, depressed mood, decreased appetite or weight loss, restlessness, abdominal pain, tremors, sweating, fever, chills, and headache. Withdrawal contributes to ongoing use. These symptoms can last from 2 weeks to greater than a month after reduction or cessation of use (DeJong et al., 2022, p. 414).
- Physical exercise, meditation or prayer, relaxation techniques, herbal preparations, over-the-counter analgesics, and other medications can be successful interventions for many individuals with mild

cannabis withdrawal. Treatment of withdrawal symptoms is an important aspect of relapse prevention (DeJong et al., 2022, p. 414).

- Several psychosocial treatments of cannabis use disorder, including motivational enhancement therapy (MET), cognitive behavioural therapy (CBT) and contingency management, have been shown to be beneficial. CBT has the most robust data for reduction of cannabis use and rates of abstinence. However, overall rates of continued abstinence remain low and decline after completion or cessation of treatment. MET in combination with CBT has been found to be a more comprehensive treatment approach (DeJong et al., 2022, p. 415).
- Incentive-based interventions have been shown to be highly effective in treatment retention and promoting abstinence from substances (DeJong et al., 2022, p. 415).
- While contingency management has mixed data as a standalone psychosocial intervention for cannabis use disorder, either MET or CBT or combined MET/CBT programs may be potentially augmented by contingency management to optimize successful cessation or reduction (DeJong et al., 2022, p. 415).

5. Implications for Health Care

5.1 What are the implications of these findings for health care providers?

- Mensah et al., (2024, p. 7) report that the interpretation of their study data by the Aboriginal authors and Aboriginal Governance Group involved in the study is that:
 - the true effects are likely to be cyclical and that holistic prevention and harm minimisation approaches should embed a range of drug and alcohol, mental health, social, and legal supports
 - supportive approaches must be shaped to the context of women's lives and give women opportunities to rebuild and draw upon their strengths within culturally safe provision of care, recognising that both cannabis and tobacco co-use may be being used as ways of coping with intergenerational trauma and adversity.
- Note while the Brown et al., (2016) study was outside the study period, we include it here given its relevance. Brown et al., (2016), based on the findings of their study of Aboriginal and/ or Torres Strait Islander women in South Australia, concluded:
 - there is a compelling case for stronger efforts to address the clustering of risk for adverse outcomes in Aboriginal and Torres Strait Islander communities and point to the need for antenatal care to address broader social determinants of adverse perinatal outcomes.
 - integrated responses—collaboratively developed with Aboriginal communities and organisations—that focus on constellations of risk factors, and a holistic approach to addressing social determinants of adverse birth outcomes, are required.
 - there should be greater focus on ensuring that women, families, and health professionals are aware of the likely adverse consequences of cannabis use during pregnancy is needed, with new approaches to supporting women to stop, or curtail the use of cannabis before, and during pregnancy.
 - frameworks for providing antenatal care should be rethought, and services should be redesigned to combine high-quality clinical care with a stronger public health approach to addressing modifiable social risk factors for poor maternal and child health outcomes.
- As prenatal cannabis use is becoming more common and cannabis potency is increasing, health care providers should discuss the uncertainty regarding the potential benefits and harms of cannabis use during pregnancy with women who are pregnant or trying to conceive (Lo et al., 2024, p. 14).
- Women should be educated on potential risks of marijuana, and especially, tobacco use during pregnancy (Waddell et al., 2023, p. 1).
- While clinical guidance should continue to advocate for abstinence from both tobacco and marijuana during pregnancy, it is important for providers to consider that counselling pregnant women to quit using marijuana without also advising the cessation of tobacco use may not necessarily lead to improved birth outcomes for their infants (Waddell et al., 2023, p. 6).
- This underscores the need for clinicians to initiate dialogue surrounding substance use early in their patients' pregnancies. This proactive approach provides ample opportunities to address risk factors, provide patient education, initiate substance use cessation interventions, and promote positive birth outcomes (Waddell et al., 2023, p. 6).
- The current recommendations to limit cannabis use during pregnancy should continue. Healthcare providers should have open discussions with pregnant patients about the potential risks of cannabis use during pregnancy and provide evidence-based recommendations for safer alternatives when possible (Moore, 2024, p. 162).

