INDIGENOUS PARENT AND OFFSPRING MENTAL HEALTH

THE MENTAL HEALTH OF INDIGENOUS PERINATAL INDIVIDUALS, ASSOCIATIONS OF PARENT AND OFFSPRING PSYCHOPATHOLOGY, AND OFFSPRING RISK AND WELL-BEING

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A Thesis Submitted to the School of Graduate Studies in Partial Fulfilment of the Requirements for the Degree Doctor of Philosophy

McMaster University DOCTOR OF PHILOSOPY (2023) Hamilton, Ontario (Neuroscience)

TITLE: The Mental Health of Indigenous Perinatal Individuals, Associations of Parent and Offspring Psychopathology, And Offspring Risk and Well-Being

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NUMBER OF PAGES: xv, 231

Lay Abstract

Indigenous peoples, the original inhabitants of their lands, face a number of challenges that can increase their risk for poor mental health. The goal of this thesis was to examine the mental health of Indigenous pregnant persons, parents, and their children. We found that Indigenous peoples were more likely to have mental health challenges during pregnancy and up to one year after their baby's birth compared to non-Indigenous peoples. We also found that children of Indigenous parents with mental health challenges were more likely to experience these difficulties compared to kids with healthy Indigenous parents. Finally, we found that First Nations children that had knowledge of an Indigenous culture or lived in a well-connected community had better well-being than First Nations children not exposed to these factors. Findings from this thesis can be used to develop interventions to help optimize mental health among Indigenous pregnant persons, parents, and children.

Abstract

Objectives: To examine perinatal mental health, mechanisms of psychopathology transmission from parent to offspring, and offspring risk and well-being among Indigenous peoples by: 1) synthesizing the prevalence of perinatal mental health challenges among Indigenous perinatal individuals, 2) examining the association of psychopathology among Indigenous parent-offspring dyads, and 3) identifying factors associated with First Nations children's well-being

Methods: Four studies were designed to address these objectives. Study 1 meta-analyzed studies on mental health challenges among Indigenous pregnant and postpartum individuals. Study 2 used data from administrative health databases to identify the prevalence and determinants of depression, anxiety, and post-traumatic stress disorder among Métis pregnant persons in Alberta, Canada. Study 3 systematically synthesized studies on the association of Indigenous parent and offspring psychopathology. Study 4 used data from the 2006 Aboriginal Children's Survey to identify determinants of First Nations children's socioemotional and behavioural well-being

Results: In Study 1, Indigenous perinatal individuals were at a 62% increased risk of a mental health challenge compared to non-Indigenous individuals. In Study 2, Métis pregnant persons were more likely to have depression, anxiety, and post-traumatic stress disorder than non-Métis pregnant persons. Factors associated with both depression and anxiety included having pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location. In Study 3, offspring of Indigenous parents with mental health challenges were 2-4 times more likely to experience psychopathology compared to offspring of healthy Indigenous parents. In Study 4, knowledge of an Indigenous culture and strong community cohesion were associated with better well-being among First Nations children

Conclusion: This work highlights the importance of reducing mental health challenges among Indigenous birthing parents and children and lends insight into cultural factors that can be used to promote the well-being of young First Nations children.

Keywords: Indigenous Peoples; Pregnancy; Postpartum; Child; Psychopathology

Acknowledgements

I would like to thank my supervisor Dr. Ryan J. Van Lieshout for his mentorship and guidance throughout my graduate school journey. You created and identified opportunities for me, motivated me to do my best, and helped me navigate academia as a budding clinician-scientist. I have learned many lessons from you and I am grateful. I would like to thank my supervisory committee members, Dr. Minuzzi and Dr. Schmidt for supporting me for the past five years. I appreciated how both of you were so approachable and receptive when discussing my research. I hope to embody your kindness and leadership skills in my own career.

Thank you to my mother and father for instilling the love of learning in me. My mother, my mother, my mother for her dedication to higher education. My father for his nurturance, kindness, and sincere interest in my work. My sister and brother for their support, conversations, and advice. My husband for reminding me not to "take tension" and always putting things in perspective. After all, یہ زندگی ہے.

Thank you to my lab members for providing a fun and supportive environment to learn in. Thank you to 93.3 CFMU, The AlmaMAC, and its guests who were fellow graduate students. Your passion for your research fuelled my own academic interests.

I would like to thank Mr. Troy Hill for his mentorship and support for the past six years. Who would have thought attending that workshop six years ago would have led to such fruitful collaboration! I would like to also thank Dr. Burack and Dr. Ospina for their mentorship, collaboration, and enthusiasm for supporting a young researcher like myself. Thank you to the midwives and staff at the Six Nations Maternal and Child Centre, and the Métis Nation of Alberta for their collaboration and research partnership during my thesis.

Thank you Zotero for being the most efficient referencing software and actually getting better with updates. How I wish I could express my love for you in an ode like Pablo Neruda.

I would like to thank Vanier Canada Graduate Scholarships for funding my doctoral research. I would like to thank the Research Data Centre at McMaster University where part of my doctoral research was conducted, as well as the CRDCN Emerging Scholars Award which provided financial support for Study 4.

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List of abbreviations and symbols

β: Standardized Beta
ACS: Aboriginal Children's Survey
ADHD: Attention Deficit Hyperactivity Disorder
aOR: Adjusted Odds Ratio
APHP: Alberta Perinatal Health Program
aRR: Adjusted Risk Ratio
BDI: Beck Depression Inventory
CANZUS: Canada, Australia, New Zealand, United States of America
CBCL: Child Behavior Checklist
CD: Conduct Disorder
CES-D: Center For Epidemiological Studies–Depression
CI: Confidence Interval
CIDI: Composite International Diagnostic Interview
CIHR: Canadian Institutes of Health Research
COVID-19: Coronavirus Disease Of 2019
DISC-R: Diagnostic Interview Schedule For Children–Revised
DSM: Diagnostic and Statistical Manual Of Mental Disorders
DSM-III-R: Diagnostic and Statistical Manual of Mental Disorders-III–Revised
EPDS: Edinburgh Postnatal Depression Scale
GAD: Generalized Anxiety Disorder
GHQ: General Health Questionnaire
ICD-9: International Classification Of Diseases Version 9
ICD-10: International Classification Of Diseases Version 10
ICD-10-AM: International Classification Of Diseases Version 10 Australian Modification
ICD-10-CA: International Classification Of Diseases Version 10 Canadian Enhancements
IRS: Indian Residential Schools
ITSEA: Infant-Toddler Social And Emotional Assessment
M: Mean
MDD: Major Depressive Disorder
MDE: Major Depressive Episode
MFQ: Mood and Feelings Questionnaire
MNA: Métis Nation of Alberta
MOOSE: Meta-Analysis Of Observational Studies In Epidemiology
N/A: Not Applicable
NOS: Newcastle-Ottawa Scale
OCAP: Ownership, Control, Access, Possession
ODD: Oppositional Defiant Disorder
OR: Odds Ratio
PDSS: Postpartum Depression Screening Scale
PHQ-2: Patient Health Questionnaire-2
PHQ-15: Patient Health Questionnaire-15
PPD: Postpartum Depression

PRAMS-3D: Pregnancy Risk Assessment Monitoring System-3 Depression Questions
PRISMA: Preferred Reporting Items For Systematic Reviews
PTSD: Post-Traumatic Stress Disorder
SD: Standard Deviation
SDQ: Strengths and Difficulties Questionnaire
SE: Standard Error
SMD: Standardized Mean Difference
SPSS: Statistical Package For The Social Sciences
STAI: State-Trait Anxiety Inventory
TWEAK: Tolerance, Worry, Eye-opener, Amnesia, & Cut-down drinking
UM-CIDI: University of Michigan Composite International Diagnostic Interview
USA: United States of America
USPSTF: United States Preventive Services Task Force

Declaration of Academic Achievement

This thesis contains four studies which were all written by the student (Sawayra Owais). For all the research studies, Sawayra Owais was involved in generating the research question, conducting the statistical analyses (with the exception of Study 2), and writing and completing the manuscript. The studies contained in this thesis were conducted between September 2018-June 2023. Studies 1 and 3 have been published in peer-reviewed journals, however formal permission by the publisher (SAGE Publications) was not required to reuse these journal articles in the dissertation. Please see the Appendix for more details. The co-author contributions for each study included in the thesis are outlined below.

Study 1

In Study 1, Sawayra Owais was involved in developing the research questions, generating search strategies, extracting and analyzing data from articles, and writing the manuscript. Mateusz Faltyn was involved in the article selection and screening process, extracting and analyzing data from articles, and revising the first draft of the manuscript. Ashley Johnson, Chelsea Gabel, Bernice Downey, and Nick Kates were involved in developing the research questions, planning the searches, providing help in the interpretation of data, and editing the manuscript. Ryan Van Lieshout was involved in developing the research questions, guiding the article selection and screening process, providing help in the interpretation of data, and editing the manuscript. All authors approved of and are accountable for the final draft of the manuscript.

Study 2

In Study 2, Sawayra Owais was involved in generating the research questions, interpreting the data, and writing the manuscript. Maria Ospina was involved in generating the research questions, overseeing the statistical analyses, aiding in data interpretation, and editing

the manuscript. Jesus Serrano-Lomelin was involved in conducting the statistical analyses and editing the manuscript. Reagan Bartel, Kelsey Bradburn, and Ashton James were involved in generating the research questions and data interpretation. Ryan Van Lieshout was involved in generating the research questions, helping in the interpretation of data, and editing the manuscript.

Study 3

For Study 3, Sawayra Owais was involved in developing the research questions, generating search strategies, extracting and analyzing data, and writing the manuscript. Mateusz Faltyn and Hanyan Zou were involved in article selection and screening, and revising the manuscript. Troy Hill, Nick Kates, and Jacob Burack were involved in developing the research questions, planning searches, helping to interpret the data, and editing the manuscript. Ryan Van Lieshout helped develop the research questions, guided the article selection and screening process, assisted in data interpretation, and edited the manuscript. All authors approved of and are accountable for the final draft of the manuscript.

Study 4

For Study 4, Sawayra Owais was involved in developing the research question, conducting the statistical analyses, interpreting the data, and writing the manuscript. Camron Ford, Troy Hill, Jessica Lai, and John Krzeczkowski provided feedback on the intellectual content of the manuscript and aided in data interpretation. Maria Ospina, Jacob Burack, and Ryan Van Lieshout were involved in developing the research question, helping in data interpretation, and critically evaluating the intellectual content of the manuscript. All authors approved of and are accountable for the final draft of the manuscript.

Chapter 1: Introduction

Brief history and sociodemographic characteristics of Indigenous peoples

Indigenous peoples are the original inhabitants of their ancestral lands prior to the establishment of country borders (United Nations Permanent Forum On Indigenous Issues, 2023). Worldwide, there are 476 million Indigenous peoples (United Nations, 2023a). While there is significant diversity in terms of language, culture, and beliefs among Indigenous groups, many share a similar history of colonialism, especially Indigenous communities in Canada, Australia, New Zealand, and the United States (i.e., the 'CANZUS' nations) (Nelson & Wilson, 2017). Colonialism, where European settlers politically controlled Indigenous peoples, resulted in profound cultural, social, and environmental disruptions. The Indian Act, Indian Residential Schools (IRS), and the Sixties Scoop are just a few examples of colonial policies that existed in Canada that have had detrimental effects on Indigenous peoples. Indeed, these and other oppressive practices disrupted the passing on of cultural and traditional teachings (Kirmayer et al., 2003), contributed to family breakdown (Kirmayer et al., 2003), and compromised individual emotion regulation (Brave Heart, 1999).

Consequences of colonialism are seen today in the form of poorer socioeconomic, environmental, and health outcomes among Indigenous peoples compared to non-Indigenous peoples (Gracey & King, 2009). They are three times as likely to be living in extreme poverty (International Labour Organization, 2019), up to four times likely to have chronic diseases such as diabetes or cardiovascular disease (Vachon et al., 2018; Vos et al., 2009; T. Young et al., 2002), more likely to live in communities near polluting industries resulting in higher rates of

mercury poisoning, respiratory illness, and cancer (Waldron, 2018), and have a lifespan of up to 20 years less than their non-Indigenous peers (United Nations, 2023b).

Mental health of Indigenous peoples

The enduring effects of colonialism have also contributed to mental health disparities seen among Indigenous peoples. For instance, in a nationally representative survey of Indigenous adults living off-reserve in Canada (n=43,240), researchers found that only 53.3% self-reported their mental health as very good or better (Statistics Canada, 2020a) compared to 68% of the general Canadian population (Findlay & Arim, 2020). Other nationally representative surveys suggest that compared to non-Indigenous peoples, Indigenous youth and adults living off-reserve in Canada have a higher prevalence of long-term mood (17.7% vs. 12.6%) (Statistics Canada, 2013, 2020b) and anxiety (19.0% vs. 8.7%) disorders (Statistics Canada, 2013, 2020b), tobacco use (21.9% vs. 5.0%) (Sikorski et al., 2019), and past-year suicide attempts (5.4% vs. 2.7%) (Liu et al., 2021; Statistics Canada, 2020a).

These mental health disparities are also seen among Indigenous adults outside of Canada where studies report a higher prevalence of psychological distress (Jorm et al., 2012; Page et al., 2022), mood (Nasir et al., 2018; Page et al., 2022), anxiety (Ministry of Health, 2008; Nasir et al., 2018; Page et al., 2022), and substance use disorders (Nasir et al., 2018), and suicidality (Pollock et al., 2018).

However, not all studies on Indigenous adults suggest that they have higher estimates of mental health problems compared to non-Indigenous individuals. Indeed, some studies suggest that Indigenous adults have comparable prevalence estimates of some depressive (Beals et al., 2005; Black et al., 2017; Kisely et al., 2017) and anxiety disorders (Black et al., 2017; Kisely et

al., 2017). Reasons for these inconsistent findings remain unclear but could be contributed to by methodological issues including a lack of utilization of mental health measurements not developed and/or validated with Indigenous peoples, non-representative participant recruitment, or lack of collaboration with Indigenous communities leading to participant selection bias. Methodological limitations aside, lower estimates could also be contributed to by the tremendous resilience Indigenous peoples have shown as they attempt to re-learn their cultures, languages, and traditions despite facing significant disadvantages (Kirmayer et al., 2011). Studies that use validated measures of mental health, recruit representative samples (i.e., population-based studies), partner with Indigenous communities and organizations, and examine positive mental health can address existing methodological issues and help move the Indigenous mental health literature forward.

Despite some disparate data regarding the prevalence of certain mental health issues, the effects of colonialism have resulted in constant threats to Indigenous peoples' psychological safety, freedom, and self-identity which can increase the risk for mental health challenges. Early identification and intervention could decrease the severity and/or prevalence of mental health difficulties among Indigenous peoples.

The importance of the perinatal period

Mental disorders occurring during the perinatal period – encompassing pregnancy up to one year postpartum – are the most common complications of pregnancy and childbirth. Indeed, up to one in five pregnant persons or birthing parents will experience subthreshold mental disorders, with the most common being depression or anxiety (Fawcett et al., 2019; Gavin et al., 2005). These mental health challenges are associated with negative long-term consequences for

the mother, offspring, and society (Goodman, 2019; Logsdon et al., 2006; Stein et al., 2014). Indeed, the cost of a single case of untreated perinatal depression and anxiety is £75,728 and £34,840, respectively, with up to 75% of these costs being attributed to the child (Bauer et al., 2016).

The perinatal period presents as an opportune time to address, reduce, and even eliminate the presence of mental health problems in birthing parents and their offspring. Pregnancy has been described as a "teachable moment" as pregnant persons are highly motivated to change less desirable health behaviours to promote a healthy pregnancy and an optimal start to life for their offspring (Phelan, 2010). At no other point in a pregnant person's life will they have more contact with the healthcare system than during the perinatal period, and so healthcare providers can capitalize on this period to screen for and treat mental health challenges. Addressing mental health problems during pregnancy or in the early postpartum period also has the potential to prevent the intergenerational transmission of psychopathology from birthing parent to offspring (Letourneau et al., 2017; Tsivos et al., 2015). Indeed, research has shown that perinatal depression in birthing parents increases the risk of internalizing and externalizing problems in infants and young children (Goodman, 2019), and that these effects can also persist into adolescence in the form of depressive (Murray et al., 2011) and/or anxiety disorders (Halligan et al., 2007), and even psychotic symptoms (Srinivasan et al., 2020). Importantly, when birthing parents are treated for mental health problems, their can offspring benefit as well (Cohen et al., 2002; Handley et al., 2017; Krzeczkowski et al., 2021; Murray & Cooper, 2003). Therefore, capitalizing on the perinatal period can have tremendous positive benefits for the birthing parent, offspring, and society.

In order to address perinatal mental health challenges and develop targets for intervention, it is important that risk factors (and particularly those that are modifiable) be identified. Common risk factors for perinatal mental health challenges include a past history of mental illness (Giallo et al., 2014; Patton et al., 2015; Savory et al., 2021), low socioeconomic status (Ban et al., 2012), intimate partner violence (Halim et al., 2018), and major life stressors (Giallo et al., 2014). One group that is especially at risk of facing these risk factors are Indigenous women (Brennan, 2015; Daoud et al., 2019; Nasir et al., 2018; Statistics Canada, 2022). Those identifying as Indigenous women face the gendered impact of colonialism, particularly in the CANZUS nations. Indeed, colonial and patriarchal policies broke down matriarchal societies and threatened women's self-identities, roles, and autonomy in their communities (Baskin, 2020; Fredericks, 2010), forced separation from culture and kinship in their most formative years (i.e., IRS, Sixties Scoop, Millennium Scoop, Stolen Generation) (Kirmayer et al., 2016), sterilized them without their consent (Baskin, 2020), and decreased capacity for birthing in their communities (Bowen & Pratt, 2018). In Canada, Indigenous birthing parents are 16 times more likely to be transported long distances (>200 kilometres) to give birth (Smylie et al., 2021) which has been shown to be associated with feelings of isolation (Chamberlain & Barclay, 2000), lack of choice in the birthing process (Chamberlain & Barclay, 2000), and cultural loss (O'Driscoll et al., 2011).

Today, obstetric and gynecological societies from the CANZUS nations (Advisory Committee on Infant and Maternal Mortality, 2022; Australian College of Midwives & Congress of Aboriginal and Torres Strait Islander Nurses and Midwives, 2017; SOGC, 2010) support "bringing birth back" to the community and prioritizing traditional birthing practices. Indeed, research has shown that individuals that received Indigenous midwifery care experienced less

perineal trauma and were less likely to have their baby admitted to the neonatal intensive care unit than those who did not receive Indigenous midwifery care (Kildea et al., 2012). Moreover, research suggests that receiving Indigenous midwifery care may help optimize the mental health of Indigenous pregnant persons and birthing parents, even under stressful conditions (i.e., the COVID-19 pandemic) (Owais & Van Lieshout, 2023). While there has been progress in establishing midwifery centres in Indigenous communities, the majority of Indigenous perinatal persons, especially those living in remote and rural areas, are still subjected to European views of the birthing process.

Taken together, Indigenous pregnant persons and birthing parents continue to face numerous risk factors for mental health challenges. However, no synthesized data exist on the prevalence of such problems, nor an analysis on whether these problems differ by Indigenous group, country, or severity. Such data could help clinicians more optimally detect, screen, and monitor mental health challenges among their Indigenous perinatal patients. This is especially important as data suggest that Indigenous perinatal individuals are less than half as likely to be screened for perinatal depression compared to their non-Indigenous peers (San Martin Porter et al., 2019). Synthesized mental health prevalence data could also guide policymakers and inform resource allocation and guide the development of culturally-safe interventions.

