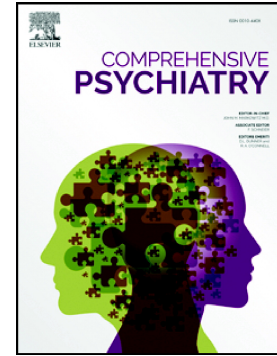


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Understanding cannabis use and mental health difficulties in context with women's experiences of stressful events and social health issues in pregnancy: the Aboriginal Families Study

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ABSTRACT

Background: Few population-based data sources fully recognise the intersections between stressful events, social health issues, and cannabis use in pregnancy, and little is known about sequelae for women's mental health.

Methods: We draw on two waves of population-based data for 344 families participating in the Aboriginal Families Study longitudinal cohort. We examine women's mental health in the first year postpartum and when children were aged 5-9 years in context with life experiences and use of cannabis in pregnancy.

Outcomes: 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) 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). Similar patterns of psychological distress, depressive (aPHQ-9) and anxiety symptoms (GAD-7) were evident when the study children were aged 5-9 years.

Interpretation: 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 turn 5-9 years. 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.

Key words: Aboriginal and Torres Strait Islander; pregnancy; cannabis; stressful events; social health issues; mental health; psychological distress; depression; anxiety.

INTRODUCTION

Aboriginal and Torres Strait Islander and international Indigenous communities experience profound impacts of colonisation including collective and intergenerational trauma,^{1,2} and the introduction of alcohol, tobacco, cannabis, and other illicit substances.³⁻¹⁰ Concerns as to the potential for negative impacts of cannabis on mental health across the lifecourse, particularly in pregnancy, are growing as evidence builds across communities, research, and clinical practice.¹¹⁻¹⁵ In tandem, there is an increasing recognition of the potential harms for children's health and development associated with cannabis exposure in-utero.¹⁶⁻²⁰ Understanding the extent to which mental health distress and cannabis use cluster with psychosocial adversity is vital to inform effective prevention and harm minimisation approaches.^{3,10,13-16,21-24}

Mental health concerns associated with cannabis use in pregnancy and post-partum include higher risks of persistent and major depressive disorders and suicidality.¹³⁻¹⁵ These potential impacts of cannabis use in pregnancy on women's mental health are essential to prioritise in health promotion, clinical care, and public mental health policies. Equally, effective antenatal care requires recognition that cannabis use may indicate women are seeking ways to manage mental health distress, with supports to offset the overlay and cumulative impacts of social adversity, stressful events, and social health issues.^{13-16,21-24} New insights from population studies are needed to investigate co-occurring psychosocial adversity, substance use, and mental health distress preceding, throughout and following pregnancy to inform effective support approaches.

The Aboriginal Families Study is a prospective, population-based cohort study, conducted in partnership with the Aboriginal Health Council of South Australia (AHCSA) with the ongoing guidance of an Aboriginal Governance Group established prior to commencing the study.²⁵⁻²⁷ Aboriginal and Torres Strait Islander leadership and governance were provided for this manuscript by the Aboriginal Governance Group including Aboriginal authors KG, CL, AN, and YC. In addition, Aboriginal author GG provided cultural and clinical leadership with regard to interpretation of the data presented in this paper. Cannabis use in pregnancy was prioritised as a focus of inquiry based on feedback from community consultations with Aboriginal and Torres Strait Islander people living in urban, regional and remote areas of South Australia. Community members stressed the importance of asking women about 'things happening in their lives' as context for understanding women's and children's health

and wellbeing during and after pregnancy, reflecting their concerns about the high levels of stressful events and social health issues women experience.²⁸

Collaborative work with the Aboriginal Governance Group found evidence of co-occurrence of stressful events and social health issues with cannabis use, including tobacco co-use, in pregnancy.¹⁶ Evidence of adverse sequelae in the lower birthweights and higher risk of babies born small for gestational age has contributed to the growing body of evidence cautioning risks of cannabis exposure in-utero, in context with the concerns for child development associated with stressful events and social health issues.¹⁶⁻²⁰ Building on these findings we examine mental health sequelae for women, drawing on surveys spanning the first year postpartum to children beginning primary school.

METHODS

The Aboriginal Families Study

The Aboriginal Families Study investigates social and cultural determinants of maternal and child physical and mental health, health care and birth outcomes. The cohort includes 344 Aboriginal families that had a baby in the state of South Australia from July 2011-June 2013, mothers were recruited to the cohort through service and community networks in the first year postpartum.²⁵⁻²⁷ 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.²⁷ At each wave these women gave oral or written voluntary informed consent to participation. In comparison with routine perinatal data the cohort is representative in terms of maternal age, gestation, and birthweight, with slight over-representation of women having their first baby and under-representation of metropolitan hospital births.^{25,26} Women in the second wave are representative of the cohort with respect to place of residence, education, maternal age, and birth outcomes.²⁷

Measures

Areas of focus within each of the waves of the study were defined according to the priorities identified within the preceding community consultations with Aboriginal and Torres Strait Islander people living in urban, regional and remote areas of South Australia.²⁵⁻²⁷ The selection of measures and design or adaption of new questions was overseen by the Aboriginal Governance Group in collaboration with the study research team. Similarly, specification of all analyses for this manuscript and interpretation of study findings was

undertaken in partnership with the Aboriginal Governance Group over a series of collaborative planning and review meetings and in critical review of the manuscript by the authorship group.

Aboriginal researchers invited women to complete structured questionnaires by interview or self-complete as women preferred.²⁵⁻²⁷ Women were assured of confidentiality and non-identifiability within publications. We examine measures of women's experiences during pregnancy and mental health in the first year postpartum and when the study children were aged 5-9 years:

Baseline sociodemographic characteristics: Women reported their highest educational qualification, number of children, and dates of birth for themselves and the study child. Remoteness of area of residence was categorised following the Australian Geographic Classification System.²⁹

Cannabis or tobacco use in pregnancy: At baseline, women were asked to recall whether during their pregnancy they had smoked any cigarettes or yarndi (as cannabis is referred to in participating communities).¹⁶ Response options were 'Yes, cigarettes', 'Yes, yarndi', 'Yes, cigarettes and yarndi', 'No', or 'Prefer not to answer', answered by 339 of 344 participating women (98.5%). For the purposes of this analysis women were grouped into three categories: (i) those who had not used cannabis or smoked cigarettes during pregnancy; (ii) those who smoked cigarettes only; and (iii) those who used cannabis with or without co-use of tobacco. We considered an inclusive classification of cannabis use including co-use of tobacco, recognising the difficulty of delineating the use of tobacco with cannabis products.^{4,7,10,23}

Stressful events and social health issues in pregnancy: In state-wide consultations prior to the study, discussion focused on how circumstances that affect the health of mothers also affect children as they grow up. Community members stressed the importance of asking women about 'things happening in their lives' as context for women's and children's health and wellbeing.²⁵ In consultation with the Aboriginal Governance Group a measure of stressful events and social health issues was designed and administered at baseline where women reported on these experiences in pregnancy and the first year postpartum, and extended in follow-up when the study children were age 5-9 years.^{27,28} Questions were pretested with urban and regional communities to ensure cultural acceptability and that participants would be comfortable with the wording when asked by Aboriginal researchers. We focus on experiences in pregnancy spanning illness or injury; grief and loss; housing, social, financial,

and legal stress; family and community violence; drug or alcohol problems; and a summary of 0, 1-2, or 3 or more (3+) experiences (Table 2). Items were completed by 317-334 women (92.2%-97.1%) and the summary measure was complete for 313 women (91.0%).

Psychological distress (first year postpartum and when study children aged 5-9 years):

The Kessler-5 (K-5) scale was used to assess psychological distress. In the adaption of the Kessler-6 scale for use with Aboriginal and Torres Strait Islander people, having 'felt worthless' was removed and minor rewording used to improve acceptability.³⁰ Participants describe how frequently over the past four weeks they felt nervous; without hope; restless or jumpy; that everything was an effort; or so sad that nothing could cheer you up. Each item is scored from 1-5 according to whether this had been none, a little, some, most, or all of the time, with total scores ranging 5-25. The K-5 was fully completed by 331 women (96.2%) at baseline (first year postpartum) and 222 women (97.8%) at follow-up (5-9 years). We considered K-5 scores of 11-25 to indicate referral for assessment and support with mental health due to likely depression and/or anxiety. This classification has been established using the modified Kessler-5 scale (MK-K5) where the wording of items was adapted further and validated with an Aboriginal and Torres Strait Islander population.³¹ We note similar trends using the K-5 classifications of 12 'high' or 15 'very high' psychological distress³⁰ (Figures S1, S2).