- The link between preconception cannabis exposure and perinatal depression and anxiety carries notable implications for clinical practice. First, it highlights the importance of screening for cannabis use and cannabis use disorder among people with reproductive capacity and educating patients on the potential impact of cannabis on fertility and peripartum mental health. Studies show that women receiving prenatal care are not adequately counselled on cannabis use, that patients are dissatisfied with the information they receive from healthcare providers on cannabis, and that nearly half of providers do not discuss cannabis with their patients after they disclose its use during healthcare visits (Leng et al., 2023, p. 153).
- Screening should be extended to capture preconception substance use to identify women at increased risk of peripartum depression and anxiety who may benefit from more intensive support. Given the frequency of cannabis use disorder comorbidity with major depressive disorder and anxiety disorders, the optimal approach to such patients would be an integrated treatment plan that addresses both addiction and psychological factors through medication and psychosocial interventions (Leng et al., 2023, p. 153).
- Given that no association was found between depression and anxiety symptoms with occasional cannabis use, the goal of reducing the frequency of use rather than total abstinence may be a more clinically relevant metric (Leng et al., 2023, p. 153).
- Providers rely on maternal cannabis use data which focuses largely or exclusively on foetal outcomes. Providers saw themselves as protectors of foetal health, rather than both maternal and foetal health, with the underlying assumption that pregnant women were incapable of this role due to their cannabis use. This led to women feeling deprioritized in their provider-patient relationship. In response, pregnant patients who are protecting themselves against ambiguous and far-reaching structural consequences (e.g., child protection services involvement) often will not disclose cannabis use to providers and face consequences when they do. Future perinatal cannabis research and educational interventions should expand the focus to encompass maternal needs as well as social and environmental experiences to keep pregnant women engaged (Gould et al., 2024, p. 6).
- Findings are consistent with prior research, which shows that providers often do not adequately counsel patients following disclosure of maternal cannabis use. When providers do acknowledge use, it is often a punitive approach due to perceptions of unclear evidence (Gould et al., 2024, p. 6).
- There is an urgent need for multi-level harm reduction-based interventions as evidence in this area is generated. This includes: (1) provider-based interventions to highlight how harm reduction can be implemented in one-on-one patient-provider appointments, education around why patients are using cannabis, and how providers can reduce structural inequities such as increased screening among low-income patients; (2) institutional interventions, such as clear guidelines for how to approach pregnant patients who disclose cannabis use, and pathways that prioritize the patient rather than punish; and (3) peer-to-peer programming with an emphasis on health literacy, media literacy, and social media literacy to enable better navigation and comprehension of cannabis content in and outside of healthcare settings (Gould et al., 2024, p. 7).
- Early detection of cannabis use during pregnancy, cessation counselling with mental health interventions, and first live birth are predictors for cannabis discontinuation during pregnancy (Brik et al., 2024, p. 1). This study showed that when it is detected early (in the first trimester of pregnancy), and women are referred to a perinatal mental health specialist, for receiving cannabis discontinuation counselling and follow-up, the risk of continuing antenatal cannabis use is reduced (Brik et al., 2024, p. 6).
- A randomized controlled trial examining the acceptability and early efficacy of a computer-based, single-session, brief motivational intervention followed by a booster session also found high acceptability and significant reduction in cannabis use rates in the intervention group. Our results showed that counselling for cannabis discontinuation and a motivational intervention, as well as coordination with obstetrics and health social workers, from an interdisciplinary approach, were key predictive factors of cannabis discontinuation during pregnancy (Brik et al., 2024, p. 6).