Advancing Indigenous perinatal mental health

Well-designed research studies can aid in the development of screening, detection, and treatment pathways for Indigenous perinatal individuals and help advance the landscape of Indigenous perinatal mental health. For example, self-report measures can be efficient tools to assess mental health challenges in a time-constrained clinical setting. However, their benefits

may be limited when measurements are not normed for the population under study. Many studies on Indigenous perinatal mental health use self-report measures that have not been culturally validated and/or adapted. For example, in a review of 14 studies on the utilization of the Edinburgh Postnatal Depression Scale (EPDS), the gold standard for screening for perinatal depression, just three studies had validated the EPDS for use in their Indigenous participants (Chan et al., 2021).

Two, consistent with the recommendations of the United Nations Permanent Forum on Indigenous Issues, disaggregated data are needed (United Nations, 2019). Studies on Indigenous mental health, including those conducted in the perinatal period, often aggregate participants from different Indigenous groups together. While this may increase statistical power, it masks the rich diversity of and differences between Indigenous groups, obscuring potential differences in mental health outcomes. Of relevance to Indigenous perinatal mental health, some evidence suggests that there are differences in postpartum depression risk, determinants, and birth outcomes among First Nations, Métis, and Inuit perinatal individuals in Canada (Chantal et al., 2018; Daoud et al., 2019; Sheppard et al., 2017). Examining Indigenous groups separately can lead to more accurate prevalence estimates and the development of more relevant community-specific interventions. Disaggregated data are especially important in Canada, where Métis-specific data are scarce despite their being the second most populous Indigenous group (Government of Canada, 2022), and their exposure to a range of Métis-specific determinants of health that can increase the risk of perinatal mental health challenges.

Association of parent and offspring psychopathology among Indigenous families

Poor parental mental health is one of the most potent risk factors for offspring psychopathology. Data taken from 10 countries with 51,507 participants found that the children of parents with mental disorders were 5 times more likely to have a mental disorder than the children of healthy parents (McLaughlin et al., 2012). Importantly, when parents are successfully treated, their children are more likely to recover as well (Siegenthaler et al., 2012), signifying the importance of disrupting the intergenerational transmission of psychopathology.

Parenting behaviours such as low parental monitoring, harsh parenting, or coercive interactions can contribute to the transmission of mental disorders from parent to offspring. Given that research supports the direct association between adverse childhood experiences and these parenting behaviours (Rowell & Neal-Barnett, 2022), Indigenous families may be at greater risk of psychopathology transmission. Indeed, Indigenous adults report more adverse childhood experiences compared to their non-Indigenous peers (Burnette et al., 2017; Hamdullahpur et al., 2018; Klest et al., 2013; Moon et al., 2016; Warne et al., 2017). Despite the higher exposure to adversities that can compromise the rearing environment and increase the risk of transmission of mental disorders, synthesized data on the association between parent and offspring psychopathology among Indigenous families are very limited. It is important to examine this association for a few reasons. First, children are the fastest growing demographic among Indigenous communities. In Canada, about 30% of the Indigenous population is 14 years or younger compared to 16.4% of the non-Indigenous population (Government of Canada, 2017c). Second, research has consistently shown the early life experiences can shape the life trajectory (Maggi et al., 2010; Walker et al., 2011). As early childhood is a period of rapid brain

development and the development of social, emotional, and cognitive processing skills, it is important to capitalize on this period to optimize the health and development of children (Tottenham, 2020). Third, structural disadvantages that Indigenous children and families are exposed to are rooted in historical injustices. Colonial policies (e.g., IRS, Sixties Scoop, Millennium Scoop, birthing evacuations, birth alerts etc.) targeted children and thus jeopardized their ability to reach their full development potential during this critical time of rapid brain development (Gilmore et al., 2018), eliminated opportunities to learn Indigenous culture (Burack & Schmidt, 2014), and prevented them from observing and learning parenting practices (Kirmayer et al., 2003). Therefore, examining associations between Indigenous parent and offspring psychopathology not only makes sound scientific rationale, but is a matter of social justice.

Mental health of Indigenous children

Indigenous children and youth from around the world have poorer mental well-being than their non-Indigenous peers. For instance, researchers found that 5-6-year-old Aboriginal and Torres Strait Islander children in Australia were almost three times more likely to have conduct problems, hyperactivity/inattention, emotional difficulties, and total difficulties on the Strengths and Difficulties Questionnaire than their non-Indigenous peers (O'Brien et al., 2020). Other studies have shown that Indigenous children and youth from around the world have high prevalence estimates of depression (Cushon et al., 2016; Lemstra et al., 2008, 2011; Mota et al., 2012), attention-deficit/hyperactivity disorder (Baydala et al., 2006; Priest et al., 2012; Zubrick et al., 2005), substance use disorder (Costello E.J. et al., 1997; Lehti et al., 2009; Whitbeck et al., 2008), and suicidality (Lehti et al., 2009).

Disparities in mental health among Indigenous and non-Indigenous children and youth are contributed to by the disproportionate exposure to risk factors. Indigenous children and youth are more likely to be exposed to adverse childhood experiences (Basu & Isaacs, 2019; Kenney & Singh, 2016), and live in low-income (Australian Government, 2021; Creamer et al., 2022; Government of Canada, 2017a; Government of New Zealand, 2018) and single-parent households (American Community Survey, 2023; Government of Canada, 2017b; Government of New Zealand, 2018; National Aboriginal and Torres Strait Islander Social Survey, 2009), and have a larger household sizes (Australian Bureau of Statistics, 2012; Government of New Zealand, 2015; Population Reference Bureau, 2004; Statistics Canada, 2015), all of which are risk factors for psychopathology in general populations samples (Eamon, 2001; Maggi et al., 2010; Sameroff, 2006). In addition, Indigenous children and youth face unique Indigenous-specific risk factors as well. For instance, racism (Shepherd et al., 2017; Walls et al., 2007), historical loss (Whitbeck et al., 2009), familial attendance (e.g., parent or grandparent) at an IRS (Elias et al., 2012; Hackett et al., 2016), and acculturation (i.e., assimilation into the dominant colonial culture) (Eliassen et al., 2012) have all been shown to be associated with poorer mental health among Indigenous children and youth from around the world.

While these studies have contributed to our understanding of Indigenous children and youth health, more research is needed on younger children (i.e., preschool-aged) given that the first five years of life are characterized by rapid brain development and optimal caregiving environments can positively influence their developmental trajectories (Tottenham, 2020). Indeed, in relation to cognitive processing, James Heckman, a Nobel laurate economist and champion of early childhood intervention, stated "*Most of the gaps at age 18 that help to explain gaps in adult outcomes are present at age five*" (Heckman, 2008, p. 298). Relatedly, other

research supports that early childhood intervention programs have been shown to be associated with higher rates of high school completion and college attendance (Smokowski et al., 2004), lower rates of adolescent and adulthood delinquency (Reynolds et al., 2007; Smokowski et al., 2004), and better adolescent and adult mental health (Reynolds et al., 2007; Smokowski et al., 2004). Therefore, examining the mental health of young Indigenous children provides an important opportunity to intervene and reduce health inequities early in life.

Strengths-based approach to Indigenous children's mental health

The literature summarized above highlights that a deficits-based approach, where failures, deficiencies, and negative outcomes are emphasized, has dominated the discourse on Indigenous mental health, including that of children. Indeed, up to 87% of studies published on Indigenous children's mental health do not report any positive health outcomes (C. Young et al., 2017). Such deficit-based approaches have been shown to be a barrier to health promotion (Fogarty et al., 2018), reinforce negative stereotypes (Hyett et al., 2019), and hinder the development of strategies, policies, and interventions that can nurture young children in to healthy, contributing, thriving members of society (Halseth & Greenwood, 2019).

Taking a strengths-based approach to Indigenous children's mental health would be consistent with Indigenous conceptualizations of health, where positive aspects and the development of resilience is emphasized (Vukic et al., 2011). Additionally, the measurement of positive mental health can contribute to more accurate representations of the well-being and functioning of Indigenous children. For instance, in a study where researchers were developing a questionnaire to assess attitudes toward physical activity and diet in American Indian children, researchers found that negatively-worded items did not meet reliability criteria (Stevens et al.,

1999). After consultation with tribal leaders, researchers attributed these results, in part, to Indigenous ways of thinking which focus on the positive and avoid negative thoughts and feelings (Stevens et al., 1999).

In addition to measuring positive well-being of Indigenous children, the determinants of these constructs must also be identified. Consistent with the notion of 'culture as treatment' and the knowledge that cultural teachings contribute to the socialization and development of young children (Causadias & Cicchetti, 2018) more research is needed on Indigenous-specific determinants of positive mental health among children. Indeed, Allison Barlow and John Walkup, researchers that partnered with Native American communities to develop strengths-based programming, described in an editorial published in the Journal of the American Academy of Child and Adolescent Psychiatry that empirical research must not only describe mental health among Indigenous children but also examine "*cost-effective, evidence-based solutions that reflect Indigenous cultural strengths and community will*" (Barlow A. & Walkup J.T., 2008, p. 843). Research in older age groups have shown that greater involvement in Indigenous cultural activities, a stronger cultural identity, and spirituality are associated with lower levels of aggression and suicidal ideation among Indigenous youth (Flanagan et al., 2011; Yoder et al., 2006). Examination of Indigenous-specific determinants of positive well-being among younger Indigenous children can also empower communities to use existing Indigenous ways of knowing in prevention and treatment strategies and provide a more holistic understanding of the full experience of First Nations children, their developmental pathways, and set the stage for the development of more effective early interventions.

Sandwich thesis overview

The aims of this dissertation are to examine mental health among Indigenous pregnant persons and birthing parents, the risk parental mental health challenges pose to offspring, and the mechanisms of this intergenerational transmission. To address these research aims, four manuscripts were prepared. These are all either previously published, currently under review, or in preparation. In Study 1, we synthesized data on the prevalence of mental health challenges among Indigenous perinatal individuals from around the world. Based on our Study 1 findings, we established that Indigenous perinatal individuals are at greater risk for mental health challenges, but we found that these data are commonly aggregated across Indigenous groups and that Canadian data are extremely scarce. Therefore, in Study 2, we conducted a population-based study and used data from administrative databases in Alberta to identify the prevalence and determinants of depression, anxiety, and post-traumatic stress disorder among Métis pregnant persons in that province, and compared these estimates to their age-matched peers. We found that Métis pregnant persons were more likely to have mental disorders during pregnancy and common factors associated with depression and anxiety during pregnancy included pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location. Based on these findings, and with the knowledge that parental psychopathology is a potent predictor of offspring psychopathology, we examined these associations in an Indigenous context in Study 3. We found that Indigenous offspring of parents with mental health challenges were more likely to have psychopathology compared to Indigenous offspring of healthy parents, and that this association may be stronger in Indigenous families than non-Indigenous families. In the first three studies, while a strengths-based approach was not explicitly taken, we described the importance of employing such approaches in the

discussion sections of each manuscript. Additionally, we provided historical context (i.e., enduring effects of colonialism) for any observed negative health outcome in our studies. Identification of negative health outcomes and other risks, with the appropriate historical context, can help individuals and communities understand how to effectively counteract these challenges. Finally, in order to better understand young Indigenous children's mental health in Canada from a strengths-based perspective, we used data from a nationally-representative survey to examine First Nations-specific factors (in addition to non-Indigenous-specific factors) associated with preschool-aged First Nations children's well-being.

Overall, this body of work helps to address gaps in the Indigenous health literature (e.g., reporting disaggregated data, less reliance on self-report measures), provides data on understudied populations (e.g., perinatal individuals, Métis, young children) and uses Indigenous ways of knowing to examine mental health (i.e., strengths-based approach, identifying Indigenous-specific determinants). Importantly, these studies were conducted in partnership and consultation with Indigenous mentors, community leaders, and health centres. Since all of these studies were either systematic reviews or secondary data analyses, there were some constraints to fully applying some Indigenous research guidelines (e.g., ownership, control, access, or possession of data). However, Indigenous mentors and organizations were consulted to contextualize the findings. When translating our study findings to policies, Indigenous mentors, community leaders, and health centres will be consulted to guide policy design and implementation.

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Chapter 2: The Perinatal Mental Health of Indigenous Women: A Systematic Review and Meta-Analysis (Study 1)

Study 1 Overview

Title: The Perinatal Mental Health of Indigenous Women: A Systematic Review and Meta-Analysis

Authors: Sawayra Owais, MSc, Mateusz Faltyn, Ashley V. D. Johnson, MD, Chelsea Gabel, PhD, Bernice Downey, RN, PhD, Nick Kates, MD, and Ryan J. Van Lieshout, MD, PhD

Context and Overall Implications: Indigenous perinatal individuals are disproportionately exposed to risk factors for mental health challenges, although no synthesized data existed on the prevalence of such difficulties. The first study in this thesis synthesizes the association of mental health challenges among Indigenous perinatal individuals compared to their non-Indigenous peers. This meta-analysis found that Indigenous individuals were at a 62% increased risk for mental health challenges, and are more likely to experience severe forms of these challenges. This study can lend support for the development of culturally-safe screening and treatment protocols, and also highlights research gaps (e.g., recruitment of representative samples, utilization of culturally validated mental health measurements, and partnership with Indigenous communities) for future researchers to address.

Acknowledgements: We would like to acknowledge Jo-Anne Petropoulos for her help in reviewing the search strategies.

Conflicts of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Published In: The Canadian Journal of Psychiatry

Citation Information: Owais S, Faltyn M, Johnson AVD, Gabel C, Downey B, Kates N, et al. The Perinatal Mental Health of Indigenous Women: A Systematic Review and Meta-Analysis. *Can J Psychiatry*. 2020 Mar 1;65(3):149–63. doi: 10.1177/0706743719877029.

Abstract

Objective: Although Indigenous women are exposed to high rates of risk factors for perinatal mental health problems, the magnitude of their risk is not known. This lack of data impedes the development of appropriate screening and treatment protocols, as well as the proper allocation of resources for Indigenous women. The objective of this systematic review and meta-analysis was to compare rates of perinatal mental health problems among Indigenous and non-Indigenous women.

Methods: We searched Medline, EMBASE, PsycINFO, CINAHL, and Web of Science from their inceptions until February 2019. Studies were included if they assessed mental health in Indigenous women during pregnancy and/or up to 12 months postpartum.

Results: Twenty-six articles met study inclusion criteria and 21 were eligible for meta-analysis. Indigenous identity was associated with higher odds of mental health problems (odds ratio [*OR*] 1.62; 95% confidence interval [CI], 1.25 to 2.11). Odds were higher still when analyses were restricted to problems of greater severity (*OR* 1.95; 95% CI, 1.21 to 3.16) and young Indigenous women (*OR* 1.86; 95% CI, 1.51 to 2.28).

Conclusion: Indigenous women are at increased risk of mental health problems during the perinatal period, particularly depression, anxiety, and substance misuse. However, resiliency among Indigenous women, cultural teachings, and methodological issues may be affecting estimates. Future research should utilize more representative samples, adapt and validate diagnostic and symptom measures for Indigenous groups, and engage Indigenous actors, leaders, and related allies to help improve the accuracy of estimates, as well as the well-being of Indigenous mothers, their families, and future generations.

Trial Registration: PROSPERO-CRD42018108638.

Keywords: Aboriginal health, common mental disorders, Indigenous people, pregnancy, postpartum

Introduction

Up to 20% of women experience problems with their mental health during the perinatal period,[1] with adverse effects for the mother, her family, and the healthcare system.[2-4] A past history of mental illness,[5] poor social support,[6] poverty,[7] intimate partner violence,[8] childhood sexual abuse,[9] and other forms of trauma all increase risk.

One group that experiences very high rates of these and other risk factors are Indigenous women. Despite this, very little is known about their mental health during the perinatal period.[10] Indigenous populations are the original inhabitants of ancestral land prior to the establishment of borders with cultural identities distinct from the dominant society's.[11] However, because of colonization and assimilation efforts, they now live with structural risks that have contributed to poorer health outcomes than their non-Indigenous counterparts.[12]

Although not all Indigenous women develop perinatal mental health problems, it is important to understand the mental health problems experienced by Indigenous women around the world so that those who may be suffering can be helped and the intergenerational transmission of risk to their children can be reduced. Resilience processes can also be examined in Indigenous women and their children who are thriving, so protective factors against the development of mental health problems can be elucidated. By understanding the scope of the problem facing Indigenous women and their families, we will then be able to better prioritize and study the relevant risk and resilience mechanisms through which perinatal mental health problems may be transmitted. Synthesizing the literature on Indigenous perinatal mental health should ultimately lead to the development of early screening, identification, and treatment protocols and help guide the development of policies to help future generations.

Bowen and colleagues conducted a systematic search and narrative summary of the literature (up to 2010) on the perinatal mental health of Indigenous women, identifying 16 quantitative articles.[13] Thirteen measured perinatal depression and reported antenatal prevalence rates from 17% to 47%. Although this review advanced our understanding of perinatal depression among Indigenous women, a number of gaps remain. Point estimates of absolute and relative risks are not yet known, and some of the studies that provided prevalence data were designed to validate questionnaires rather than estimate these rates, potentially introducing sampling bias.

It is also not known how country of residence, severity of illness, or other factors affect the risk of developing psychopathology among Indigenous perinatal women. It is important to know which mental health problems Indigenous women are most vulnerable to, so that appropriate screening and intervention protocols can be developed and applied (e.g., pharmacological and nonpharmacological treatments, public health policies, etc.). Screening and intervention can allow for earlier detection and potentially the prevention of intergenerational transmission of psychopathology to help reduce the burden on the mother, her family, and the healthcare system. Finally, little data exist on outcomes other than depression although problems like perinatal substance misuse and anxiety are significant risk factors.[14,15]

Since the review of Bowen and colleagues synthesized data published nearly a decade ago, accompanied with the increasing appreciation of the importance of the health and well-being of Indigenous peoples and the impact perinatal mental health problems can have on future generations, it is important to have a comprehensive and contemporary understanding of the prevalence and relative risk of these difficulties among Indigenous women.[16,17] The objective of

this systematic review and meta-analysis was to examine rates of perinatal mental health problems among Indigenous women from the first trimester of pregnancy up to 12 months postpartum and compare them to non-Indigenous women.

Methods

Search Strategy

The study protocol guiding this systematic review and meta-analysis was published in the PROSPERO database on October 11, 2018 (CRD42018108638). The guidelines and checklists from the preferred reporting items for systematic reviews (PRISMA) and meta-analyses and meta-analysis of observational studies in epidemiology (MOOSE) were followed.[18,19] Indigenous collaborators of Mohawk (AJ), Red River Métis (CG), and Oji/Cree (BD) heritage were consulted to help create search strategies, plan the subgroup and sensitivity analyses, analyze and interpret the data, and review the final draft of the manuscript.

A systematic search of electronic databases (Medline, EMBASE, PsycINFO, CINAHL, and Web of Science) was conducted from their inceptions until February 25, 2019. Search strategies/terms were developed in collaboration with a health sciences librarian and clinicians/researchers of Mohawk, Red River Métis, and Oji/Cree heritage to ensure terms were specific and inclusive (please see Supplemental Material data available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7019461/). In general, searches were centered on three Medical Subject Heading terms: Indigenous populations, pregnancy or postpartum period, and mental disorders. Despite terms to describe Indigenous populations being changed over time, we elected to generate all possible terms in order to best capture all potential articles

related to perinatal Indigenous mental health. The ancestry approach was also used, where the reference lists of relevant articles were hand-searched to identify additional studies.

Eligibility Criteria

Observational (cross-sectional, case–control, cohort) studies were included if (1) participants were Indigenous women (as defined by World Health Organization[20] or other valid criteria [i.e., self-identification][21]), (2) participants were assessed anywhere from the start of pregnancy to 12 months postpartum, (3) mental health outcomes were assessed, (4) studies used diagnostic interviews or self-report questionnaires to measure mental health outcomes, and (5) outcomes were reported separately for Indigenous and non-Indigenous women. Although diagnostic manuals have defined the perinatal period to last from the first trimester of pregnancy until 4 weeks postpartum, we elected to extend this time period up to 12 months postpartum to align with clinical practice of diagnosing women with mental health problems if they experience them within a year of delivery.[22] All mental health outcomes that had a nonorganic cause and were indexed under “mental health disorders” on the databases (“mental disease” for Embase) were included. For an exhaustive list, please see the Supplemental Material data. All efforts were made to find the English translation of non-English articles.