Depressive symptoms (when study children aged 5-9 years): The culturally adapted 9-item Personal Health Questionnaire (aPHQ-9) was used to assess depressive symptoms.³² This measure has been validated with Aboriginal and Torres Strait Islander communities, demonstrating acceptability, sensitivity, and specificity to screen for major depressive disorder. Nine items reflect mood, appetite, sleep, energy, and concentration over the preceding two weeks, each scored from 0-3 points if experienced not at all, several days, more than half the days, or nearly every day. For two-part questions assessing higher or lower activity and eating patterns the highest scoring item is included in the aPHQ-9 total. Scores range 0-27, with 10-27 indicating referral for a current major depressive disorder.³² The aPHQ-9 was fully completed by 218 women (96.0%) with some indication of sensitive items including suicidality not answered.

Anxiety symptoms (when study children aged 5-9 years): Following pretesting to ensure Aboriginal and/or Torres Strait Islander women in South Australia were comfortable to complete this measure, the 7-item Generalized Anxiety Disorder scale (GAD-7)^{33,34} was administered. Seven items reflect feeling nervous or anxious, not being able to control worry,

worrying too much, having trouble relaxing, restlessness, irritability, and feeling afraid something awful might happen, over the preceding two weeks. Each item is scored from 0-3 if experienced not at all, several days, more than half the days, or nearly every day. Scores range 0-21, with 10-21 indicating referral for generalised anxiety disorder.^{33,34} The GAD-7 was fully completed by 219 women (96.5%).

Statistical analyses

Women's use of cigarettes or cannabis during pregnancy was examined according to sociodemographic characteristics. In these and all subsequent analyses, comparisons were between (i) women who had not used cannabis or smoked cigarettes during pregnancy (reference group); (ii) those who smoked cigarettes only; and (iii) those who used cannabis with or without co-use of tobacco. Associations between each stressful event or social health issue and use of cigarettes or cannabis were estimated relative risks (RR) with 95% confidence intervals (CI) using Poisson regression with robust error variance. Relative risk ratios (RRR) comparing total stressful events and social health issues (0, 1-2, 3+) were estimated using multinomial logistic regression. Associations between use of cannabis or tobacco, stressful events and social health issues, and the series of mental health measures were estimated as mean differences (MD) in mental health symptoms using linear regression. Adjusted mean differences (aMD) were estimated using multivariable linear regression taking account of women's age, education, and remoteness, and the child's age. Percentages of women meeting criteria for referral for support and assessment of mental health were compared using relative risks (RR) and adjusted relative risks (aRR) estimated using Poisson regression with robust error variance.

Ethical approval and Aboriginal and Torres Strait Islander governance

Ethics approval for the Aboriginal Families Study was granted by the South Australian Aboriginal Health Research Ethics Committee and by the Royal Children's Hospital Human Research Ethics Committee. Wave 1 was additionally approved by the Women's and Children's Health Network Human Research Ethics Committee, and wave 2 by the South Australian Department of Education. All aspects of the research have been conducted in accordance with Ethical Guidelines for research with Aboriginal and Torres Strait Islander People and Communities, provided by the Australian National Health and Medical Research Council (NHMRC),^{35,36} the South Australian Aboriginal Health Research Accord,³⁷ and the Aboriginal and Torres Strait Islander quality appraisal tool.³⁸

The study has been governed via a series of agreements between the Murdoch Children's Research Institute and the Aboriginal Health Council of South Australia (AHCSA) detailed further by Glover et al.²⁷ These agreements include establishing the role of the Aboriginal Governance Group in providing advice and direction to the research team in working in accordance with local community protocols, and recognition of the intellectual and cultural property contributed by the members of this group, the participants in community consultations, and the participants of the cohort study. These agreements make provision for shared intellectual property in outputs arising from the study and recommendations for dissemination of the findings and community feedback.

RESULTS

Cannabis or tobacco use in pregnancy

In the baseline survey 19.5% of women (n=66) reported they had used cannabis in pregnancy either with or without co-use of tobacco (Table 1). Frequency of cannabis use was similar amongst women living in major cities (17.2%), regional (19.0%), and remote areas (24.1%). Women with higher educational qualifications were less likely to have used cannabis, ranging from 4.5% amongst women with university education to 27.5% amongst women who had not completed secondary school. Younger women more frequently used cannabis, 31.5% of women aged 15-19 years when the study child was born, compared with 14.3% of women 30 years or older, and similarly those who had their first child at a younger age.

Clustering of stressful events, social health issues, and cannabis use

Consistent associations between cannabis use and social health issues including family or community violence, legal, and financial stress were evident (Table 2). Housing stress was experienced frequently by all groups of women, affecting 50.8% of women who had used cannabis (with or without tobacco co-use) in pregnancy, 40.7% of women who had used cigarettes only, and 40.6% of women who had used neither cigarettes nor cannabis. In comparison with 1.2% of women who had used neither cigarettes nor cannabis in pregnancy, one in three (32.3%) of the women who had used cannabis indicated experiencing problems with drugs or alcohol, RR 26.2, 95% CI (6.30, 108.7). Almost half the women who had used cannabis (49.2%) indicated that their partner had problems with drugs or alcohol, RR 4.09, 95% CI (2.49, 6.71). Almost all women who had used cannabis experienced 3+ stressful events or social health issues (88.3%), the remainder (11.7%) experienced 1-2. Compared to women who did not use cannabis or cigarettes, women who had used cigarettes alone more

often reported problems with drugs or alcohol, their partner having problems with drugs and alcohol, and/or being pestered for money. Higher risks of other co-occurring social health issues were not evident for those who had used cigarettes only.

Mental health sequelae

Women's mental health symptoms varied substantially by use of cannabis or tobacco in pregnancy, being particularly heightened amongst women who had used cannabis with or without tobacco co-use, (Figure S1). In turn, higher indication for referral for mental health assessment and support was evident for women who used cannabis with or without tobacco co-use in the first year postpartum and when their children were aged 5-9 years (Figure 1). Similar patterns of symptoms and indication for referral were evident for women who had experienced 3+ stressful events and social health issues (Figure 1, Figure S2).

Smoking cigarettes or using cannabis in pregnancy were both associated with higher levels of psychological distress in the first year postpartum (MD 1.34, 95% CI 0.41, 2.28 for women who had used cigarettes only; MD 3.43, 95% CI 2.33, 4.54 for women who had used cannabis with or without tobacco co-use; in comparison to women who had used neither cannabis nor tobacco, Table 3). Having taken account of women's sociodemographic characteristics and stressful events and social health issues experienced in pregnancy, a substantive difference was maintained for women who had used cannabis (aMD 2.35, 95% CI 1.23, 3.46). Associations between cannabis use in pregnancy and psychological distress continued when the study children were aged 5-9 years (aMD 2.67, 95% CI 0.88, 4.46), similarly depressive symptoms (aMD 2.54, 95% CI 0.51, 4.57), and anxiety symptoms (aMD 1.95, 95% CI -0.08, 3.98). In contrast, smoking cigarettes only was not associated with women's ongoing mental health.

Psychological distress in the first year postpartum was higher across women experiencing 1-2, or 3+, compared with no stressful events and social health issues (MD 1.82 for each increment, 95% CI 1.21, 2.43). Having taken account of women's sociodemographic characteristics and their use of tobacco or cannabis, a less substantive difference was evident (aMD 1.31, 95% CI 0.70, 1.93). Similar patterns were evident when the study children were aged 5-9 years, psychological distress (aMD 1.10, 95% CI 0.07, 2.12), depressive symptoms (aMD 0.95, 95% CI -0.19, 2.09), and anxiety symptoms (aMD 1.10, 95% CI -0.03, 2.23).

Referral for assessment and support

Women who had used cannabis in pregnancy (with or without tobacco co-use) had the highest indication for referral across all mental health conditions (Figure 1). In the first year postpartum, 52.5% of the women who had used cannabis met criteria for referral for depression and/or anxiety compared with 20.9% of the women who had not used either cannabis or cigarettes. When the children were aged 5-9 years, 41.0% of the women who had used cannabis in pregnancy met criteria for referral and support for depression and/or anxiety; 38.5% for a major depressive episode; and 32.4% for generalised anxiety disorder. Heightened need for referral was evident in analyses that had taken account of women's sociodemographic characteristics and stressful events and social health issues experienced (Table 4).