- It has been described that woman valued open interactions with obstetricians who acknowledged their motivations for cannabis use and wanted information on potential risks through conversations and educational materials. however, about 62% of cannabis users, indicated discomfort discussing antenatal cannabis use with their physician (Brik et al., 2024, p. 6).
- Clinicians working with pregnant patients who use cannabis could ask them about their goals for cannabis use during the postpartum period and provide resources and support to those who want to abstain or use less frequently postpartum. Given the high demands on postpartum women, prevention approaches that support patients' mental health and provide skills for managing the unique stresses of the postpartum period, along with appropriate referrals for postpartum depression, may be especially helpful. For patients who choose to use cannabis postpartum, a harm reduction, collaborative approach that works with women to meet their goals for using cannabis postpartum in ways that minimize exposure to second-hand or thirdhand smoke and avoid parenting while impaired may be helpful (Young-Wolff et al., 2024, p. 441).
- Our findings of increased risk for low birth weight, small for gestational age birth, and preterm birth are important because these adverse outcomes are risk factors for neurodevelopmental impairments, development of lower respiratory tract conditions, and other serious illnesses and chronic conditions. These findings support the American College of Obstetricians and Gynaecologists and American Academy of Paediatrics recommendations encouraging pregnant women and those considering pregnancy to discontinue use, and further emphasise the need for educating pregnant women and those who may become pregnant on risks of prenatal cannabis use (Avalos et al., 2023, p. 12).
- The literature search identified several areas for intervention to reduce cannabis use during pregnancy, including physician and pharmacist training, engagement with pregnant patients, regulation of dispensary workers, and the role of child protective services (Swenson, 2023, p. 1).
- When asked about if they discuss or disclose their cannabis consumption to their physician, the pregnant patients discussed social stigmas, fear of child protective services, and fear of legal repercussions (Barbosa-Leiker et al. in Swenson, 2023, p. 3). Some patients mentioned the fear of urine drug screens, the judgment from clinicians, and the lack of communicated information (Barbosa-Leiker et al. 2020). Patients discussed their fear of having their new baby or their existing children taken away from them because of their cannabis use (Barbosa-Leiker et al.in Swenson, 2023, p. 3)
- Patients are working in a complex legal and sociopolitical framework, where they turn to multiple sources for information, including physicians, pharmacists, dispensary employees (budtenders), the internet and social media, and legal bodies like child protective services (Swenson, 2023, p. 7).
- Physicians should begin initiating conversations regarding cannabis consumption at early prenatal visits. These conversations should be patient-focused, non-derogatory and should focus on answering patient questions and educating patients on the known risks to ensure they make informed decisions. Physicians should be honest about the potential legal consequences in their state and should be upfront about the possibility of toxicological testing at labour and delivery (Swenson, 2023, p. 8).
- For pharmacists to give informed healthcare advice, it is pertinent that they are aware of drug interactions. To know if patients are consuming medicinal or recreational cannabis, and to provide appropriate prescription guidance, it is necessary for pharmacists to ask pregnant patients outright about their consumption while they are checking the patient's prescription medications (Swenson, 2023, p. 8).
- Hospitals should implement substance use screeners, which include marijuana consumption, into their electronic medical record akin to anxiety and depression screeners that many hospitals use. When a patient self-reports cannabis use in the screener, the EMR should flag the Cannabis Use Disorder Test (CUDIT-R), a validated screening tool for cannabis use disorder (Cannabis Use Disorder Test n.d). If a patient screens positive for cannabis use disorder, the EMR should flag for referral out to locally based substance use treatment services that are available for pregnant and postpartum people (Swenson, 2023, p. 8).