Data Extraction and Methodological Bias Assessment of Studies

Titles and abstracts were screened by two independent reviewers (MF and SO) and any disagreements were adjudicated by a third reviewer (RV). Data were extracted using a standardized form which was pilot-tested with five randomly selected studies to ensure adequate data capture. Information regarding study location was extracted, as were study design, sample

size and type, participant inclusion/exclusion criteria, mental health outcomes assessed, measures and clinical cutoffs used, timing of outcome assessment, and prevalence rates.

The methodological bias of eligible studies was assessed using The Newcastle-Ottawa Scale (NOS) for cohort and case–control studies.[23] Selection, comparability, and outcome bias were graded using this measure's star system, where the greater the number of stars represented higher methodological quality and lower risk of bias. Publication bias was assessed using funnel plots generated through RevMan 5.3 and the Egger test.

Statistical Analyses

A random effects meta-analysis was conducted. Odds ratios (*OR*s) were expressed with 95% confidence intervals (95% CIs). Cochrane *Q* test was performed to assess for statistical heterogeneity, and Higgins I^2 statistic was used to determine the extent of variation between effect estimates (0% to 100%).

In accordance with the recommendations of the Cochrane Handbook, when needed, study groups were combined so that only two distinct groups (Indigenous and non-Indigenous) were present.[24] It is important to note that Indigenous groups within and outside country borders have unique cultural histories, social structures, and lived experiences. Combining these heterogenous groups into a single group could mask any differential effects between and within Indigenous groups. However, we elected to study Indigenous women as a whole as it increased statistical power and since there was limited information on certain Indigenous groups within the searched databases (e.g., Métis women).

Our primary analysis meta-analyzed all eligible studies. Planned subgroup analyses were then conducted to examine the influence of a specific type of mental health problem (e.g.,

depression, anxiety), reproductive stage (pregnancy, postpartum), and country of residence. Sensitivity analyses were also conducted to assess the impact of risk of bias (excluding studies with a score ≤4 on the NOS). Research has also shown that young maternal age is a risk factor for the development or recurrence of perinatal mental health problems.[25,26] Since Indigenous mothers tend to be younger than their non-Indigenous counterparts,[27] we conducted a sensitivity analysis that only included studies reporting that Indigenous participants were younger than their non-Indigenous counterparts. Finally, we conducted a sensitivity analysis to determine how different clinical cutoffs defining illness severity affected prevalence rates since different ethnicities may have different thresholds for presenting symptoms of mental health problems.[28] RevMan 5.3 and R 3.4.2 Software (R Development Core Team) were used to complete statistical analyses.

Results

Search Results

Our search identified 4,583 potentially relevant articles, and 3,941 underwent title and abstract screening (after removal of duplicate citations). We identified 41 articles for full-text review and found 23 that met our inclusion criteria. Three additional articles were identified via the ancestry approach. Interrater agreement was high (Cohen κ =0.86).

Of these 26 studies, 21 were eligible for meta-analysis (see Figure 1). Tables 1a, b, and c, outline the characteristics of studies during antenatal, postnatal, and combined antenatal/postnatal periods, respectively.

Characteristics of Included Studies

Participant characteristics. A total of 444,672 perinatal women were included across the 26 studies, with 39,734 women identifying as Indigenous and 404,938 as non-Indigenous.

Study characteristics. Studies were conducted in the United States (*n* =12), Australia (*n* =6), New Zealand (*n* =4), Canada (*n* =3), and Taiwan (*n* =1). Twelve studies sampled women during pregnancy, 12 during the postpartum period, and two during pregnancy and the puerperium.

Some studies assessed more than one outcome in their sample.[29-32] Twenty-one studies assessed depression with nine using the Edinburgh Postnatal Depression Scale (EPDS),[29,33-40] five using the Center for Epidemiological Studies–Depression (CES-D),[30,31,41-43] two using the Patient Health Questionnaire-2 (PHQ-2),[44,45] two using a unique depression screening instrument designed for that study,[46,47] and one study each using the PHQ-15,[32] Postpartum Depression Screening Scale,[48] and Beck Depression Inventory (BDI).[49] Six studies measured alcohol and drug use, with two studies using diagnostic interviews,[50,51] two using the Tolerance, Worry, Eye-Opener, Amnesia, & Cut-Down Drinking Questionnaire,[30,31] and two relied on self-reports of use.[33,39] Four studies measured anxiety with two using the EPDS Anxiety subscale,[29,52] while two utilized the State-Trait Anxiety Inventory (STAI) State subscale.[30,31] Four studies assessed post-traumatic stress disorder (PTSD), with two studies using both the Traumatic Life Events and PTSD Checklist–Civilian Version,[31,53] one using the Primary Care PTSD Screen,[41] and one the Impact of Events–Revised Scale.[54] Finally, one study measured panic disorder using the PHQ-15 Panic module.[32]

The studies that were not eligible for meta-analysis either had no comparison group[33,35,41,54] or reported only continuous outcomes.[52] We completed a narrative synthesis of the results of these studies.

Table 1a. Characteristics of Antenatal (Pregnancy) Studies.

Author, Year, Country	Study Design	Indigenous Group (n)	Comparison Group(s) (n)	Mental health outcomes	Time Point	Measure(s)	Effect Estimates Indigenous vs. Comparison	Risk of Bias
Burns et al., 2006, Australia[50, 51]	Retrospective case-control	Indigenous (9018) (n=8935 for alcohol use)	Australian-born (297649) (n=297140 for alcohol use)	a) Illicit drug use b) Alcohol use[a]	Pregnancy	ICD-10-AM	a) 6.0% vs. 1.4% b) 0.8% vs. 0.1%	Low
Signal et al., 2017, New Zealand[29]	Cross-sectional	Maori (406)	Non-Maori (738)	a) Antenatal depression b) Antenatal anxiety	35-37 weeks gestation	a) EPDS (≥13) b) EPDS – anxiety subscale (≥6)	a) 22.4% vs. 15.3% b) 25.1% vs. 20.1%	Low
Buist et al., 2005, Australia[35]	Cross-sectional	Aboriginal/Torres Strai Islander (611)	Non-Aboriginal (39722)[b]	Antenatal depression	16-33 weeks gestation	EPDS (≥13)	19.0%	Low
Gavin et al., 2011, USA[32]	Prospective cohort	Asian/Pacific Islanders (273)	Non-Hispanic White (1372), Latina (202), Black (150)	a) Antenatal depression b) Antenatal panic disorder	27.4 weeks gestation (average)	a) PHQ-15 b) PHQ-15 Panic Disorder	a) 5.9% vs. 5.1% b) 1.1% vs. 3.5%	Low
Dodgson et al., 2014, USA[41]	Retrospective case-control	Native Hawaiian/Pacific Islander with PTSD (55)	Native Hawaiian/Pacific Islander without PTSD (91)	a) Antenatal depression b) Antenatal PTSD	2nd trimester	a) CES-D (≥16) b) Primary Care PTSD Screen (≥2)	a) 31.7% b) 37.7%	Low
Bowen et al., 2008, Canada[39, 52]	Cross-sectional	Aboriginal (256) (n=255 for antenatal anxiety)	Non-Aboriginal (134)	a) Antenatal depression b) Antenatal anxiety[c] c) Antenatal alcohol use d) Antenatal drug use	15.2 weeks gestation (average)	a) EPDS (≥13) b) EPDS Qs - #3-5 c) current drinker d) current drug user	a) 32.0% vs. 26.9% b) SMD = 0.00, SE = 0.15 c) 13.3% vs. 6.7% d) 23.5% vs. 8.1%	High

Morland et al., 2007, USA[53]	Prospective cohort	Native Hawaiian/Pacific Islander (39)	Asian (40), Caucasian (21), Other (1)	Antenatal PTSD	1st trimester	Traumatic Life Events Questionnaire + PTSD Checklist-Civilian Version	24.0% vs. 14.8%	High
Shah et al., 2011, Canada and Pakistan[40]	Cross-sectional	Aboriginal (128)	Pakistani (128), Canadian Caucasians (128)	Antenatal depression	1st, 2nd, or 3rd trimester	EPDS (≥13)	31.3% vs. 27.7%	High
Goebert et al., 2007, USA[30]	Prospective cohort	Native Hawaiian (24)	Asian (39), Caucasian (21)	a) Antenatal depression b) Antenatal anxiety c) Antenatal alcohol use	Pregnancy	a) CES-D (≥16) b) STAI (≥ 40) c) TWEAK (≥ 2)	a) 41.7% vs. 33.3% b) 29.2% vs. 26.7% c) 9.0% vs. 15.0%	High
Mah et al., 2017, Australia[54]	Prospective cohort	Aboriginal and Torres Strait Islander (147)	N/A	Antenatal PTSD	1st trimester	Impact of Event Scale - Revised	10.2%	High

Table 1b. Characteristics of Postnatal Studies.

Author, Year, Country	Study Design	Indigenous Group (n)	Comparison Group(s) (n)	Mental health outcomes	Time Point	Measure(s)	Effect Estimates: Indigenous vs. Comparison	Risk of Bias
Liu et al., 2018, USA[47]	Prospective cohort	Asian/Pacific Islander (463)	White (838), Hispanic (985), Black (724)	Postnatal depression	3.9 months postpartum (average)	PRAMS-3D	16.8% vs. 16.8%	Low
Liu et al., 2016, USA[44]	Prospective cohort	Asian/Pacific Islander (516)	White (799), Hispanic (596), Black (464)	Postnatal depression	9.3 weeks postpartum (average)	Two items from PHQ (depression and loss of interest)	7.6% vs. 9.5%	Low
Abbott & Williams, 2005, New Zealand[36]	Prospective cohort	Samoan (646), Tongan (285), Cook Islands Maor (227), Niuean (59), Other Pacific (47)	Non-Pacific (99)	Postnatal depression	6 weeks postpartum	EPDS (≥13)	16.1% vs. 21.2%	Low
Hayes et al., 2010, USA[45]	Prospective cohort	Hawaiian (1549), Other Pacific Islander (278), Samoan (165)	Filipino (1394), White (1345), Japanese (830), Chinese (775), Korean (340), Black (147), Hispanic (117), Other Asian (110), Other (101)	Postnatal depression	Early postpartum	Two items from PHQ (depression and loss of interest)	47.2% vs. 44.1%	High
Roberson et al., 2015, USA[46]	Prospective cohort	Native Hawaiian/Pacific Islander (20851)	White (12813), Filipina (9922), Japanese (5191), Other Asian (4034), Other (2880)	Postnatal depression	3-4 months postpartum (average)	Hawaii PRAMS depression scale (≥10)	9.4% vs. 8.8%	High
Stock et al., 2012, Australia[34]	Cross-sectional	Indigenous (3)	Non-Indigenous (197)	Postnatal depression	3.6 months postpartum (average)	EPDS (≥13)	66.7% vs. 15.2%	High
Wei et al., 2008, USA[48]	Cross-sectional	Lumbee Tribe (305)	African-American (142), Hispanic (81), White (51), Non-Hispanic Other (7)	Postnatal depression	6 weeks postpartum	PDSS (≥ 60)	29.2% vs. 20.7%	High
Huang et al., 2007, USA[42]	Prospective cohort	American Indian (267), Asian and Pacific Islander (37)	Non-Hispanic White (3918), Non-Hispanic Black (1274), Hispanics	Postnatal depression	6-12 months postpartum	CES-D	47.4% vs. 41.5%	High

			(1246), Non-Hispanic Asians (918)					
Wang et al., 2003, China and Taiwan[49]	Cross-sectional	Aborigines – Pingtung County (99)	Taiwanese (210), Chinese (196)	Postnatal depression	6 weeks postpartum	BDI (≥10)	59.6% vs. 35.0%,	High
Sugarman et al., 1994, USA[43]	Cross-sectional	American Indian (444)	Black (3849), White (3489)	Postnatal depression	Up to 1 year postpartum	CES-D (≥16)	32.0% vs. 27.9%	High
Webster et al., 1994, New Zealand[38]	Cross-sectional	Maori (42)	European (163)	Postnatal depression	4 weeks postpartum	EPDS (≥13)	14.3% vs. 6.1%	High
Onoye et al., 2009, USA[31]	Prospective cohort	Native Hawaiian/Pacific Islander (22)	Asian (20), Caucasian (12)	a) Postnatal depression b) Postnatal PTSD c) Postnatal anxiety d) Postnatal alcohol use	4-8 weeks postpartum	a) CES-D (≥16) b) Traumatic Life Events Questionnaire + PTSD Checklist-Civilian c) STAI (≥40) d) TWEAK (≥2)	a) 31.8% vs. 15.6% b) 4.5% vs. 0% c) 31.8% vs. 12.5% d) 9.1% vs. 15.6%	High

Table 1c. Characteristics of Combined Antenatal and Postnatal Studies.

Author, Year, Country	Study Design	Indigenous group (n)	Comparison Group(s) (n)	Mental Health Outcomes	Time Point	Measure(s)	Effect Estimates: Indigenous vs. Comparison	Risk of Bias
Becares & Atatoa, 2016, New Zealand[37]	Prospective cohort	Maori (1260), Pacific Islander (1029)	European (3265), Asian (1051)	a) Antenatal depression b) Postnatal depression	3rd trimester of pregnancy (average) 9 months postpartum	a) EPDS (≥13) b) EPDS (≥13)	a) 24.5% vs. 12.2% b) 16.0% vs. 8.4%	Low
Hayes et al., 2010, Australia[33]	Prospective cohort	Torres Strait Islander (92)	N/A	a) Antenatal depression b) Postnatal depression c) Antenatal drug use d) Antenatal alcohol use	Pregnancy to postpartum (anytime)	a) EPDS (≥13) b) EPDS (≥13) c), d) Demographic psychosocial assessment form	a) 37.8% b) 14.1% c) 15.0% d) 18.5%	High

If the study used specific cutoffs to define a mental health problem, they are provided in parentheses under the column "Measurement(s)." BDI = Beck Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; EPDS = Edinburgh Postnatal Depression Scale; *ICD-10-AM* = International Classification of Diseases Version 10 Australian Modification; PHQ = Patient Health Questionnaire; N/A = not applicable; PDSS = Postpartum Depression Screening Scale; PRAMS-3D = Pregnancy Risk Assessment Monitoring System-3 Depression questions; PTSD = post-traumatic stress disorder; SE = standard error; SMD = standardized mean difference; STAI = State-Trait Anxiety Inventory; TWEAK = Tolerance, Worry, Eye-opener, Amnesia, & Cut-down drinking.

[a]Antenatal alcohol use was an outcome reported in a separate paper (also by Burns et al., 2006), but since both studies contained the same participants, we placed all outcomes together.

[b]Number of non-Aboriginal women who were depressed was not reported in the study.

[c]Antenatal anxiety was an outcome reported in a separate paper (also by Bowen et al., 2008), but since both studies contained the same participants, we placed all outcomes together.

Risk of Bias and Quality Assessment

Of 26 studies, 16 were rated as having a high risk of bias (score ≤4 on the NOS—please see Table S1 in Supplemental Material data). This was most frequently due to sample selection bias (i.e., ascertainment of exposure) and outcome measurement bias.

Publication Bias

The symmetrical pattern of the funnel plot formed around the *OR* of 1.7 is not suggestive of publication bias (see Figure 2). Further, formal statistical tests (i.e., Egger test) suggest that symmetry exists in the funnel plot (P =0.79) and also supports an absence of publication bias.

Primary Analysis

When all types of mental health problems were considered, Indigenous identity was associated with 62% higher odds of experiencing such a problem than non-Indigenous women (*OR* 1.62; 95% CI, 1.25 to 2.11; see Figure 3).

Subgroup Analyses

Type of mental health problem. Drug or alcohol use problems had the highest *OR* of all problems (*OR* 3.30; 95% CI, 2.02 to 5.40; Figure 3), followed by depression (*OR* 1.38; 95% CI, 1.15

to 1.65) and anxiety (*OR* 1.37; 95% CI, 1.04 to 1.80). *OR*s for PTSD were not higher in Indigenous than non-Indigenous women but were based on just two studies. Indigenous women were less likely to have panic disorder (*OR* 0.30; 95% CI, 0.09 to 0.97), although this is only based on a single study.

Reproductive stage. Indigenous women were found to be at elevated risk of developing mental health problems during pregnancy (*OR* 1.79; 95% CI, 1.23 to 2.59) and the postpartum period (*OR* 1.34; 95% CI, 1.12 to 1.60).

Country of study. In every country (Canada, United States, New Zealand, Australia, and Taiwan), Indigenous women manifested increased odds of any mental health problem relative to non-Indigenous women.

Sensitivity Analyses

Methodological risk of bias. Including only studies with a low risk of bias produced a comparable effect estimate (*OR* 1.59; 95% CI, 1.04 to 2.44) to our primary analysis containing all eligible studies (*OR* 1.62; 95% CI, 1.25 to 2.11).

Younger Indigenous participants. When analyses were restricted to only studies that reported Indigenous perinatal participants were younger than their non-Indigenous counterparts, the size of the *OR* for Indigenous women increased to 1.86 (95% CI, 1.51 to 2.28).

Severity of illness. Five studies categorized their participants according to varying levels of severity of mental health problem (i.e., at risk/mild, moderate, severe; Figure 4). The odds of mild perinatal mental health problems among Indigenous women were not increased (*OR* 1.78; 95% CI, 0.31 to 1.97), nor were they when studies examined problems of moderate severity (*OR* 1.58; 95% CI, 0.77 to 3.26). However, Indigenous women were nearly twice as likely to manifest a severe mental health problem (*OR* 1.95; 95% CI, 1.21 to 3.16).

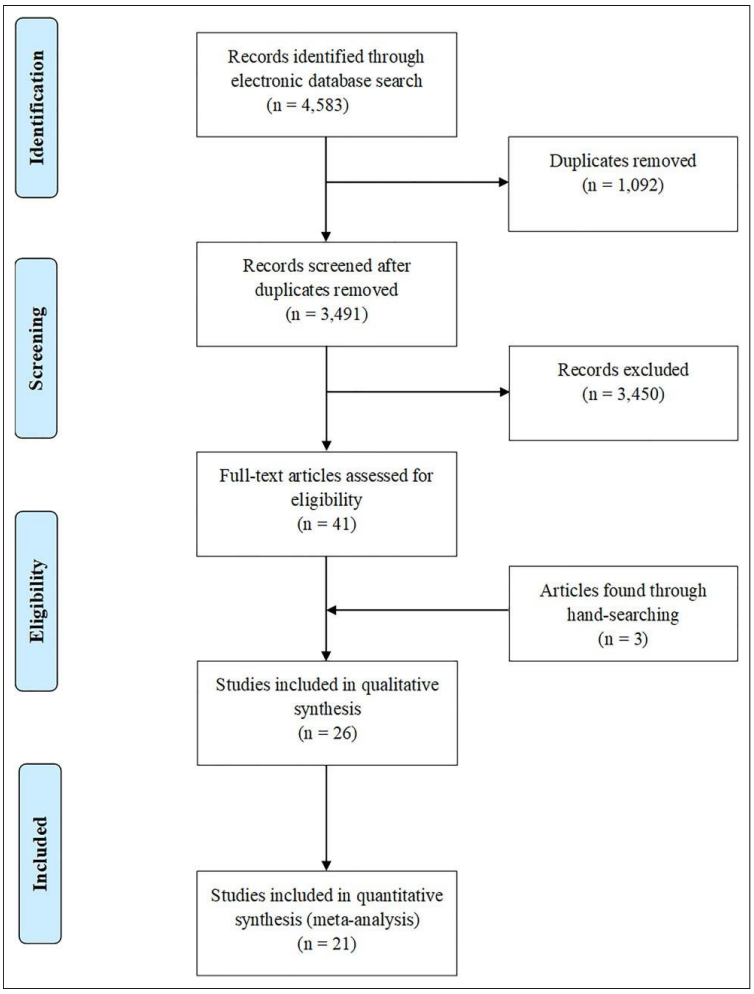

Figure 1. Flowchart displaying the number of articles identified, screened, deemed eligible, and included in the systematic review and meta-analysis.