Women who had experienced 3+ stressful events or social health issues in pregnancy also had heightened indication for referral across all conditions. In the first year postpartum, 43.2% of these women met criteria for referral for depression and/or anxiety compared with 15.6% of women who had not had these experiences. When the children were aged 5-9 years, 33.3% of women who had experienced 3+ stressful events or social health issues in pregnancy met criteria for referral and support for depression and/or anxiety; 29.2% for a major depressive episode; and 24.0% for generalised anxiety disorder.

In summary, replicability between findings over time and across conditions highlights consistent evidence of mental health sequelae of cannabis use (with or without tobacco co-use), stressful events and social health issues in pregnancy (Figure 2). Higher psychological distress across periods of caring for infants and children, evidence of depression and anxiety when children are school age, and high percentages of women meeting referral criteria provide essential insights for clinical and community based mental health support.

DISCUSSION

Our findings reflect the high burden of psychological distress, depression, and anxiety among women who had used cannabis (with or without tobacco co-use) in pregnancy, evident in the first year postpartum and as their children turn 5-9 years. 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. 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.

Findings in context

Cannabis is a concern for Australian Aboriginal and Torres Strait Islander communities, being widely accessible and often used daily.³⁻¹⁰ Coupled with increasing potency of cannabis products across international jurisdictions, up to 7-fold increases in tetrahydrocannabinol (THC) since the 1960s, it is likely that women are exposed to high cumulative doses and negative mental health sequelae.³⁹⁻⁴¹ 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 minimize harms amongst Aboriginal and Torres Strait Islander communities.^{4,9,10,39-41}

Previous research studies have found evidence of heightened depressive and anxiety symptoms amongst women using cannabis in pregnancy and the postpartum period, including persistent/major depressive disorders.¹³⁻¹⁵ Amongst pregnant and postpartum women in the US, the associations between cannabis use and specific mood, anxiety, or personality disorders range across adjusted odds ratios of 1.95 to 6.00 (statistically significant effects taking account of extensive potential confounding factors) and cannabis use disorder is associated with further heightened odds (adjusted odds ratios ranging 2.36 to 11.60).¹³ Findings confer with evidence that women in the US who had continued use of cannabis through pregnancy were substantially more likely to have elevated anxiety and depression symptoms than those who had not used cannabis in pregnancy, and poorer mental health outcomes than those who had stopped using cannabis during pregnancy.¹⁴ The higher odds of cannabis use amongst US women experiencing depression, anxiety, and trauma diagnoses and symptoms¹⁵ align with ways pregnant women have described using cannabis to manage mood and stress within qualitative research.⁴²⁻⁴⁴ These studies confer concerns as to the extent to which cannabis may be being used as a way to try to manage mental health distress, may be eliciting mental health symptoms, or that both pathways are apparent.²¹⁻²⁴

Cannabis is often used to reduce anxiety, relax, sleep, or feel connected.^{3-5,42-44} In the contexts 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.^{9,10,13-15,21-24} 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.^{1-3,9,10,16,22-24} These impacts include dispossession of land, loss of languages and cultural traditions, and associated feelings of despair, stressful experiences, and social adversity. The associations we find between cannabis use and ongoing mental ill-health suggest that use of cannabis is likely to have negative impacts in eliciting, worsening, or prolonging mental health symptoms, recognising that we cannot infer directionality or causal pathways through observational data that begin in pregnancy. Interpretation by the Aboriginal authors and Aboriginal Governance Group gives us guidance 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.^{3,9,10,13-16,21-24}

Our study provides new evidence of the sociodemographic factors that may influence cannabis use in pregnancy, clustering with stressful events and social health issues, and mental health sequelae. Findings confer with recognition of the clustering of stressful life events and cannabis use during pregnancy.^{15,16,21-24} The women in our study tended to be young, underlining the need for awareness and prevention approaches in adolescence and early adulthood.^{45,46} However, cannabis use during pregnancy was reported by women across all ages highlighting that awareness and support must be made universally accessible to families.^{13,19,47} Educational gradients reiterate the need to address structural determinants including supporting women's pathways in education.⁴⁸

Longitudinal research focusing on adolescent cohorts has supported causal pathways in which initiating and sustaining cannabis use are associated with higher ongoing risk of and severity of depressive disorders, and risk of suicidality.^{11,12} In the Next Generation Youth Well-being study, Aboriginal and Torres Strait Islander young people were less likely to use cannabis if they had not experienced depression or anxiety and were not psychologically

distressed.⁴⁵ These findings support strengths-based approaches to promoting social emotional wellbeing as important routes for early prevention of cannabis use.

We recognise that a critical area of investigation is the utility of medical derivatives of cannabis in clinical contexts, including for the relief of anxiety and trauma symptoms.^{49,50} However, we reiterate the paucity of rigorous clinical trial evaluation, safety guidance, and robust regulatory frameworks.⁵¹ We re-emphasise international guidance, including recommendations by the U.S. Surgeon General in 2019 that no cannabis derivatives are administered in pregnancy on account of growing concerns for fetal and child development.^{20,47}

Strengths and limitations

Aboriginal governance and community consultation and engagement were inherent to all research conduct. Importantly, understanding the impacts of cannabis use in pregnancy on families and children was raised as a priority in statewide community consultations preceding design of the study.²⁵ Culturally safe approaches contributed to women's preparedness to share their experiences with Aboriginal researchers without fear of adverse consequences of disclosure.^{16,25-28} Findings thus reflect a real-world view of challenges women experience that would not necessarily be recognised within clinical settings and for which there can often be barriers to disclosure.^{13-16,21-24,42-44} The study has been highly effective in recruiting and maintaining connection with families and is largely representative in relation to maternal age, place of residence, birthweight, and gestational age. However, women experiencing high life stresses may be less well represented and community needs may extend beyond those we recognise in this research.

Validated measures of psychological distress, depressive and anxiety symptoms provide robust population-based estimates of the high mental health burden within Aboriginal and Torres Strait Islander communities. We recognise that within a cohort of this size we did not have capacity to examine other mental health concerns associated with cannabis use including psychosis.³⁹⁻⁴¹ Classification of the use of cannabis or cigarettes during pregnancy relied on self-disclosure. An inclusive classification of cannabis use including tobacco co-use was applied, recognising the difficulty in delineation when these may be mixed or used communally.^{4,7,10,23} Information about use of other substances during pregnancy was not sought based on feedback from community consultation and advice from the Aboriginal Governance Group that questions about alcohol or other substances may reinforce negative

stereotypes and undermine women's safety in participating. It is likely this guidance contributed to women's accordance to disclose cannabis use within this research.¹⁶

Implications

The risks of cannabis use in pregnancy for women and their children are not yet widely recognised or advised in current practice,^{13,19,42-44} despite international consensus that cannabis use should be discontinued in pregnancy including any use for medical reasons.^{20,47} In Australia there has been sustained effort towards smoking cessation and national guidance to abstain from alcohol during pregnancy, but little information and no national guidance given to women about the harms of cannabis use for their own mental health, for the growth of their child during pregnancy, and for their child's longer term development.¹³⁻²⁰ The Aboriginal Governance Group have expressed concern this may reinforce perceptions of cannabis being less harmful than cigarettes, alcohol, or prescription medications.⁴²⁻⁴⁴

Our research focuses on exposure to cannabis and the experiences of stressful events and social health risks in pregnancy, aligning the opportunity to establish cannabis prevention and harm minimisation approaches in context with mental health support within antenatal care and child and family health services.^{16,19,22,23} Our findings of longer-term mental health impacts emphasize the need for supports that extend across pregnancy, the postpartum, and child and family support systems. Within these systems, it is essential to explore culturally safe ways of supporting women to access and build strategies for coping with life stressors where cannabis may have been used for this reason,^{16,22-24,52,53} acknowledging and supporting women's experiences of collective and intergenerational trauma.^{1-3,10} Prevalent social health issues including family and community violence, problems with alcohol or other drugs, and legal, financial, and housing stress reflect the urgency of integrating drug and alcohol, mental health, social health, and legal expertise within clinical care models.^{3,13-16,21-24} These approaches must be shaped to the context of women's lives and recognise dependence may ensue from both cannabis and tobacco co-use.^{4,7,10,23}

Previous findings from this study have supported the inclusion of Aboriginal Maternal Infant Care workers and family support workers within multi-disciplinary teams, enabling provision of culturally safe support to Aboriginal and Torres Strait Islander families during pregnancy in urban and regional centres in South Australia.^{27,28,52} Our findings provide a critical foundation on which translational responses can continue to be implemented. The

Aboriginal Governance Group and research team are continuing to work together to advocate for holistic responses to intergenerational trauma and culturally safe mental health supports.⁵³

Previous findings, including from this cohort, have evidenced concern regarding birth outcomes for children exposed to cannabis in utero, particularly restricted fetal growth.^{16,17} Evidence of impacts of cannabis exposure on children's development and mental health is building, including autism spectrum traits.¹⁸⁻²⁰ It is essential to continue to assess the health and development of children in this cohort as they transition adolescence, in context with in-utero exposures, life experiences, and access to resources supporting social and emotional wellbeing, ongoing priorities that our research team is focusing on. Continuing research into physical, social and mental health sequelae for women within this cohort is vital, particularly pathways that may involve experiences of trauma and intersects with cannabis and other substances.^{1-3,10,16,22-24,53} It is critical that further research establishes a more in-depth understanding of frequency of use, types, and concentration of cannabis products used and their respective impacts on women and children, including cannabis derivatives prescribed for medical reasons and synthetic cannabinoids.^{4,9,10,39-41} Continuing to build recognition of social and cultural protective factors within Aboriginal and Torres Strait Islander communities is an imperative route towards supporting mental health and social-emotional wellbeing within antenatal and family-centred care.^{16,22-24,52,53}

CONCLUSIONS

Our findings provide robust, population-based evidence of the complex social contexts surrounding the use of cannabis in pregnancy. 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. 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.