6. What are the existing gaps in research on cannabis use during pregnancy?

Further research is needed to understand the various short-term and long-term impacts of cannabis use during pregnancy on both maternal and child health. Future research is also needed to understand more about who is using cannabis during pregnancy and the impacts of the use on outcomes for maternal and child health, as well as effective health care and other supports. It will be important to determine the influence of the following factors on use, impacts and effectiveness of health care and other supports:

- frequency of use
- dosing
- types of products (sourced via prescription/pharmaceutical grade; grown at home for personal use; 'illegal' and bought from/gifted by another)
- potency of product (THC levels)
- modes of use (e.g., smoking, apparatus, edibles, tinctures)
- substance co-use
- timing of use during pregnancy (or after including during lactation)
- age of person using
- indigeneity
- other demographic factors (such as socio-economic status, income, education)
- the legal status of cannabis in the jurisdiction in which use is occurring (e.g., is cannabis use criminalised, decriminalised, legalised (fully or to some extent)?)
- access to medicinal cannabis
- protocols to measure parental and foetal exposure to cannabis

The studies reported needs for further research as follows:

- Building further understanding of the frequency of use of cannabis during pregnancy and the types and doses of products being used, including the use of cannabis for medical reasons and the use of synthetic cannabinoids, is an urgent priority in order to establish effective approaches to minimise harms amongst Aboriginal and Torres Strait Islander communities (Mensah et al., 2024, p. 7).
- It is important for studies seeking to determine the association of cannabis use in pregnancy to ascertain cannabis use through screening methods with greater accuracy than participant self-report alone, and to adjust for important confounding factors, such as polysubstance, tobacco or alcohol use, or to use propensity scores or matching techniques to reduce selection biases (Lo et al., 2024, p. 14).
- Findings underscore the need for further clinical and empirical focus on dynamic patterns of use/co-use of tobacco and cannabis across the perinatal period, including cessation interventions to reduce tobacco and cannabis use in pregnancy and protect against relapse in postpartum (Powers et al., 2024, p. 1).
- Additionally identified was a trend in maternal race between the two study groups ($p = .064$), which highlights a greater percentage of non-Hispanic White women who used tobacco when compared to Hispanic and/or non-White women. While not statistically significant, this trend may point toward potential differences in tobacco and marijuana use among different races if studied in a larger sample (Waddell et al., 2023, p. 5).
- More preclinical and prospective studies are needed to deepen our understanding of whether these associations vary by sex, dose, timing, and composition of cannabis (e.g., ratio of delta—tetrahydrocannabinol to cannabidiol). Addressing these gaps may help to solidify causality and identify intervention strategies (Moore, 2024, p. 154). While the literature has rapidly expanded since 2014, key gaps in knowledge remain. More data is needed to understand whether these associations are cannabinoid-related (Moore, 2024, p. 161).

- Data are lacking on the short- and long-term health effects for infants exposed to cannabis through breast milk. The limited existing studies on the potential harms from cannabis exposure through breast milk are conflicting, and additional research is critically needed. With increasing potency of cannabis (percentage of THC) in recent years, high-quality contemporary research that examines mode of cannabis administration and potency will be important to better understand the potential risks of cannabis during lactation (Young-Wolff et al., 2024, p. 442).
- Further studies are needed to understand the magnitude of cannabis exposure on short- and long-term maternal and offspring health outcomes to better gauge the scope and dimensions of its potential harm. These future studies need to be conducted through the lens of social determinants of health, expounding on the nexus between racism, criminalisation of cannabis, and perinatal outcomes (Prewitt et al., 2023, p. 197).
- Our findings suggest a potential increased risk of respiratory support associated with in utero cannabis exposure that merits further investigation. Future research on the effects of mode of administration and cannabis potency during pregnancy on neonatal outcomes is also needed (Avalos et al., 2023, p. 12).

For noting:

- Findings from a planned community-driven, co-designed, prospective, mixed-method observational study with regional Queensland parents expecting an Australian Indigenous baby and their close house-hold contacts during the peri-gestational period will be of interest. The study plans to recruit a sample of 80 mothers expecting an Australian Indigenous baby. The research will utilise a multi-pronged and multi-disciplinary approach to explore interlinked objectives. The results will be reported using the STROBE guidelines (see: <https://www.equator-network.org/reporting-guidelines/strobe>) for observational studies (Ratsch et al., 2024).

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