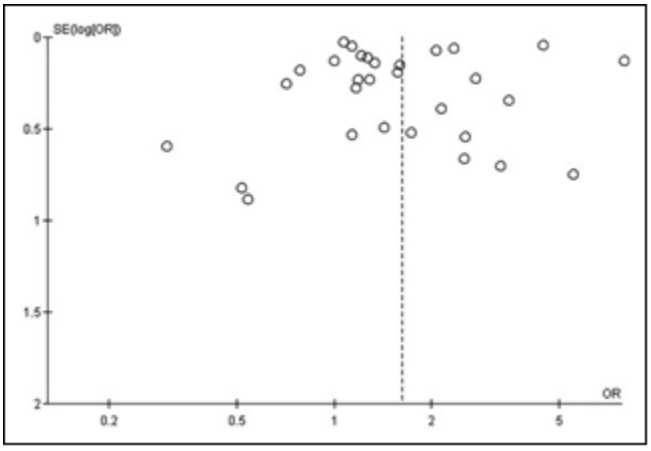

Figure 2: Funnel plot with a symmetrical pattern and an effect estimate about 1.7, suggesting an absence of publication bias

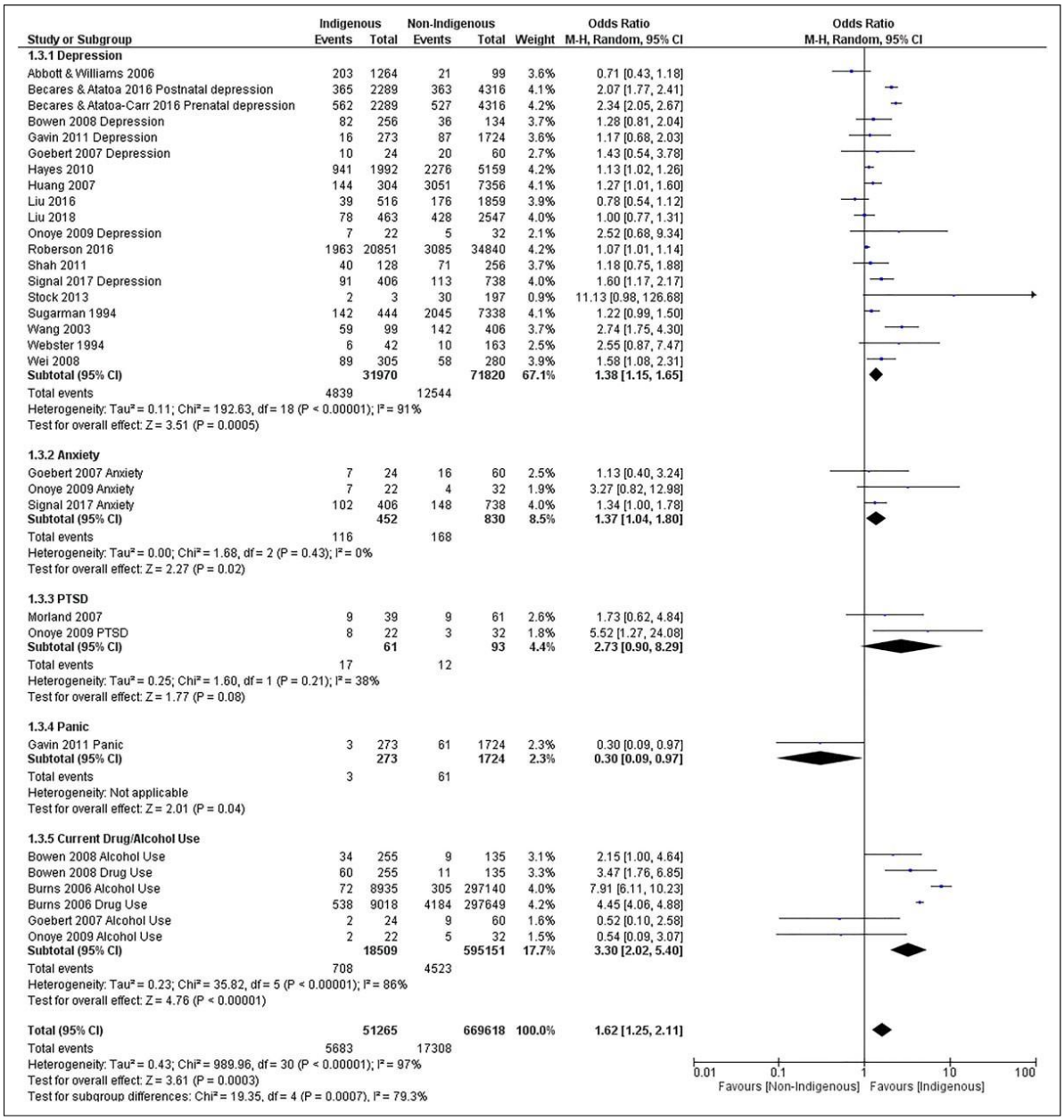

Figure 3. Perinatal mental problem among Indigenous and non-Indigenous women by type of problem.

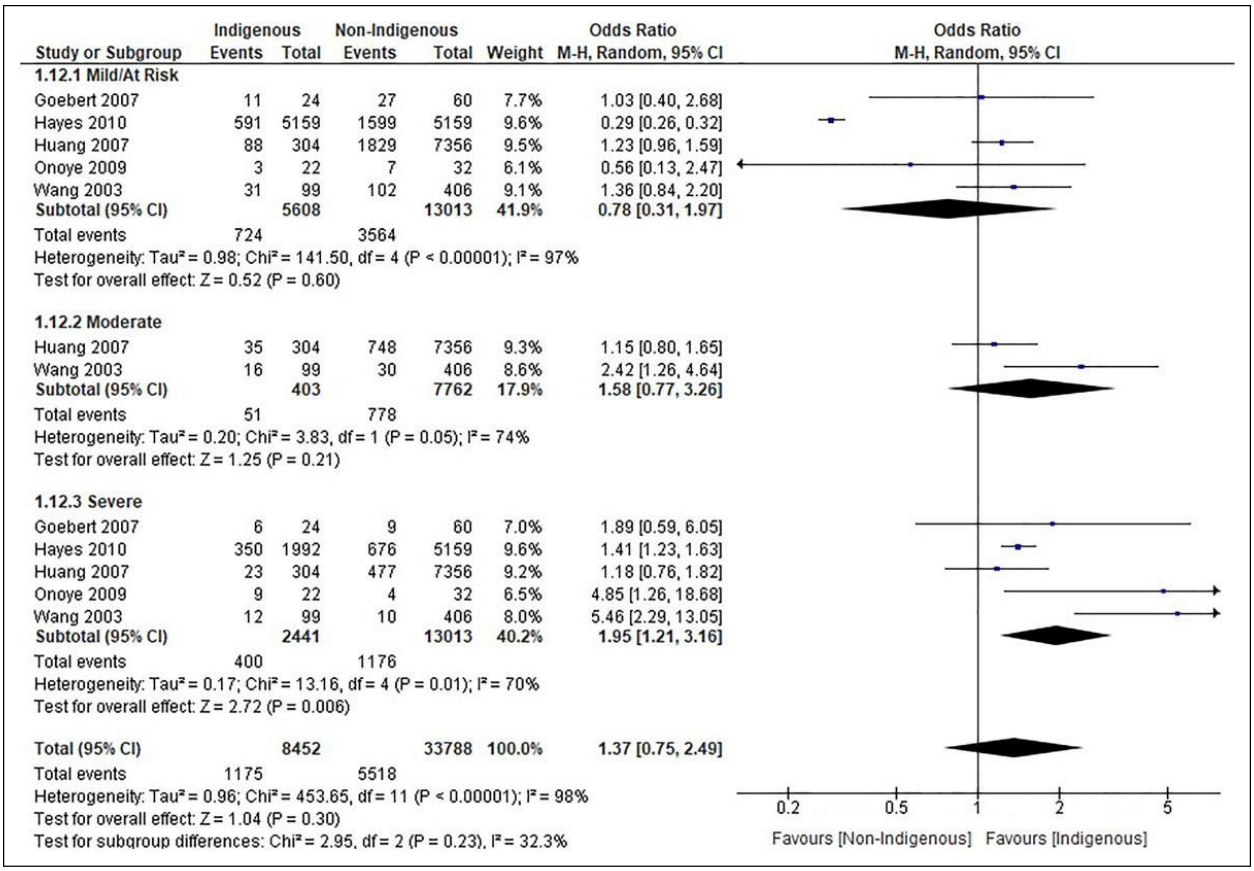

Figure 4. Perinatal mental problem among Indigenous and non-Indigenous women by severity.

Narrative Synthesis

Antenatal drug or alcohol use. Hayes et al. (2010) found that 15.0% and 18.5% of Indigenous women self-reported any drug and alcohol use, respectively, during pregnancy.[33] For context, antenatal drug and alcohol use among the general pregnant population ranges from 3.7% to 4.3% and 5.4% to 11.6%, respectively.[55]

Antenatal depression. Three of the five studies not eligible for meta-analysis reported data on prevalence rates of antenatal depression among Indigenous women from the United States[41] and Australia.[33,35] Hayes et al followed a group of 92 women who identified as Torres Strait Islanders and found that 37.8% of these women reported antenatal depression using the EPDS.[33] Dodgson et al. (2014) examined Native Hawaiian/Pacific Islander women with and

without antenatal PTSD and found antenatal depression prevalence rates of 31.7% among all women using the CES-D.[41] Finally, Buist and Bilszta (2005) conducted a cross-sectional study with 611 antenatal women identifying as Aboriginal Strait Islanders and found that 19% of them endorsed symptoms of antenatal depression through the EPDS.[35]

Antenatal anxiety. Bowen et al. (2008) conducted a prospective cohort study with 389 pregnant women from Canada (255 identifying as Aboriginal) and found no significant differences in antenatal anxiety between the two groups using the EPDS Anxiety subscale.[52]

Antenatal PTSD. Mah and colleagues conducted a cross-sectional study with 147 antenatal women from Australia identifying as Aboriginal or Torres Strait Islander and reported antenatal PTSD prevalence rates of 10.2% using the Impact of Events Scale–Revised.[54] Dodgson et al. (2014) found antenatal PTSD prevalence rates at 37.7% using the Primary Care PTSD Screen.[41] In the general perinatal population, antenatal PTSD rates are 3.3%.[56]

Postnatal depression. Hayes et al. (2010) reported that 14% of their sample expressed postnatal depressive symptoms, as assessed by an EPDS score ≥13.[33]

Overall, rates for depression and PTSD were similar to ones reported in the meta-analysis while anxiety rates were higher in the meta-analyzed studies, and drug/alcohol use rates were lower in studies contained in our meta-analysis.

Discussion

This systematic review and meta-analysis suggests that Indigenous women are at increased risk of mental health problems across the perinatal period, particularly depression, anxiety, and substance misuse. When analyses are limited to higher levels of symptoms and younger Indigenous perinatal women, odds in Indigenous women are higher still.

These findings are consistent with a recent Canadian study (that was not eligible for this review) that showed that postpartum depression rates were higher in First Nations (12.9%), Inuit (10.6%), and Métis (9.1%) women compared to their non-Indigenous peers (5.6%).[57] Using the same data, another group reported that Indigenous women were twice as likely to have postpartum depression compared to their non-Indigenous peers (*OR* 2.11; 95% CI, 1.44 to 3.09).[58]

However, previous meta-analyses on the mental health of Indigenous males and females of a wide range of ages living in the Americas, Australia, and New Zealand suggested that the prevalence of mental health problems is generally not increased relative to non-Indigenous groups, and in some cases, may even be lower.[59,60] These findings have been hypothesized to be due to the resiliency and cultural teachings of Indigenous peoples. Despite colonization and its ongoing effects, assimilation efforts, and current systematic racism hindering their quality of life, Indigenous peoples across the globe have shown profound resilience, particularly because of connectedness to traditional land and culture.[59,61] In fact, studies have shown that the more involved a community is with their culture (e.g., cultural facilities, self-governance), the lower the suicide rate in that community.[62] Indigenous peoples have faced unique social origins of mental health problems including a collective history of forced displacement, colonization, and dissolution of traditional family units (e.g., Indian Residential Schools, Sixties Scoop, Stolen Generation), combined with present-day systematic oppression, racism, forced evacuation birthing for Indigenous women living in remote and Northern areas of Canada, and high rates of intimate partner violence (up to 45 times more than their non-Indigenous counterparts).[63-65] Given these numerous structural disadvantages, it may be surprising that our reported rates of mental health problems are not higher.

The reasons for discrepancies between what might be expected based on high rates of exposure to adversities and reported risks of mental health problems are not well understood. Of relevance to perinatal psychopathology, in some Indigenous spiritualities, pregnancy is viewed as a sacred journey and gift from the Creator.[66] During this time, women are taught to honor their traditional teachings and immerse themselves in positive and good thoughts as these are a medicine for herself and her baby.[67] Therefore, perinatal Indigenous women may receive a greater level of support from their communities during this time which may, in part, protect against the development or recurrence of perinatal mental health problems.

Certainly, this review suggests that Indigenous women are at increased risk of psychopathology in the perinatal period. However, subgroup and sensitivity analyses suggest that rates may actually be even higher. Our sensitivity analysis showed that the odds were even higher in young Indigenous mothers (*OR* 1.86; 95% CI, 1.51 to 2.28) relative to when all Indigenous women were included (*OR* 1.62; 95% CI, 1.25 to 2.11). Regardless, methodological limitations present in many extant studies particularly limitations in sampling, measurement, and Indigenous engagement may affect the size of detected effects.

Indeed, 18 of the 26 studies eligible for this review employed convenience sampling to recruit participants and most studies were small and enrolled participants mainly recruited from tertiary care centers, potentially limiting the representativeness of their samples. A number of other studies specifically recruited women who were socioeconomically disadvantaged as control participants, potentially leading to overestimates of mental health problems in non-Indigenous comparison groups.[39,40,48,52]

Limitations in existing measures, particularly their lack of cultural validity, could also affect effect estimates. Of the 26 studies, 24 reviewed used self-report measures, mainly

questionnaires that have not been validated in Indigenous women (i.e., BDI, STAI, CES-D, or PHQ). The expression of poor mental health can vary from culture to culture. For instance, research has shown that some Indigenous groups may express depression as anger or somatic symptoms.[68] Using measurements normed primarily in Caucasian groups runs the risk of underestimating the prevalence of perinatal mental health problems in Indigenous women. Further, the scales used in the studies have not been formally validated in Indigenous teenagers despite research showing that Indigenous mothers tend to be younger and more likely to be teenagers.[27] To our knowledge, there are no validation studies for these scales (e.g., BDI, CES-D, EPDS, PHQ, STAI) conducted exclusively in Indigenous teenagers. This further limits our interpretation of the data, as symptom expression and illness severity may be different in teenagers compared to their older counterparts. Even questionnaires that have been previously validated may have limitations as these validation studies were completed using small samples and showed only poor predictive validity for mental health problems in Indigenous women.[69-72] Just two studies in this meta-analysis utilized structured diagnostic interviews, the gold standard for assessing psychiatric disorders. Consistent with our subgroup analyses relating to disorder severity, the two studies that utilized structured diagnostic interviews reported some of the highest *OR*s seen in this review (removing these two studies from the meta-analysis reduces the magnitude of our overall effect estimate from 1.62 [95% CI, 1.25 to 2.11] to 1.41 [95% CI, 1.20 to 1.66]). These findings suggest that mental health problems endorsed by Indigenous women may be better detected through clinical interviews and questionnaires that have been culturally validated and adapted.[73,74] Although no structured diagnostic interview (i.e., The Mini International Neuropsychiatric Interview, Structured Clinical Interview for DSM Disorders) has specifically been validated in Indigenous populations, studies have highlighted the cultural acceptability with these structured[73] or semi-structured interviews.[74]

A lack of Indigenous consultation and collaboration in included studies is another factor that could affect the size of effect estimates. Indeed, only 5 of the 26 studies employed Indigenous research methodologies[29,33] or had Indigenous research team members that interacted with participants.[36,42,54] Working with Indigenous researchers, clinicians, actors, and leaders would promote the inclusion of appropriate measurements, outcomes, and methodological design in such studies. For example, while no studies specifically examined Inuit women, it is well-known that pregnant women living in Northern and remote locations in Canada must be evacuated (by themselves) to a larger city in order to deliver their baby.[75] Research has elucidated the isolation, depression, and loss of control that these new mothers face without their family and friends nearby.[75] Such negative birthing experiences certainly contribute to poor maternal mental health, yet were not highlighted in any of the studies in our review. Actively seeking and involving Inuit actors and leaders from study inception may circumvent such methodological problems in future research. Further, given past medical research atrocities involving Indigenous groups, participants may not have been as open or trusting of non-Indigenous researchers which may have led to decreased reporting of problems overall (including those relating to mental health). Relatedly, Indigenous women who have greater trust in Western settler researchers may have been more likely to participate and been healthier, which contributed to underestimates in prevalence rates.[76,77]

Future Directions

To develop accurate estimates of Indigenous perinatal mental health problems, future research should aim to address methodological issues surrounding sampling, measurement, and Indigenous inclusion, as described earlier. Such research will help optimize screening

processes, the proper allocation of resources, and elucidate the risk and resilience processes in Indigenous perinatal women and their families.

First, studies must aim to recruit representative samples. While convenience sampling is simpler, it can introduce biases that can lead to inaccurate estimates. The use of weighted samples can ensure that typically underrepresented populations (e.g., Métis women, women living on-reserve/ reservation) are appropriately represented. In Canada, most of the research in the field has focused on First Nations and Inuit, or generically, in Indigenous peoples compared to their non-Indigenous counterparts. There is also a need for disaggregated data when studying Indigenous populations, something that has been called a topic of primary importance by the United Nations Permanent Forum.[21] Disaggregated data, which break down data into its component parts (e.g., sex, race, geographical district), are often lacking or even non-existent in Indigenous research, yet it can increase the utility and employment of data collection in different communities which are governed by different jurisdictions, healthcare systems, and cultures.[21]

Second, we propose that structured diagnostic interviews be adapted and validated to be culturally relevant and safe for Indigenous women to assess psychiatric problems. Cultural adaptation can include (a) capturing problems which may be specific to Indigenous peoples (i.e., wounded spirit), (b) asking about symptoms that may be endorsed differently (e.g., depression endorsed as anger), (c) understanding the social origins of mental health (e.g., forced geographic displacement, colonization, dissolution of traditional family units), or (d) employing methods guided by Indigenous knowledge, such as storytelling in clinical interviews.[76,78] Given that the administration of diagnostic interviews comes with many barriers (i.e., must be done by a trained and qualified professional, time-consuming, often conducted in-person),

questionnaires must concurrently be adapted and validated so that accurate prevalence rates can be estimated in an efficient, barrier-free manner.