Contributors

KG, CL, AN and YC provided Aboriginal leadership through the Aboriginal Families Study Aboriginal Governance Group, with GG, through authorship. FM, KG, CL, DG, YC, and SB contributed to the conceptualisation of the study and funding acquisition. KG, DG, AN, and SB led the fieldwork, data collection, and data curation at wave 2. All authors had full access to all the data in the study and DG has directly accessed and verified the underlying data reported in the manuscript. FM conducted data analyses with input from all authors. FM and SB wrote the original draft. All authors have critically revised the whole report and approved the decision to submit for publication.

Declaration of interests

None of the authors declare any competing interests.

Data sharing

Under the conditions of the ethics approval, the Principal Investigator of the Aboriginal Families Study (SB) acts as the custodian for study data and the Intergenerational Health group at Murdoch Children's Research Institute, Melbourne, Australia, as the co-ordinating unit. Study participants retain ownership of their data and may withdraw consent for their data to be included prior to study outputs.²⁷ Data sharing via a public repository is precluded under conditions of ethics approval. However, the Aboriginal Families Study Investigator Team and Aboriginal Governance Group welcome inquiries about the data and proposals for collaboration, please contact Lead Investigators, Karen Glover (karen.glover@sahmri.com) and Stephanie Brown (stephanie.brown@mcri.edu.au).

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REFERENCES

1. Gee GJ. Resilience and recovery from trauma among Aboriginal help seeking clients in an urban Aboriginal community controlled organisation. Melbourne, Australia: University of Melbourne, 2016. <https://rest.neptune-prod.its.unimelb.edu.au/server/api/core/bitstreams/eaf2d60a-265e-5d06-8f15-86d36a2a6a5e/content>
2. Martin G, Lovelock K, Stevenson B. An overview of Indigenous mental health and suicide prevention in Australia. Catalogue number IMH 14. Canberra: Australian Institute of Health and Welfare, 2023. <https://doi.org/10.25816/gv9g-ge98>
3. Wilkes E, Gray D, Casey W, Stearne A, Dadd L. Harmful substance use and mental health. In Dudgeon P, Milroy H, Walker R, Editors. Working together: Aboriginal and Torres Strait Islander mental health and wellbeing principles and practice (2nd Edition). Canberra: Department of the Prime Minister and Cabinet (Australia), 2014. <https://www.telethonkids.org.au/our-research/early-environment/developmental-origins-of-child-health/aboriginal-maternal-health-and-child-development/working-together-second-edition>
4. Butt J, Wilson M, Jones J, Lenton S. Review of cannabis use among Aboriginal and Torres Strait Islander people. Journal of the Australian Indigenous HealthInfoNet. 2022;3(3): Article 1:1-44. <https://doi.org/10.14221/aihjournal.v3n3.1>
5. Howard J, Butt J, Wright T, Norberg M, Copeland J, Wilkes T. Raising awareness about cannabis, its use and impact on health and wellbeing among Indigenous Australians. National Cannabis Prevention and Information Centre: Bulletin Series. 2012;14. https://drugsinmind.net/13.cannabis/_index.files/bulletin-14-raising-awareness-about-cannabis-its-use-and-impact-on-health-and-wellbeing-among-indigenous-australians.pdf
6. Dingwall KM, Cairney S. Detecting psychological symptoms related to substance use among Indigenous Australians. Drug and Alcohol Review. 2011;30(1):33-9. <https://doi.org/10.1111/j.1465-3362.2010.00194.x>
7. Clough A. Associations between tobacco and cannabis use in remote Indigenous populations in northern Australia. Addiction. 2005;100(3):346–53. <https://doi.org/10.1111/j.1360-0443.2005.01040.x>

8. Lee KK, Clough AR, Jaragba MJ, Conigrave KM, Patton GC. Heavy cannabis use and depressive symptoms in three Aboriginal communities in Arnhem Land, Northern Territory. *Medical Journal of Australia*. 2008;188(10):605-8. <https://doi.org/10.5694/j.1326-5377.2008.tb01803.x>
9. Schaffrick M, Perreault ML, Jones AMP, Illes J. Understanding and Rebalancing: A Rapid Scoping Review of Cannabis Research Among Indigenous People. *Cannabis and Cannabinoid Research*. 2023;8(3):426-433. <https://doi.org/10.1089/can.2022.0251>
10. Snijder M, Lees B, Stearne A, Ward J, Bock SG, Newton N, et al. An ecological model of drug and alcohol use and related harms among Aboriginal and Torres Strait Islander Australians: a systematic review of the literature. *Preventive medicine reports*. 2021;21:101277. <https://doi.org/10.1016/j.pmedr.2020.101277>
11. Hinckley JD, Mikulich-Gilbertson SK, He JP, Bhatia D, Ellingson JM, Nguyenkhoa B, et al. Cannabis Use is Associated with Depression Severity and Suicidality in the National Comorbidity Survey - Adolescent Supplement. *JAACAP Open*. 2023;1(1):24-35. <https://doi.org/10.1016/j.jaacop.2023.02.002>
12. Patton GC, Coffey C, Carlin JB, Degenhardt L, Lynskey M, Hall W. Cannabis use and mental health in young people: cohort study. *BMJ* 2002;325(7374):1195-8. <https://doi.org/10.1136/bmj.325.7374.1195>
13. Brown QL, Shmulewitz D, Sarvet AL, Young-Wolff KC, Howard T, Hasin DS. Cannabis use, cannabis use disorder and mental health disorders among pregnant and postpartum women in the US: A nationally representative study. *Drug and Alcohol Dependence*. 2023;248:109940. <https://doi.org/10.1016/j.drugalcdep.2023.109940>
14. Mark K, Otieno L, Moore E, Zehra A, Mitchell M. Association between continued cannabis use during pregnancy and symptoms of anxiety and depression. *International Review of Psychiatry*. 2021;33(6):528-33. <https://doi.org/10.1080/09540261.2021.1898348>
15. Young-Wolff KC, Sarovar V, Tucker LY, Goler NC, Alexeeff SE, Ridout KK, et al. Association of depression, anxiety, and trauma with cannabis use during pregnancy. *JAMA Network Open*. 2020;3(2):e1921333. <https://doi.org/10.1001/jamanetworkopen.2019.21333>
16. Brown SJ, Mensah FK, Ah Kit J, Stuart-Butler D, Glover K, Leane C, 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(2):e010286.

<http://dx.doi.org/10.1136/bmjopen-2015-010286>

17. Marchand G, Masoud AT, Govindan M, Ware K, King A, Ruther S, et al. Birth outcomes of neonates exposed to marijuana in utero: A systematic review and meta-analysis. *JAMA Network Open*. 2022;5(1):e2145653 <https://doi.org/10.1001/jamanetworkopen.2021.45653>

18. Paul SE, Hatoum AS, Fine JD, Johnson EC, Hansen I, Karcher NR, et al. Associations between prenatal cannabis exposure and childhood outcomes: results from the ABCD study. *JAMA Psychiatry*. 2021;78(1):64-76. <https://doi.org/10.1001/jamapsychiatry.2020.2902>

19. Hawkins SS. Current evidence to guide practice, policy, and research: Cannabis use during pregnancy. *Journal of Obstetric, Gynecologic and Neonatal Nursing*. 2022;51(6):643-50. <https://doi.org/10.1016/j.jogn.2022.09.005>

20. Office of the Surgeon General, US Department of Health and Human Services. U.S. Surgeon General's advisory: marijuana use and the developing brain. Accessed 8th September 2023. <https://www.hhs.gov/surgeongeneral/reports-and-publications/addiction-and-substance-misuse/advisory-on-marijuana-use-and-developing-brain/index.html>

21. al'Absi M, Allen AM. Impact of acute and chronic cannabis use on stress response regulation: Challenging the belief that cannabis is an effective method for coping. *Frontiers in Psychology* 2021;12:687106. <https://doi.org/10.3389/fpsyg.2021.687106>

22. Lee KS, Harrison K, Mills K, Conigrave KM. Needs of Aboriginal Australian women with comorbid mental and alcohol and other drug use disorders. *Drug and Alcohol Review*. 2014;33(5):473-81. <https://doi.org/10.1111/dar.12127>

23. Passey ME, Sanson-Fisher RW, D'Este CA, Stirling JM. Tobacco, alcohol and cannabis use during pregnancy: clustering of risks. *Drug and Alcohol Dependence*. 2014;134:44-50. <http://dx.doi.org/10.1016/j.drugalcdep.2013.09.008>

24. Tracy M, Freeburn B, Lee K, Woods J, Conigrave K. Review of alcohol and drug treatment for Aboriginal and Torres Strait Islander peoples. *Journal of the Australian Indigenous HealthInfoNet*. 2023;4(1): Article 1:1-32. <https://doi.org/10.14221/aihjournal.v4n1.1>

25. Buckskin M, Ah Kit J, Glover K, Mitchell A, Miller R, Weetra D, et al. Aboriginal Families Study: a population-based study keeping community and policy goals in mind right

from the start. *International Journal for Equity in Health*. 2013;12:41.

<http://www.equityhealthj.com/content/12/1/41>

26. Weetra D, Glover K, Miller R, Wilson R, Leane C, Stuart-Butler D, et al. Community engagement in the Aboriginal Families Study: Strategies to promote participation. *Women and Birth*. 2019;32(1):72-9. <https://doi.org/10.1016/j.wombi.2018.04.002>

27. Glover K, Leane C, Nikolof A, Weetra D, Gartland D, Cahir P, et al. Cohort profile: The Aboriginal Families Study: a prospective cohort of Aboriginal children and their mothers and caregivers in South Australia. (Under review).

28. Weetra D, Glover K, Buckskin M, Kit JA, Leane C, Mitchell A, et al. Stressful events, social health issues and psychological distress in Aboriginal women having a baby in South Australia: implications for antenatal care. *BMC Pregnancy and Childbirth*. 2016;16:88. <https://doi.org/10.1186/s12884-016-0867-2>

29. Statistical Geography: Volume 3 - Australian Standard Geographical Classification (ASGC) Urban Centres/Localities 2006. Cat. no. 2909.0. Canberra: Australian Bureau of Statistics, 2007.

<https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/2909.02006?OpenDocument>

30. Page IS, Ferrari AJ, Slade T, Anderson M, Santomauro D, Diminic S. Estimating the difference in prevalence of common mental disorder diagnoses for Aboriginal and Torres Strait Islander peoples compared to the general Australian population. *Epidemiology and Psychiatric Sciences*. 2022;31:e44;1-8. <https://doi.org/10.1017/S2045796022000233>

31. Brinckley MM, Calabria B, Walker J, Thurber KA, Lovett R. Reliability, validity, and clinical utility of a culturally modified Kessler scale (MK-K5) in the Aboriginal and Torres Strait Islander population. *BMC public health*. 2021;21(1):1111.

<https://doi.org/10.1186/s12889-021-11138-4>

32. The Getting it Right Collaborative Group. Getting it Right: validating a culturally specific screening tool for depression (aPHQ-9) in Aboriginal and Torres Strait Islander Australians. *Medical Journal of Australia*. 2019;211(1):24-30. <https://doi.org/10.5694/mja2.50212>

33. Spitzer RL, Kroenke K, Williams JB, Lowe B. A Brief Measure for Assessing Generalized Anxiety Disorder: the GAD-7. *Archives of Internal Medicine*. 2006;166(10):1092-7. <https://doi.org/10.1001/archinte.166.10.1092>

34. Plummer F, Manea L, Trepel D, McMillan D. Screening for anxiety disorders with the GAD-7 and GAD-2: a systematic review and diagnostic metaanalysis. *General Hospital Psychiatry*. 2016;39:24-31. <https://doi.org/10.1016/j.genhosppsych.2015.11.005>
35. National Health and Medical Research Council. Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders. Canberra: Commonwealth of Australia, 2018. <https://www.nhmrc.gov.au/about-us/resources/ethical-conduct-research-aboriginal-and-torres-strait-islander-peoples-and-communities>
36. National Health and Medical Research Council. Keeping Research on Track II: A companion document to Ethical conduct in research with Aboriginal and Torres Strait Islander Peoples and communities: Guidelines for researchers and stakeholders. Canberra: Commonwealth of Australia, 2018. <https://www.nhmrc.gov.au/about-us/resources/keeping-research-track-ii>
37. Morey K, On behalf of the Wardliparingga Aboriginal Health Equity Research Theme. South Australian Aboriginal Health Research Accord: Companion Document. Adelaide, South Australia: South Australian Health and Medical Research Institute, 2017. https://sahmri.blob.core.windows.net/communications/sahmriresearch.org/companion_document_accordfinal.pdf
38. Harfield S, Pearson O, Morey K, Kite E, Canuto K, Glover K, et al. Assessing the quality of health research from an Indigenous perspective: the Aboriginal and Torres Strait Islander quality appraisal tool. *BMC medical research methodology*. 2020; 20:1-9. <https://doi.org/10.1186/s12874-020-00959-3>
39. Murray RM, Quigley H, Quattrone D, Englund A, Di Forti M. Traditional marijuana, high-potency cannabis and synthetic cannabinoids: increasing risk for psychosis. *World Psychiatry*. 2016;15(3):195-204. <https://doi.org/10.1002/wps.20341>
40. Rehm J, Manthey J. Cannabis and public health: a global experiment without control. *World Psychiatry*. 2020;19(2):192-193. <https://doi.org/10.1002/wps.20740>
41. Freeman TP, Craft S, Wilson J, Stylianou S, ElSohly M, Di Forti M, et al. Changes in delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD) concentrations in cannabis over time: systematic review and meta-analysis. *Addiction*. 2021;116(5):1000-10. <https://doi.org/10.1111/add.15253>

42. Weisbeck SJ, Bright KS, Ginn CS, Smith JM, Hayden KA, Ringham C. Perceptions about cannabis use during pregnancy: a rapid best-framework qualitative synthesis. *Canadian Journal of Public Health*. 2021;112:49-59. <https://doi.org/10.17269/s41997-020-00346-x>
43. Chang JC, Tarr JA, Holland CL, De Genna NM, Richardson GA, Rodriguez KL, et al. Beliefs and attitudes regarding prenatal marijuana use: perspectives of pregnant women who report use. *Drug and alcohol dependence*. 2019;196:14-20. <https://doi.org/10.1016/j.drugalcdep.2018.11.028>
44. Latuskie KA, Andrews NCZ, Motz M, et al. Reasons for substance use continuation and discontinuation during pregnancy: a qualitative study. *Women Birth*. 2019;32(1):e57-e64. <https://doi.org/10.1016/j.wombi.2018.04.001>
45. Graham S, Heris CL, Gubhaju L, Eades F, Williams R, Davis K, et al. Young Aboriginal people in Australia who have never used marijuana in the 'Next Generation Youth Well-being study': A strengths-based approach. *International Journal of Drug Policy*. 2021; 95:103258. <https://doi.org/10.1016/j.drugpo.2021.103258>
46. Levine A, Clemenza K, Rynn M, Lieberman J. Evidence for the Risks and Consequences of Adolescent Cannabis Exposure. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2017;56(3):214-25. <https://doi.org/10.1016/j.jaac.2016.12.014>
47. Tsakiridis I, Oikonomidou AC, Bakaloudi DR, Dagklis T, Papazisis G, Chourdakis M. Substance use during pregnancy: a comparative review of major guidelines. *Obstetrical & Gynecological Survey* 2021;76(10):634-43. <https://doi.org/10.1097/OGX.0000000000000943>
48. Overcoming Indigenous Disadvantage 2020, Steering Committee for the Review of Government Service Provision, Canberra, Australia, 2020. Accessed 8th September 2023. <https://www.pc.gov.au/ongoing/overcoming-indigenous-disadvantage/2020>
49. Sarris J, Sinclair J, Karamacoska D, Davidson M, Firth J. Medicinal cannabis for psychiatric disorders: a clinically-focused systematic review. *BMC Psychiatry*. 2020;20:24. <https://doi.org/10.1186/s12888-019-2409-8>
50. Stack SK, Wheate NJ, Schubert EA. Medicinal Cannabis for the Treatment of Anxiety Disorders: a Narrative Review. *Current Treatment Options in Psychiatry*. 2022;9(3):163-73. <https://doi.org/10.31128/AJGP-04-21-5936>