Third, Indigenous researchers, collaborators, communities, and related allies need to be involved in all stages of projects examining perinatal mental health problems in Indigenous women. Research groups working with First Nations should employ research standards that adhere to the ownership, control, access, and possession (OCAP) principle, which provide First Nations with OCAP of the data being collected.[79] Employing the "nothing about us without us" principle will provide these communities with the empowerment, capacity, and resources to make changes that can benefit their own community members and future generations.[21,80]

Limitations

In addition to limitations in sampling, measurement, and Indigenous inclusion, limitations of studies included in the review warrant mention. First, over half (16/26) were assessed to have a high risk of methodological bias. Second, none of the studies sampled women living on-reserve/reservation, which limits our full understanding of the prevalence of perinatal mental health problems among Indigenous women. Third, some studies had a small sample of Indigenous women and thus were not adequately powered to detect differences in their primary outcome. Fourth, gray literature was not searched. Finally, we were not able to report adjusted *OR*s as 15 of the included studies failed to adjust for risk factors between Indigenous and non-Indigenous women.

Conclusion

The present review suggests that Indigenous identity increases the risk of developing a perinatal mental health problem by 62%. In order to most accurately detect and treat perinatal

mental health problems in Indigenous women, future studies must utilize representative samples, adapt and validate assessment methods to establish cultural equivalency, and engage Indigenous communities and allies under the OCAP research standard to reduce the impact of mental health problems on women, their children, and future generations.

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Chapter 3: Prevalence and Determinants of Depression, Anxiety, and Post-Traumatic Stress Disorder Among Métis Pregnant Persons in Alberta: A Population-Based Cohort Study (Study 2)

Study 2 Overview

Title: Prevalence and Determinants of Depression, Anxiety, and Post-Traumatic Stress Disorder Among Métis Pregnant Persons in Alberta: A Population-Based Cohort Study

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Context and Overall Implications: Having identified that Indigenous perinatal individuals from around the world are at a greater risk for mental health challenges (Study 1), this study examines the risk in a Canadian context and with an underrepresented group in the Indigenous health literature: Métis. This study found that Métis pregnant persons living in Alberta were more likely to have depression, anxiety, and post-traumatic stress disorder during pregnancy compared to their age-matched non-Métis peers. Common determinants of both depression and anxiety among Métis pregnant persons included: pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location. Taken together, findings from Studies 1 and 2 suggest that Indigenous perinatal individuals (including Métis pregnant persons) are more likely to have mental health challenges, and can inform the design of interventions which target modifiable risk factors.

Acknowledgements: We would like to acknowledge the Métis Nation of Alberta for their research partnership, helping generate the research questions, and aiding in data interpretation.

Conflicts of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

This manuscript has not yet been submitted to a peer-reviewed journal

Abstract

Background: Little is known about perinatal mental health and their determinants among the Métis, the second largest Indigenous group in Canada. We identified the prevalence and determinants of depression, anxiety, and post-traumatic stress disorder (PTSD) among Métis pregnant persons in Alberta, Canada.

Methods: This was a retrospective population-based cohort study of singleton and multifetal live births in Alberta, Canada between April 1, 2006 to March 31, 2016. The Métis cohort was identified based on registration with the Métis Nation of Alberta. Linked administrative health databases were used to identify cases of depression, anxiety, and PTSD as well as their potential determinants among Métis pregnant persons. Multivariable logistic regression models statistically adjusted for important maternal and sociodemographic factors and generated adjusted risk ratios (aRR) with 95% confidence intervals (CI). Statistical significance was set at $P < 0.05$.

Results: Of the 495,457 live births identified during the study period, 8,163 (1.6%) were Métis. After adjusting for relevant maternal and sociodemographic factors, Métis pregnant persons were at a 47% (aRR 1.47, 95% CI 1.17, 1.85) and 36% (aRR 1.36, 95% CI 1.09, 1.70) increased risk for depression and anxiety, respectively, compared to non-Métis pregnant persons. PTSD cases were low among the Métis (n<20) precluding further analyses although prevalence was higher among Métis (0.07%, 95% CI 0.01%, 0.12%) than non-Métis (0.03%; 95% CI 0.02%, 0.04%) participants. Determinants common to both depression and anxiety among Métis pregnant persons included pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location.

Conclusion: Métis pregnant persons are at an increased risk for having depression, anxiety, and PTSD during pregnancy. Researchers should partner with Métis communities and organizations to continue to identify targets for intervention to optimize the mental health of Métis pregnant persons and their families.

Keywords: Indigenous peoples; pregnancy; depressive disorder; anxiety disorders; stress disorders, post-traumatic

Introduction

Depression and anxiety are one of the most common mental health problems during pregnancy. Indeed, 7.1%[1] and 8.5%[2] of pregnant persons will be diagnosed with major depressive disorder and generalized anxiety disorder, respectively. Although, up to one in five individuals will experience sub-threshold depressive and anxiety symptoms during pregnancy.[3,4] Post-traumatic stress disorder (PTSD) estimates are lower (3.3% during pregnancy), however these estimates increase to nearly 20% when examining high-risk samples (e.g., severe pregnancy complications, history of childhood abuse).[5] Depression, anxiety, and PTSD are associated with a range of negative consequences for the pregnant person, offspring, and family, which can have impacts across the lifespan.[6]

In order to address perinatal mental health challenges and develop targets for intervention, risk factors should be identified. Common risk factors for depression, anxiety, and PTSD during pregnancy include low socioeconomic status,[7–9] intimate partner violence,[9–11] and chronic maternal health conditions.[12,13] One group that faces disproportionate exposure to these risk factors are Métis pregnant persons. Métis, descendants of unions between First Nations women and European fur traders in the 1700s, are one of three Indigenous groups in Canada (with First Nations and Inuit being the other two). Métis have a unique heritage, culture, and language that is distinct from First Nations and Inuit. Today, there are nearly 625,000 Métis individuals across Canada, with the second-largest population residing in the province of Alberta (127,000).[14]

The enduring effects of colonialism have resulted in Métis pregnant persons facing a number of structural disadvantages (e.g., socioeconomic disadvantage, significant life stressors, and intergenerational trauma) which can increase the risk for mental health challenges.[15]

Moreover, Métis individuals face Métis-specific determinants of health which could further increase the risk. For instance, exclusion from historic treaties, subjection to the Scrip system (which resulted in widespread loss of Métis lands), exclusion from Non-Insured Health Benefits Program (that Status First Nations and Inuit are eligible for), experience of lateral violence from Indigenous colleagues, and discrimination and racism in mainstream healthcare can negatively influence well-being among Métis adults.[16]

Research has shown that Indigenous pregnant persons and birthing parents are at a 62% increased risk for experiencing perinatal mental health challenges.[17] However, Métis-specific data are limited. Existing data have only focused on depression and found that Métis individuals that identified as women self-reported a higher prevalence of pre-existing depression[18] and postpartum depressive symptoms[19] compared to their non-Indigenous counterparts. While these studies have contributed to the small literature on Métis perinatal mental health, they may be subjected to participant selection and response bias which could limit the generalizability of results. More comprehensive data that reduces the reliance on self-report are needed to calculate prevalence estimates of depression, anxiety, and PTSD during pregnancy. Such data could contribute to accurate estimates of mental health challenges during pregnancy and establish benchmarks from which change can be measured and evidence-based policies can be developed.

The prevalence of perinatal mental health cannot be studied in isolation. Individual and social-environmental determinants of health can influence perinatal mental health, help identify intervention targets, and guide the development of culturally-appropriate treatments.[20] Identifying these determinants also aligns with the Métis definition of well-being which is conceptualized as a holistic interconnection between emotional, physical, and spiritual health.[21]

Only one study, to our knowledge, has identified determinants of perinatal mental health among Métis individuals that identified as women. Experiencing three or more stressful events, abuse, and low or no social support were associated with postpartum depressive symptoms among Métis birthing parents.[18] While this study provides Métis-specific data, information on variables associated with mental disorders during pregnancy could allow for earlier intervention to reduce the burden of these challenges on the birthing parent and offspring.

The objectives of this study were two-fold: 1) To estimate the prevalence of depression, anxiety, and PTSD during pregnancy among the Métis in Alberta and compare these to non-Métis pregnant persons, and 2) To identify determinants of depression, anxiety, and PTSD during pregnancy among Métis pregnant persons.

Methods

Ethics statement

This study received ethics approval from the University of Alberta and was conducted in partnership with the Métis Nation of Alberta (MNA).

Study design and data sources

We conducted a retrospective cohort study of all live births (>22 weeks gestation) from singleton and multifetal pregnancies occurring in Alberta, Canada from 2006-2016. Alberta is the fourth most populous province and contains the second-largest Métis population in the country.[14] The Métis consider Alberta as part of their Métis Nation Homeland and have historical ties to the province.[22] Alberta is also the only province in Canada where Métis have self-governance and jurisdiction over their lands.[22] We used the Alberta Perinatal Health Program (APHP) to identify births occurring in the province. The APHP is a validated registry

which contains maternal and newborn clinical and demographic information for every birth in Alberta that occurred in a hospital or was attended by a registered midwife at home. We used the Discharge Abstract Database and Alberta Physician Claims Assessment database to identify cases of depression, anxiety, and PTSD based on hospitalizations or physician claims according to ICD-9 and ICD-10-CA criteria. We used the Pampalon Material and Social Deprivation Index Dataset to assign an area-level socioeconomic status to the residential postal code at delivery. The MNA, the Alberta Health Analytics and Performance Reporting Branch, the APHP, and the Strategy for Patient Oriented Research Data Access Platform of the University of Alberta provided access to individual and anonymized data from the data repositories.

Exposure

Our exposure variable was Métis status. In this study, Métis (yes/no) was defined as being a member with the Métis Nation of Alberta during any period from 2006-2016. The MNA has approximately 46,000 members, the largest membership of all the Métis Nations across Canada.[14] With additional probabilistic linkage with the Alberta Health Care Insurance Plan registry for kin ties, the identification and linkage of approximate 64,000 Métis (Métis Nation of Alberta members and non-members) is feasible. Probabilistic linkage is a well-validated approach to linking databases with partially identifiable data.[23] All eligible births identified as non-Métis within the study population were selected for comparison.

Outcomes

Depression, Anxiety, and PTSD. Participants were identified with a mental disorder during pregnancy if they had one or more hospitalizations or two or more physician claims for the following disorders in the 10 months prior to birth: depression (ICD-9: 296.2, 296.3, 296.5, 300.4, 309.x (except 309.81), and 311; ICD-10-CA: F20.4, F31.3-F31.5, F32.x, F33.x, F34.1,

F41.2, and F43.2), anxiety (ICD-9: 300.0, 300.2; ICD-10-CA: F40.x, F41.x), and PTSD (ICD-9: 309.81; ICD-10-CA: F43.1x). These case definitions were selected based on validated case definitions in the literature,[24–27] or those used among Métis individuals.[28]

*Determinants of mental disorders during pregnancy***.** We selected determinants of mental disorders during pregnancy based on the literature.[29] These included: maternal age during pregnancy (<20, 20-34, ≥35), parity (0, 1, 2, ≥3), pregnancy type (single or multifetal), pre-pregnancy health one year prior to pregnancy (i.e., high weight, diabetes mellitus, depression/anxiety, heart disease, hypertension, renal disease, other conditions), pregnancy health (gestational hypertension, gestational diabetes, preeclampsia, anemia, smoking cigarettes, alcohol use, or recreational substance use), adequacy of prenatal care (no care, inadequate, intensive, intermediate, or adequate), and place of residence (urban or rural). The Pampalon Index was used to establish quintiles of material and social deprivation (least deprived [1] to most deprived [5]). The Pampalon Index is an aggregated, area-based index using Census data (area-level income, education, and employment) and maternal postal code at delivery.[30] Place of residence was categorized as urban or rural based on population density, distance from urban centres, among other criteria.[31]

Statistical Analysis

Clinical and social-environmental characteristics were described in absolute frequencies and percentages for Métis and non-Métis participants. Hypothesis testing to identify differences among these characteristics was not conducted given the exploratory nature of our research question, and since we examined determinants among the Métis cohort only. The period prevalence of depression, anxiety, and PTSD during pregnancy for study cohorts from 2006 to 2016 was calculated using the total number of cases as the numerator and the total number of

pregnancies as the denominator and standardized by age using the 2010 Canadian age-distribution for females as the reference population.[32] The extent to which the type of population (Métis/non-Métis) was associated with changes in the occurrence of mental disorders was estimated using multivariable multilevel logistic regression models adjusting for relevant individual and social-environmental variables. The result was expressed as an adjusted risk ratio (aRR) with 95% confidence intervals (CI). The association (aRR with 95% CI) of individual and social-environmental variables with mental disorders during pregnancy exclusively among Métis pregnant persons was estimated using multivariable multilevel logistic regression models.

Results

A total of 495,457 live births (1.6% Métis) that occurred in Alberta from 2006-2016 were included in the study (Figure 1). Table 1 describes clinical and sociodemographic characteristics of the Métis and non-Métis pregnant persons. The majority of Métis pregnant persons were aged 20-34 (81.7%) and were birthing their first child (42.2%). The prevalence of pre-pregnancy conditions such diabetes, depression/anxiety, heart disease, hypertension, and renal disease were low (<1.3%), however some of these were higher in prevalence during pregnancy. For instance, 5.4% and 5.2% of Métis pregnant persons had gestational hypertension and gestational diabetes, respectively. Other conditions such as preeclampsia or anemia during pregnancy were less common. The majority of Métis pregnant persons reported not smoking (68.8%) or not using alcohol/other recreational substances during pregnancy (93.1%). Regarding place of living, over one-third of Métis pregnant persons lived in a rural area and almost half were living in the two most materially and socially deprived areas.

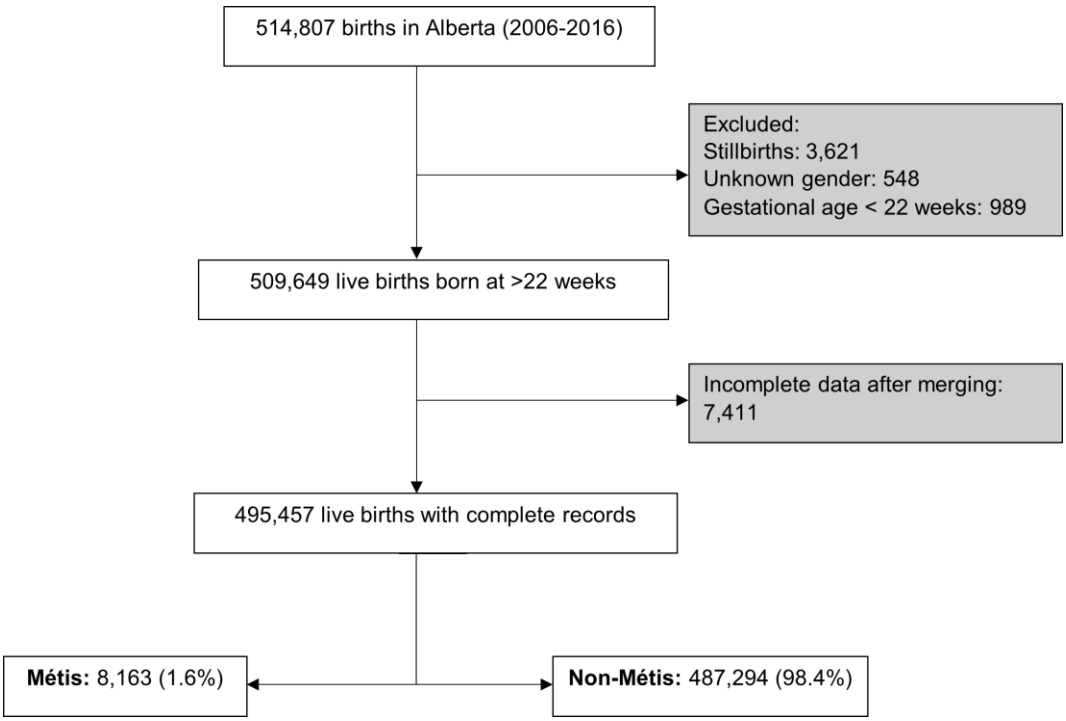

Figure 1. Flow diagram of eligible participants forming Métis and non-Métis cohorts

Table 1. Individual and social-environmental characteristics among Métis and non-Métis pregnant persons

	Métis, % (n)	**Non-Métis, % (n)**
Age		
<20	8.5 (690)	3.4 (16,512)
20-34	81.7 (6,668)	78.3 (381,327)
35+	9.9 (805)	18.4 (89,448)
Pre-pregnancy weight ≥ 91 kg		
Yes	14.3 (1,168)	9.2 (44,727)
No	84.8 (6,923)	90.2 (439,297)
Missing	0.9 (72)	0.7 (3,270)
Pre-pregnancy weight < 45 kg		
Yes	0.3 (25)	0.7 (3,268)
No	98.8 (8,066)	98.7 (480,756)
Missing	0.9 (72)	0.7 (3,270)
Pre-pregnancy diabetes		
Yes	1.3 (109)	1.2 (5,596)
No	97.8 (7,982)	98.2 (478,431)
Missing	0.9 (72)	0.7 (3,267)
Pre-pregnancy depression/anxiety		
Yes	0.3 (28)	0.2 (981)
No	99.6 (8,135)	99.8 (486,313)
Pre-pregnancy heart disease		
Yes	0.1 (5)	0.1 (340)
No	99.1 (8,086)	99.3 (483,687)
Missing	0.9 (72)	0.7 (3,267)
Pre-pregnancy hypertension		
Yes	1.2 (99)	1.0 (4,623)
No	97.9 (7,992)	98.4 (479,404)
Missing	0.9 (72)	0.7 (3,267)
Pre-pregnancy renal disease		
Yes	0.1 (11)	0.1 (450)
No	98.9 (8,080)	99.2 (483,577)
Missing	0.9 (72)	0.7 (3,267)
Other pre-pregnancy medical diseases*		
Yes	8.0 (650)	7.5 (36,772)
No	91.2 (7,441)	91.8 (447,252)
Missing	0.9 (72)	0.7 (3,270)
Pregnancy type		
Single	96.7 (7,897)	96.6 (470,787)
Multifetal	3.3 (266)	3.4 (16,507)
Parity		
0	42.2 (3,448)	42.5 (207,304)

1	31.1 (2,538)	34.3 (167,143)
2	15.6 (1,277)	14.0 (68,271)
3+	10.5 (860)	8.8 (42,729)
Missing	0.5 (40)	0.4 (1,847)
Gestational hypertension		
Yes	5.4 (437)	5.4 (26,486)
No	93.8 (7,147)	93.9 (457,541)
Missing	0.9 (72)	0.7 (3,267)
Gestational diabetes		
Yes	5.2 (427)	5.8 (28,159)
No	93.9 (7,664)	93.6 (455,868)
Missing	0.9 (72)	0.7 (3,267)
Preeclampsia		
Yes	1.4 (116)	1.3 (6,088)
No	96.9 (7,907)	97.3 (474,258)
Missing	1.7 (140)	1.4 (6,948)
Anemia during pregnancy		
Yes	0.8 (64)	0.9 (4,329)
No	98.3 (8,027)	98.4 (479,698)
Missing	0.9 (72)	0.7 (3,267)
Pregnancy care		
Adequate	36.1 (2,943)	38.2 (185,943)
Intermediate	41.2 (3,364)	37.8 (184,416)
Intensive	3.8 (309)	3.8 (18,384)
Inadequate	16.2 (1,323)	16.5 (80,602)
No care	2.7 (224)	3.7 (17,949)
Smoking in pregnancy		
Yes	30.4 (2,479)	14.3 (69,651)
No	68.8 (5,612)	85.0 (414,376)
Missing	0.9 (72)	0.7 (3,267)
Alcohol or recreational substance use in pregnancy		
Yes	6.0 (492)	3.0 (14,387)
No	93.1 (7,599)	96.4 (469,639)
Missing	0.9 (72)	0.7 (3,268)
Place of residence		
Rural	36.9 (3,014)	23.7 (115,471)
Urban	62.0 (5,061)	75.4 (367,394)
Missing	1.1 (88)	0.9 (4,429)
Material Index Quintile		
1-least deprived	10.0 (819)	18.6 (90,665)
2	16.7 (1,360)	18.9 (92,160)
3	18.9 (1,544)	18.8 (91,795)
4	22.5 (1,837)	18.4 (89,719)
5-most deprived	26.4 (2,156)	20.0 (97,523)

Missing	5.5 (447)	5.2 (25,432)
Social Index Quintile		
1-least deprived	12.2 (994)	13.0 (63,384)
2	14.6 (1,189)	18.9 (92,103)
3	20.3 (1,660)	21.8 (105,992)
4	27.2 (2,218)	21.9 (106,929)
5-most deprived	20.3 (1,655)	19.2 (93,454)
Missing	5.5 (447)	5.2 (25,432)

* Other pre-pregnancy diseases include: conditions such as severe asthma, lupus, epilepsy, or Crohn's disease

Prevalence and determinants of depression

The age-standardized period prevalence of depression during pregnancy among the Métis was 3.3% (95% CI 2.7%-3.9%) compared to 2.2% (95% CI 2.1%-2.3%) among the non-Métis (see Table 2). After adjusting for maternal age, multifetal pregnancy, pre-pregnancy weight ≥91kg, any pre-pregnancy medical condition, smoking/alcohol use/recreational substance use during pregnancy, living in an urban environment, and exposure to material and social deprivation, Métis pregnant persons were at a 47% increased risk of having depression during pregnancy when compared to their non-Métis peers (aRR 1.47, 95% CI 1.17, 1.85).

When statistically adjusting for all relevant maternal and sociodemographic variables (i.e., maternal age, parity, multifetal pregnancy, pre-pregnancy weight ≥91 kg, any pre-pregnancy condition, any gestational medical condition, adequacy of prenatal care, smoking/alcohol use/recreational substance use during pregnancy, living in an urban environment, and exposure to material and social deprivation) we identified four factors that were associated with depression among Métis pregnant persons. Pre-pregnancy weight ≥91kg, pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location were associated with an increased risk of depression (Figure S1 in the Supplementary Information). The strongest association with depression during pregnancy was having pre-pregnancy medical conditions (aRR 4.01, 95% CI 2.50-6.41).

Prevalence and determinants of anxiety

The age-standardized period prevalence of anxiety during pregnancy among the Métis was 3.5% (95% CI 2.9%-4.2%) compared to 2.5% (95% CI 2.4%-2.6%) among the non-Métis. After adjusting for maternal age, multifetal pregnancy, pre-pregnancy weight ≥91kg, any pre-pregnancy medical condition, smoking/alcohol use/recreational substance use during pregnancy, living in an urban environment, and exposure to material and social deprivation, Métis pregnant persons were at a 36% increased risk of having anxiety during pregnancy when compared to their non-Métis peers (aRR 1.36, 95% CI 1.09, 1.70).

When statistically adjusting for the aforementioned maternal and sociodemographic variables, we identified six factors that were associated with anxiety among Métis pregnant persons. Three of these were the same as depression: pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location; and three additional factors specific to anxiety were also identified: parity ≥3, having a multifetal pregnancy, and gestational medical conditions (Figure S2 in the Supplementary Information). The strongest association with anxiety during pregnancy was having a multifetal pregnancy (aRR 3.04, 95% CI 1.23-7.55).

Prevalence of PTSD

The prevalence of PTSD during pregnancy among the Métis was 0.07% (95% CI 0.01%-0.12%) compared to 0.03% (95% CI 0.02%-0.04%) among the non-Métis. Since the number of PTSD cases were too small in the Métis group (n<20), we did not calculate age-standardized prevalence estimates nor did we conduct any further statistical analyses for PTSD.

Table 2. Crude and age-specific standardized period prevalence of mental health outcomes during pregnancy for Métis and non-Métis pregnancies in Alberta (2006 – 2016).

	Métis			Non-Métis		
	N	**Crude prevalence (95% CI)**	***Age-specific standardized prevalence (95% CI)**	**N**	**Crude prevalence (95% CI)**	***Age-specific standardized prevalence (95% CI)**
Depression	265	3.3% (2.9, 3.6)	3.3% (2.7, 3.9)	9,968	2.1% (2.0, 2.1)	2.2% (2.1, 2.3)
Anxiety	272	3.3% (2.9, 3.7)	3.5% (2.9, 4.2)	11,934	2.5% (2.4, 2.5)	2.5% (2.4, 2.6)
PTSD	<20	0.07% (0.01, 0.12)	Not applicable	146	0.03% (0.02, 0.04)	Not applicable

PTSD = Post-traumatic stress disorder
*Age standardization using as reference population the 2010 Canadian Age-distribution for Females. Statistics Canada. Table 17-10-0005-01 Population estimates by age and sex DOI: https://doi.org/10.25318/1710000501-eng
Note: For PTSD, given the small number of cases (n<20) for the Métis group, no age-standardization was applied.

Discussion

We found that Métis pregnant persons were at an increased risk for depression, anxiety, and PTSD when compared to their age-matched non-Métis pregnant peers. These results are consistent with a systematic review and meta-analysis of 21 studies which found that Indigenous individuals from around the world are at a 62% increased risk of experiencing a perinatal mental health challenge compared to their non-Indigenous peers.[17] Higher risk may be due to greater exposure to low socioeconomic disadvantage,[33] intimate partner violence,[34] and experience of Métis-specific risk factors such as discrimination and racism in mainstream and First Nations-dominant healthcare systems.[16]

Our prevalence estimates of depression, anxiety, and PTSD (for both Métis and non-Métis cohorts) are lower when compared to other studies using data from administrative databases.[35–38] In one study of 45,362 perinatal individuals living in Manitoba, researchers found the prevalence of a physician-diagnosed mood and/or anxiety disorder during pregnancy

was 13.5%.[36] Another study of pregnant persons in the USA (n=4,398) found that 6.9% had a depressive disorder during pregnancy.[35] These studies may have higher prevalence estimates than ours due to differences in depression and anxiety case definitions. Indeed, the aforementioned studies had more inclusive eligibility criteria for their case definitions (i.e., included disorders that we excluded) which may have inflated their estimates. For instance, these studies included a diagnosis of obsessive compulsive disorders (OCD) in their mood and/or anxiety case definition despite OCD no longer being classified as an anxiety disorder.[36] One study also included receipt of an antidepressant as being a proxy for having a depressive disorder, which may overestimate prevalence estimates as some antidepressants may be used off- label for non-depressive conditions.[35] Similarly, among studies using administrative health databases, PTSD prevalence estimates during pregnancy range from 0.5%-1.7%.[37,38] These study estimates may be higher than ours since these studies sampled military populations (who have higher baseline estimates of PTSD compared to the general population) and also because there may be increased screening and awareness of PTSD in the military population which could lead to increased prevalence estimates.[37,38]

Two determinants that were common to both depression and anxiety among Métis pregnant persons included pre-pregnancy medical conditions and smoking/alcohol use/recreational substance use during pregnancy. The mechanisms underlying associations between pre-pregnancy health conditions and mental health among Métis pregnant persons are not known although some research points to stress-axis dysfunction as a potential mechanism.[39] Indeed, in a study where Métis pregnant persons were interviewed about their maternal health, participants attributed their poor health conditions to stress and "being made to feel guilty" about their medical conditions.[40] The mechanisms underlying substance use and mental disorders during pregnancy are less clear and include shared genetic traits[41] or neurochemical

changes that make individuals more vulnerable to the development of depression and anxiety.[42] Bidirectional relationships may also exist where mental health challenge such as depression or anxiety may lead to smoking as a form of self-medication.[43] Indeed, previous research supports that Métis pregnant persons view smoking as a way of coping and dealing with life stressors, including mental health challenges.[40]

Interestingly, we found that living in an urban region (as compared to a rural one) contributed to both depression and anxiety cases. This is in contrast to some research studies among Indigenous and non-Indigenous adults which has shown that living in an urban area was associated with fewer mental health problems compared to living in a rural location.[44–46] Our findings may differ as it could be that living in an urban location may reflect greater access to healthcare and therefore inflates the prevalence estimate since we utilized a treatment-seeking sample. It could also be because despite more Métis people living in urban areas, they are far away from their traditional Métis settlements. These settlements, despite their small population, have a significant impact on Métis self-governance, self-determination, and resistance and resurgence.[47] Therefore, living away from traditional settlements and lands could be a risk factor and negatively impact the mental health of Métis pregnant persons.

Our findings suggest that Métis pregnant persons are more likely to have depression, anxiety, and PTSD compared to their non-Métis peers. Researchers should consider partnering with Métis communities and organizations to increase access to culturally-safe mental health services. Moreover, given that pregnant persons are highly motivated to adopt positive health behaviours,[48] substance use reduction interventions, particularly those that offer mental health components, should be offered. Facilitating the provision of mental health treatment and the

design and implementation of culturally-relevant interventions may help reduce the burden of mental health challenges among Métis pregnant persons.

Strengths and Limitations

This study contains a few strengths. First, utilizing administrative health databases allows us to draw informed conclusions about large, representative, population-based cohorts. Second, in keeping with the guidelines outlined in the Tri-Council Policy Statement 2 Chapter 9, we have partnered with the MNA to ensure that our research questions are relevant and beneficial to the community.[49] Third, by focusing on Métis pregnant persons, not only are we increasing their much needed representation in the health literature, but we are in line with the United Nations Permanent Forum on Indigenous Issues which advocates for the collection of disaggregated data for Indigenous communities.[50]

The limitations of this study must also be discussed. While administrative health databases provide a rich amount of data, they are not designed for research purposes, and so we are limited in the outcomes we can examine. For instance, we are unable to examine how Métis-specific risk factors influence the prevalence of depression and anxiety. However, partnering and consulting with the MNA will ensure that our results are appropriately contextualized. Similarly, we were unable to calculate body mass index as weight and height were not measured as continuous variables. However, there is some research to suggest that body mass index may not be the most accurate measure of obesity and that other measures such as total body fat, waist circumference, and wait-to-hip ratio can be considered.[51,52] Another limitation is that no anxiety case definition for the general population, including the one we have used, has been validated against a reference standard. However, our case definition has been used in population-based cohorts of individuals living in Canada, including the Métis

living in Manitoba, and so may be an appropriate definition to use in our study.[28] Finally, these data are restricted to help-seeking individuals (i.e., those who interacted with the healthcare system) and we are unable to identify undiagnosed depression, anxiety, and PTSD during pregnancy in these population-based cohorts.

Conclusion

Using data from a population-based cohort, we identified that Métis pregnant persons have a higher prevalence of depression, anxiety, and PTSD compared to non-Métis pregnant persons, and pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use, and living in an urban location contributed to these cases. Future researchers should continue to partner with Métis communities and organizations to co-develop culturally-safe interventions to reduce the burden of these challenges and optimize the health of Métis pregnant persons, their offspring, and communities.

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Chapter 4: Psychopathology in the Offspring of Indigenous Parents with Mental Health Challenges: A Systematic Review (Study 3)

Study 3 Overview

Title: Psychopathology in the Offspring of Indigenous Parents with Mental Health Challenges: A Systematic Review

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Context and Overall Implications: With the knowledge that Indigenous perinatal individuals are at an increased risk for mental health challenges, and that parental psychopathology is one of the most potent risk factors of child psychopathology, we examined the association of parent and offspring mental health challenges among Indigenous families. We found that children of Indigenous parents who had mental health challenges were more likely to experience psychopathology compared to children of healthy Indigenous parents. Additionally, the association of psychopathology may be stronger in Indigenous than non-Indigenous dyads.

Acknowledgements: We would particularly like to thank Mr. Troy Hill (Mohawk, Six Nations of the Grand River Reserve) and Dr. Jacob Burack for their collaboration. Mr. Hill provided his perspectives on Indigenous ways of knowing while also reminding us of the significant and rich diversity of Indigenous Peoples. Dr. Jacob Burack shared his learning and experiences during a more than 2 decades long collaboration with the educators and students of the Jimmy Sandy Memorial School and the community leaders of the Naskapi Nation of Kawawachikamach, Québec, Canada, as well as from a similarly long academic association and friendship with Dr. George Blacksmith, a Cree educator and scholar whose collection of first-hand accounts of the

multigenerational effects of the residential schools on the Cree of northern Quebec is essential reading in the history of the Indigenous Peoples living in Canada. We would like to acknowledge Jo-Anne Petropoulos for her help in reviewing the search strategies.

Conflict Of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Published In: Canadian Journal of Psychiatry

Citation Information: Owais S, Faltyn M, Zou H, Hill T, Kates N, Burack JA, et al. Psychopathology in the Offspring of Indigenous Parents with Mental Health Challenges: A Systematic Review: Psychopathologie Des Descendants De Parents Autochtones Ayant Des Problèmes De Santé Mentale: Une Revue Systématique. *Can J Psychiatry Rev Can Psychiatr*. 2021 Jun;66(6):517-536. doi: 10.1177/0706743720966447

Abstract

Objective: Parental psychopathology is a significant risk factor for mental health challenges in offspring, but the nature and magnitude of this link in Indigenous Peoples is not well understood. This systematic review examined the emotional and behavioral functioning of the offspring of Indigenous parents with mental health challenges.

Method: We searched MEDLINE, EMBASE, PsycINFO, CINAHL, and Web of Science from their inceptions until April 2020. Studies were included if they included assessments of emotional, behavioral, or other psychological outcomes in the offspring of Indigenous parents with a mental health challenge.

Results: The 14 studies eligible for review were focused on parental substance misuse (n = 8), maternal internalizing (i.e., depression, anxiety) issues (n = 5), and poor overall parental mental health (n = 4). In 11 studies, parental substance misuse, depression, and/or overall mental health challenges were associated with 2 to 4 times the odds of offspring externalizing and internalizing behaviors as compared to offspring of Indigenous parents without mental health challenges.

Conclusion: The findings suggest higher risks of mental health challenges among offspring of Indigenous parents with psychiatric difficulties than among Indigenous children of parents without similar difficulties. Knowledge of these phenomena would be improved by the use of larger, more representative samples, culturally appropriate measures, and the engagement of Indigenous communities. Future studies should be focused on both risk and resilience mechanisms so that cycles of transmission can be interrupted and resources aimed at detection, prevention, and treatment optimally allocated.

Trial Registration: PROSPERO-CRD42019121301

Keywords: Indigenous people, mental disorders, intergenerational relations, parents, child, adolescent

Introduction

The presence of mental health challenges in a parent increases the risk of offspring mental health challenges by up to 5 times, one of the most potent risks known.[1-5] When parents are successfully treated, rates of mental disorders in offspring decrease,[6] highlighting the importance of detection and treatment in interrupting the intergenerational transmission of psychopathology.

The rearing environment plays an important role in this transmission. Those facing structural barriers such as institutionalized racism, poor access to health care, and forced dislocation to areas with minimal food availability, crowded housing, and inadequate transportation infrastructure can be more profoundly impacted by these social origins of disease than those not exposed. Indigenous Peoples, the original owners and inhabitants of their lands with diverse cultures within and across country borders, often face structural disadvantages due to the shared impact of historic and ongoing colonization and oppression.[7-10] This trauma differs from typical trauma because it is colonial in nature, transgenerational, and cumulative due to current systematic barriers and structural racism.[11]

Intergenerational colonial trauma and violence has caused patterns of land dislocation, institutionalization, and cultural erasure contributing toward Indigenous identity loss, breakdown of family units, historical trauma, and ultimately poor mental health outcomes.[11-16] The intergenerational transmission of mental health challenges may be mediated by epigenetic changes, alterations occurring in gene expression that take place without changes in the underlying DNA sequenece.[17,18] For instance, parental stress and trauma are associated with a downregulation of glucocorticoid receptor genes, those implicated in the stress response in offspring.[17,19]

Synthesizing the literature on the children of Indigenous parents with mental health challenges can enable a better understanding of the challenges facing Indigenous youth, as well as optimizing screening processes, identifying challenges at an early age, and guiding the development of targeted family interventions. It can also help us understand the degree to which Indigenous research methodologies are applied. Contemporary researchers need to safeguard against questions and methodologies that have been developed and utilized in the absence of input by Indigenous communities as these threaten to perpetuate colonial systems.[12,19] Indigenous research priorities and input need to be valued, honored, and protected.[20] Given this background, the aim of this systematic review was to examine emotional and behavioral functioning in the offspring of Indigenous parents with mental health challenges.

We would like to thank Mr. Troy Hill who is Mohawk from Six Nations of the Grand River Territory where he is an educator and Dr. Jacob Burack for sharing his learning and experiences collaborating with educators, students, and community leaders of the Naskapi Nation of Kawawachikamach. This article was written on the traditional territories of the Haudenosaunee and Mississaugas of the Credit First Nations and is within the lands protected by the “Dish with One Spoon” Wampum agreement.

Methods

Search Strategy

The study protocol guiding this systematic review was published on January 25, 2019, and is available online through PROSPERO (2019 CRD42019121301). Guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and

Meta-Analysis of Observational Studies in Epidemiology (MOOSE) statements were followed.[21,22]

A systematic search of electronic databases (MEDLINE, EMBASE, PsycINFO, CINAHL, Web of Science) was conducted from their inceptions until April 15, 2020. Searches were developed in collaboration with a health sciences librarian (please see Supplementary Files for our complete search strategies available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8138737/). The reference lists of relevant articles were hand-searched.

Eligibility Criteria

Studies were included if (1) ≥1 Indigenous parent(s) had symptoms of a mental health challenge(s); (2) offspring of Indigenous parents were 0 to 18 years old; and (3) offspring emotional, behavioral, and/or other psychological outcomes were reported.

Since self-identification and the right for self-determination is central to the concept of Indigeneity, and because definitions are frequently entrenched in a colonial framework, we identified Indigenous Peoples as those who have roots to traditional lands prior to colonization and distinct cultural norms from the dominant's society.[23,24] Notwithstanding the significant heterogeneity in lived experiences, many Indigenous Peoples from around the world share a collective history of colonization, forced removal from land, and systematic oppression which result in common health and social inequities.[7,25-28] Examining Indigenous groups sharing these experiences helps us to draw conclusions regarding similarities between Indigenous Peoples. We recognize that some past terms used to describe Indigenous Peoples (e.g., Indians, Natives, Aboriginal) are currently considered disrespectful. However, if a term was used to identify

Indigenous Peoples in a specific study, we continued to use that term to honor the self-identification and self-determination of the participating Indigenous Peoples.[24]

Data Extraction and Methodological Bias Assessment

Two independent reviewers (MF, HZ) screened abstracts and titles, and any disagreements were adjudicated by a third reviewer (SO). The data extraction file containing information on the studies' methods, outcomes, measures used, Indigenous population, and parental mental health challenges was piloted with 5 randomly selected studies.

Study methodological bias was assessed using National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies and the Newcastle-Ottawa Quality Assessment Scale (NOS).[29,30] The first (used for studies without a comparison group) grades the design, sample size, outcome measurement, and statistical analyses with overall study quality rated as Good/ Fair/Poor. The NOS is used when observational studies include a comparison group and grades selection, comparability, and outcome bias using a star system (more stars correspond to higher methodological quality/lower the risk of bias).

Results

Search Results

Our search strategy identified 4,105 potentially relevant articles with 2,341 articles remaining after duplicate removal. Of these, 56 were taken to full-text. Thirteen met our inclusion criteria and one more was found through hand-searching (total = 14). The interrater reliability was substantial ($k = 0.68$).[31] All included articles were available in English. See Figure 1 for the PRISMA flowchart outlining the search process.

Characteristics of Included Studies

Only 2 studies included a non-Indigenous comparison group, and the outcome measures differed between them.[32,33] As a result, we were unable to meta-analyze relative rates of mental health challenges in the offspring of Indigenous parents with mental health challenges and offspring of non-Indigenous mothers and/or fathers with similar issues. Since the other 12 studies did not contain a non-Indigenous comparison group, meta-analysis was also not possible, and so a narrative synthesis of all 14 studies is provided below.