51. Chiu V, Leung J, Hall W, Stjepanović D, Degenhardt L. Public health impacts to date of the legalisation of medical and recreational cannabis use in the USA. *Neuropharmacology*. 2021;193:108610. <https://doi.org/10.1016/j.neuropharm.2021.108610>
52. Sivertsen N, Deverix J, Gregoric C, Grant J. A call for culture-centred care: exploring health workers' perspectives of positive care experiences and culturally responsive care provision to Aboriginal women and their infants in mainstream health in South Australia. *Health Research Policy and Systems*. 2022;20(1):132. <https://doi.org/10.1186/s12961-022-00936-w>
53. Brown SJ, Glover K, Leane C, Gartland D, Nikolof A, Weetra D, et al. Aboriginal Families Study Policy Brief No 6: Social health issues - time for action. Melbourne, Australia: Murdoch Children's Research Institute, 2021. <https://www.strongerfutures.org.au/s/AFS-Policy-Brief-6.pdf>

Table 1 Characteristics of women participating in the cohort and whether cannabis or tobacco were used at any time during pregnancy

Characteristics of women in Aboriginal Families Study (N=338 ¹ , baseline survey during the first year postpartum)	Percentage of women who used cannabis or tobacco at any time during pregnancy			P
	Neither (n=162, 47.9%) %	Cigarettes only (n=110, 32.5%) %	Cannabis including tobacco co-use (n=66, 19.5%) %	
Remoteness of area of residence²				
Major city (39.6%)	54.5	28.4	17.2	0.248
Regional (35.8%)	47.1	33.9	19.0	
Remote (24.6%)	38.6	37.3	24.1	
Highest educational qualification				
Less than year 12 (38.8%)	38.9	33.6	27.5	<0.001
Completed year 12 (9.8%)	69.7	21.2	9.1	
Certificate/diploma (45.0%)	46.1	36.8	17.1	
University (6.5%)	81.8	13.6	4.5	
Age at first birth				

14 to 19 years (45.3%)	36.6	37.3	26.1	<0.001
20 to 28 years (54.7%)	57.3	28.6	14.1	
Age at birth of study child				
15 to 19 years (16.0%)	46.3	22.2	31.5	0.204
20 to 24 years (40.5%)	49.6	31.4	19.0	
25 to 29 years (26.9%)	45.1	38.5	16.5	
30 years or older (16.6%)	50.0	35.7	14.3	
Number of children				
1 (42.3%)	58.0	25.2	16.8	0.014
2 or 3 (37.0%)	42.4	34.4	23.2	
4 to 10 (20.7%)	37.1	44.3	18.6	

p: p value (bolded estimates $p < 0.05$). ¹Women who completed smoking questions and fully/partly completed stressful events and social health issues.

²Categorised following the Australian Geographic Classification System.²⁹

Table 2 Frequency of experiencing stressful events and social health issues during pregnancy by whether cannabis or tobacco were used during pregnancy

N=338¹ women in the Aboriginal Families Study	Percentage and relative risk by whether cannabis or tobacco ever used during pregnancy									
Stressful events/social health issues experienced in pregnancy (no. of women completing the question)	Total	Neither	Cigarettes only				Cannabis including tobacco co-use			
	%	%	%	RR	95% CI	P	%	RR	95% CI	p
Housing problems or had to move house (n=333)	42.6	40.6	40.7	1.00	(0.75, 1.35)	0.985	50.8	1.25	(0.92, 1.69)	0.151
Got very sick or badly hurt (n=328)	24.1	26.6	16.8	0.63	(0.39, 1.04)	0.070	30.2	1.13	(0.72, 1.79)	0.588
Problems with the police/needed to go to court (n=332)	12.7	10.6	10.3	0.97	(0.47, 2.00)	0.942	21.9	2.07	(1.09, 3.95)	0.027
Problems with drugs or alcohol (n=332)	9.0	1.2	6.7	5.40	(1.14, 25.6)	0.033	32.3	26.2	(6.30, 108.7)	<0.001
Partner had problems with drugs or alcohol (n=317)	22.1	12.0	22.0	1.83	(1.04, 3.21)	0.035	49.2	4.09	(2.49, 6.71)	<0.001
Scared by other people's behaviour (n=331)	30.2	24.7	27.4	1.11	(0.73, 1.67)	0.625	49.2	1.99	(1.38, 2.88)	<0.001

Pestered for money (n=334)	30·8	19·1	36·5	1·90	(1·27, 2·85)	0·002	50·8	2·65	(1·78, 3·95)	<0·001
Upset by family arguments (n=334)	55·4	49·4	52·8	1·07	(0·84, 1·36)	0·583	74·2	1·50	(1·22, 1·86)	<0·001
A family member or a friend passed away (n=330)	41·2	36·1	46·2	1·28	(0·96, 1·72)	0·097	45·5	1·26	(0·90, 1·76)	0·178
Ever had to leave home - family argument/fight (n=334)	26·7	22·4	24·1	1·08	(0·69, 1·68)	0·743	41·5	1·86	(1·24, 2·79)	0·003
Had to stop working or studying (n=327)	16·2	18·6	14·8	0·80	(0·46, 1·39)	0·427	12·7	0·68	(0·33, 1·41)	0·304
Ever pushed, shoved, or assaulted (n=328)	16·2	11·8	14·3	1·21	(0·64, 2·28)	0·553	30·7	2·60	(1·48, 4·57)	0·001
Number of stressful events or social health issues (n=338² women including number not fully defined)										
0	13·0	17·3	13·6	(ref.)			1·5	(ref.)		
1-2	30·8	37·7	28·2	0·95	(0·44, 2·03)	0·892	18·2	5·51	(0·68, 44·5)	0·109
3 or more	56·2	45·1	58·2	1·64	(0·80, 3·33)	0·175	80·3	20·3	(2·68, 154·1)	0·004

Number of stressful events or social health issues (n=313² women with enough data to fully identify group)

0	11·2	14·4	13·0	(ref.)		0·0	(ref.)	
1-2	28·1	37·9	23·0	0·67	(0·29, 1·55)	0·351	11·7	Not estimable due to 0·0 value
3 or more	60·7	47·7	64·0	1·48	(0·69, 3·18)	0·311	88·3	Not estimable due to 0·0 value

¹Women who completed smoking questions and fully/partly completed stressful events and social health issues. RR: Relative risk of stressful event or social health issue compared to women who used neither any cigarettes nor cannabis during pregnancy estimated using Poisson regression with robust error variance estimation/ relative risk ratio (RRR) from multinomial logistic regression comparing grouped number of stressful events or social health issues. 95% CI: 95% confidence interval. p: p value (bolded estimates indicate $p < 0.05$).

²Similar patterns were evident using either the 313 women with the fully defined total measure or the more complete analytic population of 338 women including women with items that were missed or preferred not to answer. Further analyses were conducted with both groups and reached similar conclusions with some understatement of the findings if the total analytic population and less defined measure were used, reflecting that there may be understatement of some women's experiences due to the sensitivity of answering some questions.²⁸ The further analyses presented are restricted to women with the fully defined total measure and according to the availability of other survey responses as applicable.

Table 3 Experiences in pregnancy and women's mental health symptoms (first year postpartum and when children aged 5-9 years)

Women's mental health - by experiences in pregnancy	Individual estimates			Fully adjusted estimates		
	MD	95% CI	P	aMD	95% CI	p
Psychological distress (K-5) - first year postpartum (n=304)						
Ever used cigarettes only vs neither cannabis nor tobacco	1.34	(0.41, 2.28)	0.005	<u>0.90</u>	<u>(-0.02, 1.83)</u>	<u>0.055</u>
Cannabis (including tobacco co-use) vs neither	3.43	(2.33, 4.54)	<0.001	2.35	(1.23, 3.46)	<0.001
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	1.82	(1.21, 2.43)	<0.001	1.31	(0.70, 1.93)	<0.001
Psychological distress (K-5) - when children 5-9 years (n=202)						
Ever used cigarettes only vs neither cannabis nor tobacco	0.51	(-0.94, 1.96)	0.492	0.22	(-1.31, 1.75)	0.777
Cannabis (including tobacco co-use) vs neither	3.10	(1.42, 4.79)	<0.001	2.67	(0.88, 4.46)	0.004
Stressful events/ social health issues (trend over 0, 1-2, 3 or more)	1.60	(0.66, 2.55)	0.001	1.10	(0.07, 2.12)	0.036
Depressive symptoms (aPHQ-9) - when children 5-9 years (n=199)						
Ever used cigarettes only vs neither cannabis nor tobacco	0.56	(-1.07, 2.18)	0.500	0.18	(-1.54, 1.90)	0.839
Cannabis (including tobacco co-use) vs neither	3.08	(1.18, 4.97)	0.002	2.54	(0.51, 4.57)	0.015
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	1.74	(0.69, 2.78)	0.001	0.95	(-0.19, 2.09)	0.101

Anxiety symptoms (GAD-7) - when children 5-9 years (n=199)						
Ever used cigarettes only vs neither cannabis nor tobacco	-0.34	(-1.96, 1.29)	0.685	-0.63	(-2.33, 1.07)	0.464
Cannabis (including tobacco co-use) vs neither	2.42	(0.50, 4.35)	0.014	<u>1.95</u>	<u>(-0.08, 3.98)</u>	<u>0.060</u>
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	1.63	(0.59, 2.67)	0.002	<u>1.10</u>	<u>(-0.03, 2.23)</u>	<u>0.056</u>

K-5: Kessler-5 scale; aPHQ-9: 9-item adapted Personal Health Questionnaire; GAD-7: 7-item Generalised Anxiety Disorder score. MD: mean difference; aMD adjusted mean difference from linear regression model, including: any use of cannabis or tobacco during pregnancy; trend over grouped number of social health issues or stressful events (0/1-2/3+); women's age at birth of study child; highest educational qualification and remoteness of area of residence at baseline; and age of study child at administration of survey. 95% CI: 95% confidence interval. p: p value (bolded estimates $p < 0.05$, underlined estimates $p < 0.10$).

Table 4 Experiences in pregnancy and indication for referral for assessment and support with mental health concern (first year postpartum and when children aged 5-9 years)

Indication for referral for assessment and support with mental health concern - by pregnancy experiences	Individual estimates			Fully adjusted estimates		
	RR	95% CI	P	aRR	95% CI	p
Depression and/or anxiety - first year postpartum (K-5 score 11-25 pts: n=98/304, 32.2%)						
Ever used cigarettes only vs neither cannabis nor tobacco	1.77	(1.18, 2.66)	0.006	1.48	(0.99, 2.23)	0.059
Cannabis (including tobacco co-use) vs neither	2.51	(1.69, 3.73)	<0.001	1.61	(1.11, 2.33)	0.012
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	2.14	(1.44, 3.19)	<0.001	1.84	(1.28, 2.66)	0.001
Depression and/or anxiety - when children 5-9 years (K-5 score 11-25 pts: n=54/202, 26.7%)						
Ever used cigarettes only vs neither cannabis nor tobacco	1.22	(0.69, 2.13)	0.495	1.18	(0.67, 2.07)	0.569
Cannabis (including tobacco co-use) vs neither	1.90	(1.12, 3.23)	0.017	1.76	(1.02, 3.04)	0.043

Stressful events/social health issues (trend over 0, 1-2, 3 or more)	1·81	(1·14, 2·85)	0·011	1·67	(1·04, 2·69)	0·034
Major depressive episode - when children 5-9 years (aPHQ-9 score 10-27 pts: n=45/199, 22·6%)						
Ever used cigarettes only vs neither cannabis nor tobacco	1·05	(0·55, 2·04)	0·876	0·92	(0·48, 1·77)	0·807
Cannabis (including tobacco co-use) vs neither	2·09	(1·18, 3·73)	0·012	<u>1·80</u>	<u>(0·97, 3·34)</u>	<u>0·060</u>
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	1·92	(1·12, 3·29)	0·017	1·55	(0·86, 2·79)	0·143
Generalized anxiety disorder - when children 5-9 years (GAD-7 score 10-21 pts: n=39/199, 19·6%)						
Ever used cigarettes only vs neither cannabis nor tobacco	0·83	(0·40, 1·73)	0·615	0·70	(0·35, 1·39)	0·304
Cannabis (including tobacco co-use) vs neither	<u>1·82</u>	<u>(0·97, 3·41)</u>	<u>0·061</u>	1·61	(0·84, 3·09)	0·152
Stressful events/social health issues (trend over 0, 1-2, 3 or more)	<u>1·64</u>	<u>(0·96, 2·79)</u>	<u>0·067</u>	1·35	(0·75, 2·45)	0·319

K-5: Kessler-5 scale; aPHQ-9: 9-item adapted Personal Health Questionnaire; GAD-7: 7-item Generalised Anxiety Disorder score. RR: relative risk; aRR adjusted relative risk from Poisson regression model with robust error variance estimation, including: any use of cannabis or tobacco during pregnancy;

trend over grouped number of social health issues or stressful events (0/1-2/3+); women's age at birth of study child; highest educational qualification and remoteness of area of residence at baseline; and age of study child at administration of survey. 95% CI: 95% confidence interval. p: p value (bolded estimates $p < 0.05$, underlined estimates $p < 0.10$).

Figure 1 Pregnancy experiences and need for referral for assessment and support with mental health (first year postpartum and when children aged 5-9 years)