Participant characteristics. A total of 7,557 offspring were included; 6,486 of which were Indigenous. Offspring ranged in age from 0 to 18 years. Parental Indigeneity was identified in different ways across studies. In 7 studies, parents had to identify as members of a specific tribe/Nation, or live on or near a reserve/reservation.[32,34-39] A reserve (reservation in the USA) is a tract of land that is specifically for use by Indigenous Peoples as governed by historical treaty rights.[24] In 3 studies, parents self-identified as Indigenous.[40-42] In 2 studies, participants were recruited from health services that specifically provided care to Indigenous groups.[43,44] In the remaining 2 studies, parental Indigeneity was determined through offspring self-identification.[33,45] Tables 1, 2, and 3 contain descriptions of included studies, categorized by parental mental health challenge (i.e., poor parental mental health [broadly defined], parental substance misuse, and maternal internalizing issues and arranged in ascending order of offspring age [youngest to oldest] with studies containing non-Indigenous comparison groups being listed first).

Study characteristics. Seven studies were conducted in the United States,[32,34-38,42] and 2 each in Taiwan,[33,45] New Zealand,[40,41] and Australia.[43,44] One included Indigenous groups from Canada and the United States.[39]

Five studies included measurements of both maternal and paternal mental health,[32,33,36-38] 6 of maternal mental health only,[34,35,39-42] and 3 studies did not specify whether parental mental health was that of mothers, fathers, or both.[43-45]

The most common parental mental health problem examined was substance misuse (*n* = 8) including alcohol use by ≥1 parent(s),[33,36-38,45] maternal drug use,[34,35,39] and maternal alcohol use.[34,35] Five studies included assessments of maternal internalizing issues, with maternal depression being measured in 4,[35,40-42] and maternal depressive episodes, dysthymic disorder, or generalized anxiety disorder in the other.[39] Four studies were focused on poor parental mental health (more broadly defined).[32,41,43,44]

Parental mental health was assessed in 3 studies using structured clinical interviews,[34,38,39] while the remainder utilized questionnaires or other self-report methods. The clinical interviews included the Composite International Diagnostic Interview (CIDI)[34,39] and the Semi-Structured Assessment for the Genetics of Alcoholism Diagnostic Interview.[38] Questionnaires used most commonly included the Edinburgh Postnatal Depression Scale (EPDS), General Health Questionnaire (GHQ), Center for Epidemiologic Studies–Depression (CES-D), and the Mood and Feelings Questionnaire (MFQ).

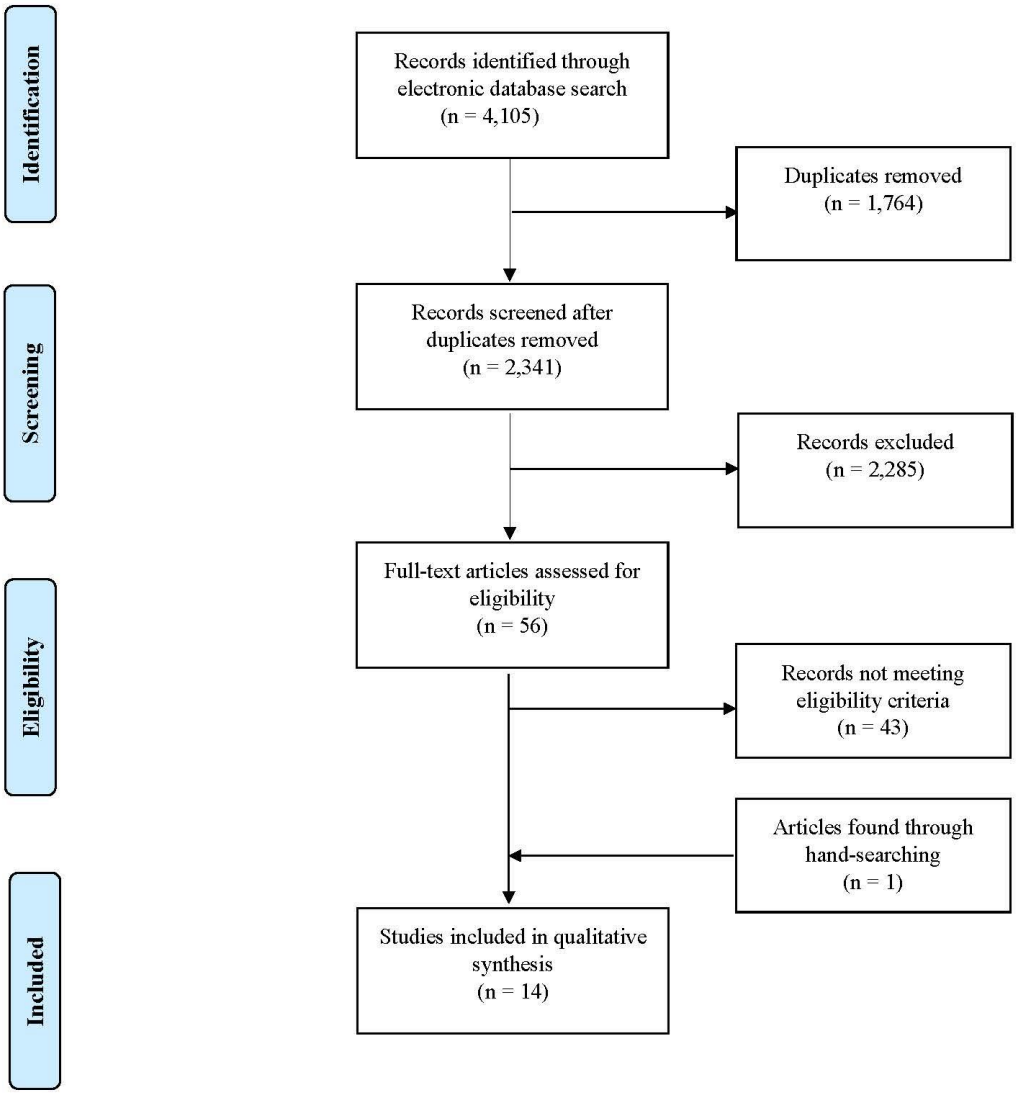

Figure 1. Flowchart displaying the number of articles identified, screened, deemed eligible, and included in the systematic review

Table 1. Characteristics of studies that examined poor parental mental health (broadly defined) and offspring psychopathology

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
Costello et al., 1997, USA	Cherokee (n=323)	Maternal and/or paternal mental illness	MFQ (≥ 5 symptoms) and/or History of Psychiatric Treatment (≥ 2 hospitalizations for psychiatric treatment) for one or both parents	Anxiety, depression, CD/ODD, ADHD, substance use	Child and Adolescent Psychiatric Assessment	9, 11, and 13 years	Parent and child	Family mental illness increased the risk of having a psychiatric disorder in Cherokee (OR 3.40, 95%CI 1.60-7.10) and White children (OR 2.10, 95% CI 1.30-3.20)	Not reported	Not reported
Gao et al., 2007, New Zealand	Pacific Islanders (n=1021)	a) Maternal postpartum depression b) Maternal psychologic-al disorder	a) EPDS (≥ 13) b) GHQ (≥ 3)	Internalizing and externalizing behaviours	CBCL (≥ 90th percentile)	2 years	Mother	a) PPD at 6 weeks increased the odds of internalizing (OR 3.03, 95%CI 2.07–4.44) and externalizing behaviours (OR 1.78, 95%CI 1.00–3.16) in 2-year-old offspring b) Psychological disorders at 12 months postpartum increased the odds for internalizing (OR 2.19, 95% CI 1.40 –	Sociodemographic characteristics, cultural orientation, antenatal maternal smoking, and child-rearing practices	a) PPD at 6 weeks postpartum did not increase the odds of internalizing and externalizing behaviours in 2-year-old offspring. b) Psychological disorders at 12 and/or 24

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
								3.41) and externalizing behaviours (OR 1.98, 95% CI 1.06 – 3.69) in 2-year-old offspring Psychological disorders at 24 months increases the odds of internalizing (OR 1.86, 95% CI 1.14–3.02) but not externalizing behaviours in 2-year-old offspring Having both depression at 6 weeks postpartum and a psychological disorder at 12 and/or 24 months postpartum increases the odds of internalizing behaviours (OR 5.54, 95% CI 3.11–9.87) but not externalizing behaviours in 2-year-old offspring		months postpartum did not increase the risk for internalizing and externalizing behaviours in 2-year-old offspring. Having both depression at 6 weeks postpartum and a psychological disorder at 12 and/or 24 months postpartum increases the odds of internalizing behaviours (aOR 2.93, 95%CI 1.54–5.57)

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
Liddle et al., 2014, Australia	Aboriginal and Torres Strait Islanders (n=183)	Parental /carer mental health challenges (study did not define 'mental illness')	Self-report	Motor skills, self-care and social interaction, hearing and language, hand-eye coordination, cognition, academic performance and issues with conduct, hyperactivity, or inattention	Pediatric referral for these issues	0-14 years	Parent/ General Practitioner	Parents having a mental health challenge increased the risk of being referred by 3 times (OR 3.00, 95%CI, 1.55–5.79)	Offspring sex, age, and snoring	Parents having a mental health challenge increased the risk of being referred by 3 times (aOR 3.07, 95%CI 1.44-6.57)
Williams-on et al., 2018, Australia	Aboriginal (n=1,474)	a) Previous treatment history of mental health challenges b) Psychologic-al distress	a) Self-report b) Kessler Psychological Distress Scale-10 (≥ 22)	Mental health-related emergency department visits	Number of emergency department visits across six years	0 – 17 years old (M = 6.73 years old)	Clinical records/clini-cian	Not reported	Offspring sex, age, and geographical area	a) Previous treatment history of parental mental health challenges was not associated with offspring mental health-related emergency department visits (ARR=2.33, 95%CI=0.83-6.93) b) Parental distress was

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
										not associated with offspring mental health-related emergency department visits (ARR=1.14, 95%CI=0.31-4.15)

Note. ADHD = Attention Deficit Hyperactivity Disorder, CBCL = Achenbach Child Behaviour Checklist, CD = Conduct Disorder, EPDS = Edinburgh Postnatal Depression Scale, GHQ = General Health Questionnaire, MFQ = Mood and Feelings Questionnaire, ODD = Oppositional Defiant Disorder, PPD = Postpartum depression

Table 2. Characteristics of studies that examined parental substance misuse and offspring psychopathology

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
Yeh & Chiang 2005, Taiwan	Hualien Taitung inhabitants (n=334)	Maternal or paternal drinking frequency	Adolescent-reported (6-point Likert scale from 'Never/rarely drinks' to 'Drinks everyday')	- Alcohol consumption frequency (over past year) - Alcohol misuse - Alcohol-related negative consequences	Self-report	10th graders (age not reported)	Offspring	Paternal drinking increased the odds of alcohol use in Aboriginal (OR 4.91, OR 2.37-10.20) and non-Aboriginal Hans (OR 2.35, 95% CI 1.33-4.14) teens. Maternal drinking only increased the odds of alcohol use in Hans teens (OR 3.14, 95% CI 1.83-5.39)	Not reported	Not reported

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
								Paternal drinking, but not maternal drinking, increased odds of problem drinking in Aboriginal (OR 6.48, 95% CI 2.19-19.18) and Han (OR 2.78, 95% CI 1.13-6.85) teens Paternal drinking, but not maternal drinking, increased the odds of alcohol-related consequences in Aboriginal teens (OR 3.07, 95% CI 1.26 – 7.50). Neither paternal nor maternal drinking was associated with alcohol-related consequences in Han teens.		
Sarche et al., 2009, USA	Northern Plains (n=86-90)	a) Maternal alcohol use b) Maternal drug use	a) CIDI-Short Form (Most drinks in a day past 12 months) b) CIDI-Short Form (Use of drugs in the past year)	1. Orientation /Engagement, Emotion regulation, Motor Quality 2. Externalizing and	1. Bayley Scales of Infant Development – II Behavior Rating Scale 2. ITSEA (10 items deleted	24-30 months	Mother and sometimes father	Not reported	Offspring sex, and household income	a) A 1 SD increase in maternal alcohol use was associated with a 0.27 SD decrease (95%CI -0.47 - -0.06) on Bayley but no statistically significant differences on ITSEA total, ITSEA

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
				internalizing behaviours	from internalizing scale after consulting with community members)					externalizing, ITSEA internalizing scales b) A 1SD increase in maternal drug use, was associated with a 0.29 SD increase (95%CI 0.09 – 0.50) in externalizing behaviour but not associated with Bayley's, ITSEA internalizing, ITSEA total scales
Frankel et al., 2013, USA	Northern Plains (n=76-79)	a) Maternal alcohol use in past month b) Maternal illicit drug use in past month c) Maternal depression	a) self-report (Highest number of drinks on a single day in the past month) b) Self-report (number of times illicit drugs used)	Externalizing, internalizing, dysregulation, and competence issues	ITSEA (21 items removed after consulting with community members) (continuous measure; mean of	27-30 months	Mother	a) Maternal alcohol use not associated with offspring externalizing, internalizing, dysregulation, or competence issues b) Maternal drug use not associated with offspring	Offspring sex, household income, maternal isolation, and maternal perceived social stress	a) Maternal alcohol use not associated with offspring externalizing, internalizing, dysregulation, or competence issues b) Maternal drug use not associated with offspring

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
			c) CES-D (mean response rating for seven items that had the largest positive loadings on the Depressed Affect factor reported for the 20-item CES-D)		domain scores)			externalizing, internalizing, dysregulation, or competence issues c) A 1 SD increase in maternal depression was associated with a 0.37 SD increase on externalizing scales (p=0.03), 0.38 SD increase on internalizing scales (p=0.01), and 0.38 SD increase on dysregulation scales (p=0.01). Associations with offspring competence were not significant		externalizing, internalizing, dysregulation, or competence issues c) A 1 SD increase in maternal depression was associated with a 0.28 SD increase on externalizing behaviours (p<0.01), 0.28 SD increase on internalizing scales (p<0.01), and 0.26 SD increase on dysregulations scales (p<0.01). Associations with offspring competence were not significant
Wall et al., 2000, USA	Native American (n=73)	Maternal and/or paternal alcoholism and alcohol-related issues	Self-report (hx of heavy drinking and number of alcohol-related issues experienced)	Internalizing and externalizing behaviours (measured on a continuous scale)	CBCL	7-13 years	Parent	Boys of parents with alcoholism had higher scores on the CBCL (total, internalizing scale, externalizing scale). No differences appeared for girls	Not reported	Not reported
Gilder et al., 2002, USA	Mission Indians (n=117)	Maternal and/or paternal	Self-report (hx of heavy drinking and number of	-Internalizing (MDD, separation anxiety	Children's Semi-Structured Assessment	7-14 years	Parent and child * 81 of the 117	Parental alcohol dependence was not associated with increased lifetime rates	Not reported	Not reported

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
		alcohol dependence	alcohol-related issues experienced) with some reports verified through psychiatric diagnoses or verification through tribal elders	disorder, overanxious disorder) - externalizing disorders (ADHD, ODD, CD)	for the Genetics of Alcoholism, Parent Version		children self-completed the Diagnostic Interview for Children & Adolescent-s	of offspring psychiatric disorders		
Swaim et al., 2011, USA	American Indian (n=251)	Maternal and/or paternal alcohol abuse or dependence	Semi-Structured Assessment for the Genetics of Alcoholism Diagnostic Interview AND Family History Assessment Module of the National Institute on Alcohol Abuse and Alcoholism – Collaborative	- Alcohol use over past 30 days - Alcohol related issues	Self-report - Rutgers Alcohol Problems Index	13-18 years	Offspring	Parental alcohol use/dependence was not associated with alcohol use in the past 30 days among 13-year-olds Dual parental diagnoses increased the risk of alcohol related issues at age 18 compared to having no parents diagnosed	Not reported	Not reported

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
			Studies on the Genetics of Alcoholism							
Yeh, 2004, Taiwan	Aborigines (n=495)	Maternal and/or paternal drinking frequency in past 12 months	Adolescent-reported (6-point Likert Scale from 'Never' to 'Everyday')	1. Drinking frequency 2. Drunkenness	1. Self-report ('How often do you drink') 2. Self-report ('How often do you get drunk')	10th graders (age not reported)	Offspring	Maternal and/or paternal drinking was associated with adolescent drinking frequency and drunkenness	Not reported	Not reported

Note. ADHD = Attention Deficit Hyperactivity Disorder, CBCL = Achenbach Child Behaviour Checklist, CD = Conduct Disorder, CES-D = Center for Epidemiologic Studies – Depression Scale, CIDI = Composite International Diagnostic Interview, DISC-R = Diagnostic Interview Schedule for Children-Revised, DSM-III-R = Diagnostic and Statistical Manual of Mental Disorders-III-Revised, EPDS = Edinburgh Postnatal Depression Scale, GAD = Generalized Anxiety Disorder, GHQ = General Health Questionnaire, ITSEA = Infant-Toddler Social and Emotional Assessment, MDD = Major Depressive Disorder, MDE = Major Depressive Episode, ODD = Oppositional Defiant Disorder, UM-CIDI = University of Michigan Composite International Diagnostic Interview

Table 3. Characteristics of studies that examined maternal internalizing issues and offspring psychopathology

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
Paterson et al., 2013, New Zealand	Pacific Islanders (n= 1064 children at 2 years, 1066 children at 4 years, 1019 children at 6 years)	Maternal depression	GHQ (≥ 3)	Internalizing and externalizing behaviours (≥ 90th percentile)	CBCL	2, 4, 6 years	Mother	Not reported	- Offspring sex and ethnicity, maternal age, education level, marital status, postnatal depression at 6 weeks postpartum, household income, and household size (internalizing model) - Offspring sex (externalizing model)	Maternal depression increased risk for internalizing behaviours (aOR 2.64, 95%CI 1.97-3.54) but this did not vary among the three different ages Maternal depression increased risk for externalizing behaviours at 4 years (aOR 3.42, 95%CI 2.25-5.21) and 6 years (aOR 2.72, 95%CI 1.51-4.89) but NOT 2 years (aOR 0.64, 95%CI 0.30-1.36)
Riser et al., 2019, USA	American Indian/Alaskan Native (600)	Maternal depression	CES-D (≥15)	Externalizing behaviours (e.g., aggression, impulsivity)	Preschool and Kinder-garten Behaviour Scales, Second Edition	4.5 – 7 years old (*M*=5.5 years old)	Parent		Offspring age, sex, and cognition	Maternal depression was not associated with levels of offspring externalizing behaviours (β=0.04, *p*=0.07)
Whitbeck et al., 2008, USA	American Indians from the US and Canadian Northern	a) Maternal internalizing disorder (MDE, dysthymic	a) UM-CIDI (culturally modified)	- Internalizing (MDE, dysthymic disorder, GAD) - Externalizing (ODD, CD, ADHD)	Diagnostic Interview Schedule for Children - Revised	10-15 years	Parent and child (only agreed reports marked as positive)	Not reported	Offspring sex and age, living in a single-mother household, and living in a	a) Maternal lifetime internalizing disorders increased the risk for 12-month offspring substance use (aOR 1.93, 95%CI 1.13-

Author, Year, Country	Indigenous offspring (n)	Parental mental health challenge	Parental measure	Offspring outcome	Offspring measure	Age of offspring	Informant for offspring outcomes	Main unadjusted results	Variables adjusted for	Main adjusted results
	Midwest (n=480)	disorder, GAD) b) Maternal substance use disorder	b) UM-CIDI (culturally modified)	- Substance use disorders (alcohol, alcohol dependence, marijuana abuse, marijuana dependence, nicotine dependence)					remote Canadian reserve	3.28) and externalizing (aOR 1.71, 95%CI 1.02-2.86) but not internalizing disorders b) Maternal lifetime substance use disorders increased the risk for offspring 12-month internalizing (OR 2.53, 95% CI 1.06-6.04) and externalizing (OR 1.96, 95% CI 1.12-3.42) but not substance use disorder

Note. CBCL = Achenbach Child Behaviour Checklist; CD = conduct disorder; CES-D = Center for Epidemiological Studies Depression Scales; GAD = generalized anxiety disorder; GHQ = General Health Questionnaire; MDE = major depressive episode; ODD = oppositional defiant disorder; UM-CIDI = University of Michigan Composite International Diagnostic Interview.