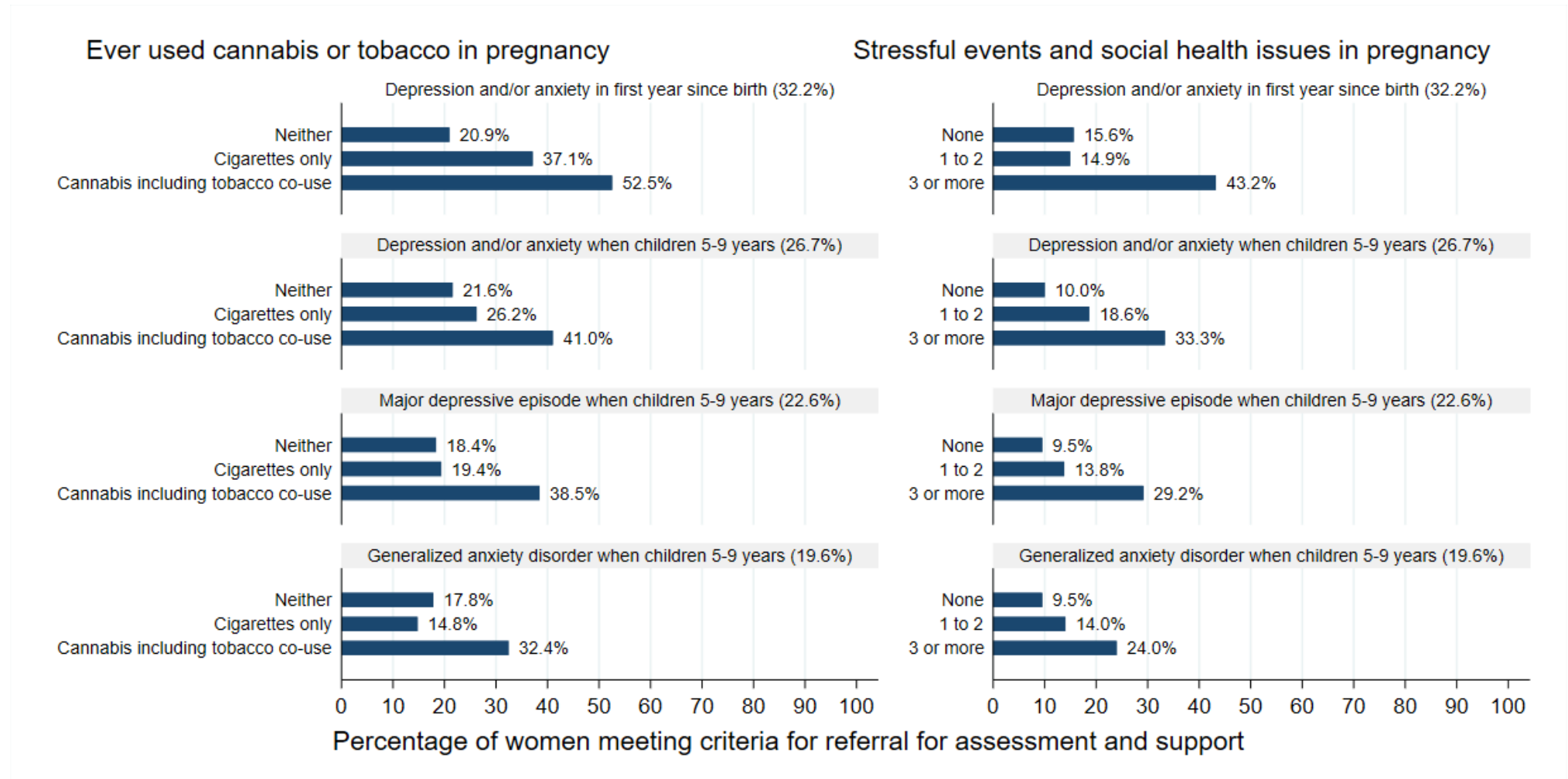
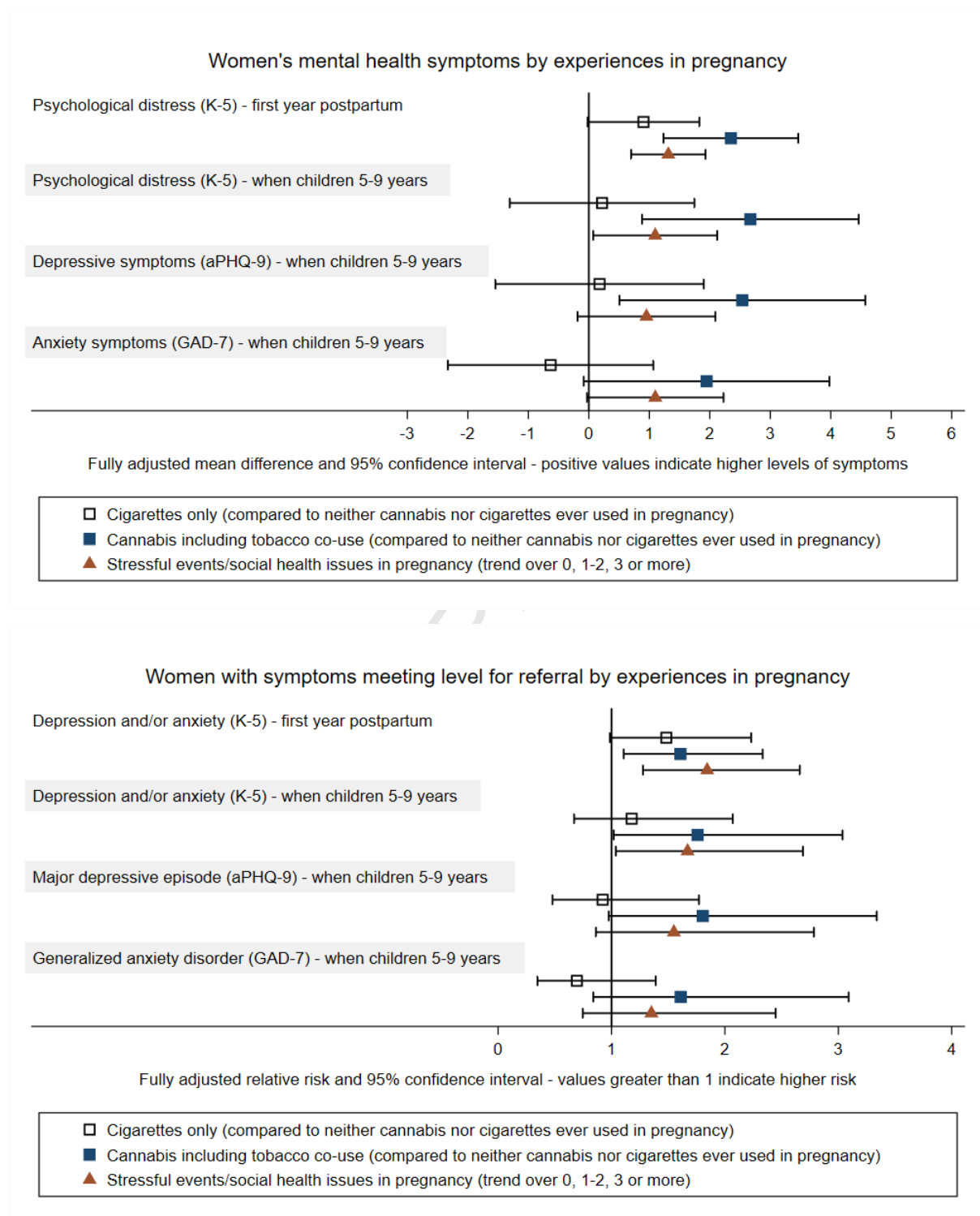


Figure 2 Experiences in pregnancy, women's mental health, and indication for referral for mental health concerns (first year postpartum and when children aged 5-9 years)



ICMJE DISCLOSURE FORM

Date: 8th September 2023

Your Name: Fiona Mensah on behalf of all Authors

Manuscript Title: Understanding cannabis use and mental health difficulties in context with ‘things happening in women’s lives’ during pregnancy: the Aboriginal Families Study

Manuscript number (if known): Not assigned

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Time frame: Since the initial planning of the work			
1	All support for the present manuscript (e.g., funding, provision of study materials, medical writing, article processing charges, etc.) No time limit for this item.	Australian National Health and Medical Research Council (NHMRC)	Project grants #1004395, #1105561 supporting the Aboriginal Families Study SB Leadership Grant #2018144 YC Emerging Leadership Grant #1178590 GG Emerging Leadership Grant #2018465
		SA Health	Funding awarded to the Aboriginal Families Study

		Australian Government Research Training Program	AN PhD Scholarship
		Royal Children's Hospital Research Foundation and Murdoch Children's Research Institute	AN PhD top-up scholarship
		Victorian Government's Operational Infrastructure Support Program	Research at the Murdoch Children's Research Institute is supported by the Victorian Government's Operational Infrastructure Support Program
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Graphical Abstract

Understanding cannabis use and mental health difficulties in context with women's experiences of stressful events and social health issues in pregnancy: the Aboriginal Families Study

Community identified priorities: Aboriginal and Torres Strait Islander people participating in community consultations that informed the design and conduct of the Aboriginal Families Study raised concerns about the impacts of cannabis use in pregnancy on families and children. They cautioned that we need to understand 'things happening in their lives' as a context for women's and children's health and wellbeing, referring to concerns about stressful events and social health issues.

The Aboriginal Families Study design: prospective, population-based cohort study

Centered on Aboriginal leadership provided by the study's Aboriginal Governance Group

Population: 344 Aboriginal families that had a baby in the state of South Australia from July 2011-June 2013

Exposure measures: Use of cannabis and/or cigarettes, stressful life events and social health issues in pregnancy

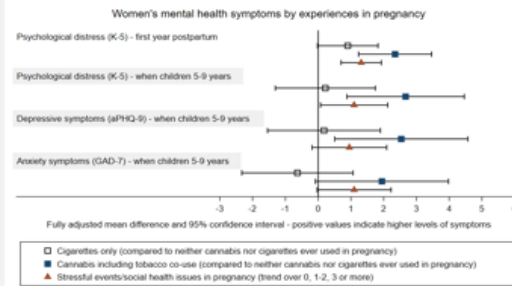
Women's outcome measures:

Psychological distress, Kessler (5 item) - first year postpartum and when study children aged 5-9 years

Depressive symptoms, culturally adapted Personal Health Questionnaire (9 item) - 5-9 year follow up

Anxiety symptoms, Generalized Anxiety Disorder scale (7 item) - 5-9 year follow up

Key findings: Psychological distress in the first year postpartum was substantially higher amongst women who had used cannabis (including tobacco co-use) or experienced 3 or more stressful events or social health issues. Similar patterns of psychological distress, depressive and anxiety symptoms were evident in follow up when their children were aged 5-9 years.



Mensah FK, Glover K, Leane C, Garitand D, Nikolof A, Clark Y, Gee G, Brown SJ. Understanding cannabis use and mental health difficulties in context with women's experiences of stressful events and social health issues in pregnancy: the Aboriginal Families Study. Comprehensive Psychology, submitted 8th September 2023.

- Stressful events and social health issues frequently co-occur with use of cannabis in pregnancy
- A heightened burden of mental health difficulties is evident amongst women with these experiences
- Psychological distress, anxiety, and depressive symptoms frequently persist beyond pregnancy
- A high need of referral for mental health support is evident for women impacted by these experiences
- Holistic prevention and support are needed to minimise the use of and harms of cannabis in pregnancy