Internalizing and externalizing behaviors in offspring were examined in all 14 studies. These were assessed in 9 studies using questionnaires, 3 used structured interviews, and 2 used clinical records. Specifically, 3 studies used the Child Behaviour Checklist (CBCL)[36,40,41] or another self-report measure (please see Table 1 for full details),[33,38,45] and 2 utilized the Infant Toddler Socioemotional Assessment (ITSEA).[34,35] One study each included the Child and Adolescent Psychiatric Assessment,[32] Diagnostic Interview Schedule for Children–Revised,[39] Children's Semi-Structured Assessment for the Genetics of Alcoholism, Parent Version,[37] Preschool and Kindergarten Behavior Scales, Second Edition,[42] pediatric referrals for offspring behavior and socioemotional issues,[43] and mental health related-emergency department visits.[44] Sarche et al. also measured orientation/engagement, emotion regulation, and motor quality using the Behavior Rating Scale of the Bayley Scales of Infant Development–II.

Six of the 14 studies included a culturally modified measure of offspring outcomes and/or consulted community members to ensure their questionnaire and/or interview protocols were culturally appropriate.[34,35,39-41,44] Most often, the measures were modified by removing questions that were deemed to be offensive, part of regular Indigenous infant development, or thought to potentially cause confusion in respondents.

Study Methodological Bias

Using the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, 3 studies were rated as "Good,"[35,39,44] 6 studies were rated as "Fair,"[34,38,40-42,45] and 3 studies were rated as "Poor."[36,37,43] The most common factor increasing the risk of bias was outcome assessors not being blinded to exposure status (i.e., clinical status of parents). The 2 other studies assessed using the NOS were found to have a low[32]

and high risk of bias.[33] Tables 4 and 5 contain descriptions of the risk of methodological bias across the 14 studies.

Narrative Synthesis of Results

Unadjusted results were reported for 6 of the studies, results adjusted for covariates were reported for 5 of the studies, and both unadjusted and adjusted estimates were reported in the other 3 studies. We report adjusted results below, but in the absence of such data, we report unadjusted findings.

Overall Parental Mental Health (Broadly Defined)

The overall mental health of parents was examined in 4 studies, with an association between poor overall parental mental health and offspring psychopathology identified in 2. Costello et al. examined 3-month prevalence rates of anxiety, depression, oppositional, and attention deficit/hyperactivity disorder using parent and child reports for Indigenous (n = 323) and non-Indigenous youth (n = 933) living in North Carolina. They found that if one or both Indigenous parents were treated for a psychiatric disorder on ≥2 occasions and/or had a MFQ score ≥5, their offspring were over 3 times more likely to have a psychiatric disorder (OR = 3.40; 95% CI, 1.60 to 7.10) compared to Indigenous offspring of healthy parents.[32] Poor parental mental health also increased the risk for Caucasian offspring by 2-fold when compared to the Caucasian peers of parents without mental health challenges. While results are unadjusted, this study was rated to have a low risk of bias.

Liddle et al. conducted a cross-sectional examination of associations between parental self-reported mental health challenges and the prevalence of a pediatric specialist referral for developmental and/or behavioral issues in 183 Indigenous children living in Australia aged 0 to

14 years.[43] Those who had parents with mental health challenges were over 3 times more likely to be referred for behavioral issues, compared to the offspring of Indigenous parents with no self-reported mental health challenges. Although, this study should be interpreted with caution due to its high risk of bias. In contrast, in a study of associations between symptoms of a maternal psychiatric disorder (GHQ ≥3) at 12 and 24 months postpartum, and maternal reports of offspring behavior at 24 months postpartum using the CBCL (≥ 90th percentile), Gao et al. found no statistically significant links when maternal age, ethnicity, household income, prenatal cigarette exposure, marital status, and education level were adjusted (fair methodological risk of bias).[41] In a study rated to have a low risk of bias with 1,474 Aboriginal children aged 0 to 17 years old living in Australia, Williamson et al. found no associations between offspring mental health–related emergency department visits and prior parental treatment for mental health challenges or current parental distress when offspring age, sex, and geographical area were adjusted statistically.[44]

Overall, poor overall parental mental health was associated with an increased risk of offspring psychopathology in 2 studies (one with a low risk of methodological bias, the other with a high risk of bias) and but not in 2 other studies (low to fair risk of bias).

Parental Substance Misuse

Eight studies examined parental substance misuse including drug and/or alcohol issues. Yeh and Chiang examined the influence of parental drinking on adolescent drinking frequency, drunkenness, and drinking-related problems among Han (non-Aboriginal) and Aboriginal 10th graders living in Taiwan. Paternal drinking increased the odds of alcohol use by almost 2-fold in the Aboriginal versus non-Aboriginal teens (OR = 1.90; 95% CI, 1.33 to 2.73).[33] Furthermore, paternal drinking increased the odds of problem drinking over 3-fold in the Aboriginal versus the

non-Aboriginal teens (OR = 3.10; 95% CI, 1.91 to 5.20).[33] These results were unadjusted and the study was rated to have a high risk of bias.

In a study with 96 Mission Indian children aged 8 to 13 years living on or near one of the 6 reservations in California, Wall et al. examined the impact of excessive parental alcohol use on offspring behavior. In unadjusted analyses, 23% of Indigenous offspring had behavioral problems compared to 8% of children of healthy parents. Male, but not female offspring of Indigenous parents with excess alcohol use also scored higher on the internalizing, externalizing, and total behavior scales on the CBCL as compared to the Mission Indian children of parents engaging in healthy drinking patterns. This effect was particularly strong for paternal alcohol misuse.[36] In a cross-sectional study of the same group of Mission Indian children (*n* = 117), Gilder et al. examined the prevalence of psychiatric diagnoses among the offspring of parents with alcohol dependence.[37] Based on combined parent and child reports, parental alcohol dependence was not associated with an increased risk of any lifetime psychiatric disorder in these 7- to 14-year- olds.[37] Both studies were rated to have a high risk of bias.

Among 480 adolescents from Canada and the United States, Whitbeck et al. found that a lifetime substance use disorder in Indigenous mothers increased the odds for internalizing (aOR = 2.53; 95% CI, 1.06 to 6.04) and externalizing behaviors (aOR = 1.96; 95% CI, 1.12 to 3.42), but not substance use disorders in adolescents as compared to the offspring of Indigenous mothers without a substance use disorder. These findings were adjusted statistically for offspring sex, age, single parent status, and the experience of living in a remote location, and the study was rated to have a low risk of bias.[39]

Sarche et al. conducted a cross-sectional study with 90 mother–children dyads from a Northern Plains reservation (fair study quality). Analyses adjusting for offspring sex and

household income found that maternal alcohol use was associated with lower levels of offspring orientation/engagement, but not externalizing or internalizing behaviors in 2-year-olds. Furthermore, maternal drug use was associated with increased levels of symptoms of externalizing behaviors in 2-year-old children, but not orientation/engagement or internalizing behaviors.[34] In contrast, Frankel et al., rated to have a low risk of bias, examined associations between maternal alcohol or drug use and offspring emotional and behavioral difficulties among 79 toddlers from a Northern Plains reservation. They found that neither maternal alcohol use nor drug use was associated with levels of offspring internalizing, externalizing, dysregulation, or competence issues.[35]

In a prospective cohort study with 251 American Indian teenagers, Swaim et al. found that when both parents had an alcoholism diagnosis, risk for alcohol-related problems in their 18-year-old children was increased, but that this was not associated with alcohol use in the past month among the 13-year-olds.[38] In a cross-sectional study, Yeh found that adolescent-reported maternal and/or paternal drinking was associated with self-reported adolescent drinking and drunkenness frequency in 495 Aboriginal children living in Taiwan.[45] Both were judged as having fair study quality. In sum, parental substance misuse was associated with offspring internalizing and externalizing behaviors in 6 studies but not in 2 others (one rated as high risk of bias).

Maternal Internalizing Issues

Associations between maternal internalizing issues (i.e., depression, dysthymia, or generalized anxiety disorder) and offspring socioemotional outcomes were examined in 5 studies. Frankel et al. conducted a cross-sectional study with 27- to 30-month-old Northern Plains (USA) toddlers using maternal reports of a culturally modified version of the ITSEA. Current

maternal depression was associated with more offspring dysregulation, and internalizing and externalizing behaviors after adjusting for offspring sex, maternal isolation, stress, and negative social influences.[35] Similarly, in a study of over 1,000 mother–offspring dyads at 2, 4, and 6 years of age, and rated to have a fair study quality, Paterson et al. found that current maternal depression increased the odds of offspring internalizing behaviors by more than 2-fold when compared against children of asymptomatic Pacific Islander mothers.[40] Current maternal depression increased the odds of offspring externalizing behaviors in 4-year-olds (aOR = 3.42; 95% CI, 2.25 to 5.21) and 6-year-olds (aOR = 2.72; 95% CI 1.51 to 4.89), but not among 2-year-old children when compared to the offspring of Pacific Islander mothers without maternal depression.[40]

Whitbeck et al. reported that lifetime maternal internalizing disorders (i.e., major depressive episode, dysthymic disorder, or generalized anxiety disorder), as assessed using a culturally modified version of the CIDI, increased the odds of a 12-month prevalence of externalizing and substance use disorders by nearly 2 times in 480 Indigenous youth living in Canada and American Northern Midwest when compared with adolescents of healthy Indigenous mothers. Offspring sex, age, living in a single-mother household, and living in a remote location were statistically adjusted and the study was rated to have a low risk of bias.[39] In contrast, Gao et al. found no association between maternal depression at 6 weeks postpartum (EPDS ≥ 13) and maternal reports of offspring internalizing and externalizing behaviors at 2 years of age using the CBCL when adjusting for maternal age, ethnicity, household income, prenatal exposure to cigarettes, marital status, and education level.[41] However, somewhat consistent with the other studies, increased chances of internalizing behaviors were evident when the mothers had persistent mental health challenges (depression at 6 weeks postpartum *and* symptoms of a psychological disorder at 12 and/or 24 months postpartum).

In a study with 600 American Indian/Alaskan Native kindergarten-aged children, Riser and colleagues found no statistically significant association between self-reported severe maternal depression (CES-D ≥ 15) and parent-reported offspring externalizing behaviors when offspring sex, age, and cognitive skills were adjusted.[42] The study was judged to have a fair study quality.

In sum, maternal internalizing issues were found to be associated with offspring internalizing and externalizing behaviors in 4 of the 5 studies with 2 of these studies rated to have a low risk of bias.

Table 4. Study Methodological Bias Assessment Using the National Institutes of Health Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies

Criteria	Gao et al., 2007	Liddle et al., 2014	Williamson et al., 2018	Sarche et al., 2009	Frankel et al., 2013	Wall et al., 2000	Gilder et al., 2002	Swaim et al., 2011	Yeh, 2004	Paterson et al., 2014	Riser et al., 2019	Whitbeck et al., 2008
1. Was the research question or objective in this paper clearly stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Was the study population clearly specified and defined?	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
3. Was the participation rate of eligible persons at least 50%?	Y	Y	Y	Y	Y	CD	CD	CD	Y	CD	CD	Y
4. Were all the subjects selected or recruited from the same or similar populations (including in the same time period)? Were inclusion and exclusion criteria for being in the study prespecified and applied uniformly to all participants	Y	Y	Y	Y	Y	CD	Y	CD	Y	Y	N	Y
5. Was a sample size justification, power description, or variance, and effect estimates provided?	N	N	N	N	N	N	N	N	N	N	N	N
6. For the analyses in this paper, were the exposure(s) of interest measured prior to the	Y	N	Y	N	N	N	N	Y	N	Y	Y	Y

outcome(s) being measured?												
7. Was the timeframe sufficient so that one could reasonably expect to see an association between exposure and outcome if it existed?	Y	N	Y	N	N	N	N	Y	N	Y	Y	Y
8. For exposures that can vary in amount or level, did the study examine different levels of the exposure as related to the outcome (e.g., categories of exposure, or exposure measured as continuous variable)?	N	N	N	N	Y	N	N	N	N	N	N	N
9. Were the exposure measures (independent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
10. Was the exposure(s) assessed more than once over time?	Y	N	N	N	N	N	N	N	N	Y	Y	Y
11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?	N	Y	Y	Y	Y	N	N	Y	Y	N	N	Y

12. Were the outcome assessors blinded to the exposure status of participants?	N	CD	Y	N	N	N	N	Y	N	N	N	N
13. Was loss to follow-up after baseline 20% or less?	Y	NA	Y	NA	NA	NA	NA	Y	NA	N	Y	Y
14. Were key potential confounding variables measured and adjusted statistically for their impact on the relationship between exposure(s) and outcome(s)?	Y	Y	Y	Y	Y	N	N	N	N	Y	Y	Y
Quality Rating	Fair	Poor	Good	Fair	Good	Poor	Poor	Fair	Fair	Fair	Fair	Good

Note. CD = Cannot determine, N = No, NA = Not Applicable, Y = Yes

Table 5. Study Methodological Bias Assessment Using the Newcastle-Ottawa Quality Assessment Scale

Author, Year	Representativeness of exposed cohort (selecti bias)	Justification of sample size (selection bias)	Ascertainment of exposure (selection bias)	Non-respondents (selection bias)	Comparability of cohorts (comparability bias)	Ascertainment of outcome (outcome bias)	Well-defined variables (outcome bias)	Statistical tests used (outcome bias)	Total score
Costello et al., 1997	*	None	Written self-report	*	*	*	*	*	6/9
Yeh & Chiang, 2005	*	None	Written self-report	No	*	Self-report	*	*	4/9

Note. The asterisks represent ‘Yes’.

Discussion

Associations between parental psychopathology and offspring emotional and behavioral outcomes were examined in 14 studies of Indigenous parents and their offspring across 5 countries. In 11 of these 14 studies, associations were found between parental mental health challenges and offspring emotional and behavioral challenges. Of these 11 studies, just 2 included non-Indigenous comparison groups. These 2 studies provided limited data to suggest that the offspring of Indigenous parents with mental health challenges were more susceptible to their adverse effects than those born to non-Indigenous parents.[32,33] While data comparing risk in the offspring of Indigenous and non-Indigenous parents with mental health challenges are scarce, and no conclusions regarding causality can be made, these findings raise the possibility that Indigenous offspring may be more susceptible to the adverse effects of being raised by a parent with a mental health challenge. Why this might be is unclear, but factors such as identity loss and environmental stresses could be implicated. Indeed, identity loss due to ongoing colonial trauma in Indigenous Peoples has been shown to amplify mental health risk.[26,46] Colonization resulted in forced dislocation from familiar, traditional lands to unknown, remote lands and placement with individuals different from their Nation.[13,26] Accordingly, Indigenous Peoples did not have access to familiar food sources nor to their kinship network which contributed to identity loss.[26] Further, assimilation practices such as residential/boarding schools or placement of Indigenous children in the care of Caucasian families resulted in the breakdown and disconnection of family units.[8,25,27,47] During these critical developmental periods, children rarely observed or learned the cultural and parenting practices of their heritage.[7,47]

Disconnection from cultural lands or social status in their community may also be particularly deleterious when the identity loss occurs during childhood or adolescence. Since

some Indigenous groups hold sociocentric identities, offspring mental health challenges can be further exacerbated if the mental health of their parents, kin, or community is suboptimal.[8,25,48] For example, parents suffering from mental health challenges may be unable to provide sufficient support, nurturance, and socioemotional development to their children.[49] If environmental stressors such as chronic poverty, precarious housing, food insecurity, and other structural disadvantages that are often faced by Indigenous Peoples are concurrent with mental health challenges, then psychopathology among family members can be further exacerbated.[50] The mechanisms underlying this transmission have yet to be elucidated, although a growing area of research includes examining epigenetic changes among Indigenous Peoples, particularly those who are descendants from survivors of residential schools.[51,52]

However, caution must be exercised in drawing conclusions about amplified risk transmission in these individuals, particularly since this is based on just 2 studies (one of which did not include a direct comparison of Indigenous and non-Indigenous groups) and because many questionnaires and structured interviews are neither developed with Indigenous families in mind nor tested and validated in these populations. The lack of Indigenous research methodologies (e.g., symbol-based reflection) in these studies further requires us to interpret these results with caution.[53]

In the remaining 12 studies, in which no non-Indigenous comparison group was included, associations between parental mental illness and offspring psychopathology were found in 9, with rates comparable to general population samples, raising the possibility that the transmission rates may not be stronger in Indigenous families. For example, studies in the review suggested that the offspring of Indigenous parents with substance use issues are 2 to 3 times more likely to have a mental health challenge. Evidence from large general population samples indicate that

exposure to parental substance use increases the risk for offspring psychiatric morbidity anywhere from 2 to 8 times.[54,55] We calculated effect sizes for our included studies on maternal depression and offspring emotional and behavioral issues and found small effect sizes for offspring internalizing (d = 0.23 to 0.26) and externalizing difficulties (d = 0.13 to 0.29).[56] Comparable effect sizes were reported in a meta-analysis of 193 studies of general population samples where the strength of the association between maternal depression and offspring behavior across all ages was small for internalizing (g = 0.23) and externalizing (g = 0 .21) behaviors.[57]

Due to the ongoing structural disadvantages that Indigenous Peoples face, the similarity of effect sizes with non-Indigenous groups may be surprising.[10] However, this may be due to reclamation of Indigeneity or collective resilience which have been associated with a more positive well-being.[26,58,59] Indeed, parents' cultural connectedness was found to protect offspring against the development of externalizing and internalizing behaviors in studies included in our review.[34,40] This is consistent with seminal findings by Chandler and Lalonde that the greater the cultural continuity (degree to which culture was transmitted from generation to generation) of a First Nations community, the lower the risk of suicide among the member of that community.[60] Therefore, Indigenous youth who retain a cultural identity within and beyond their community may be protected against the development of mental health challenges. Further, Indigenous groups that practice traditional parenting techniques like alloparenting, provide opportunities to the children to have decreased exposure to parental psychopathology, and ample opportunity for socioemotional development through modeling, which may reduce the transmission of psychopathology.[61] In addition, engaging in collective resilience (e.g., political activism or group participation in cultural traditions) may help to optimize mental health in Indigenous Peoples.[62] Even if offspring may be experiencing individual adversities, the social solidarity they receive

from community members may prevent the development or worsening of mental health challenges.

However, the findings of these studies may also be biased toward the null hypothesis by studies' methodological limitations that restrict our full understanding of the risks and their precipitants that Indigenous offspring may experience. These include issues related to Indigenous engagement, sampling, measurement, and analysis among others.[63] Indeed, Indigenous groups did not appear to have been consulted in 8 of the 14 studies, and so the recruitment of participants could have been biased toward those who are more trusting of researchers who use Western-dominant research methodologies, resulting in the misestimation of mental health challenges among Indigenous offspring. The lack of Indigenous partnership may also have prevented Indigenous definitions of mental well-being from being applied where well-being is viewed as wholistic, strength-based (rather than solely highlighting deficits), interconnected between mind, body, spirit, and land; acknowledges culture-bound syndromes; and advocates for reclamation of cultural traditions as a form of healing.[8,64,65] Failing to uphold Indigenous views on well-being and healing could result in misestimation of mental health challenges and hinder the identification of issues that are relevant for Indigenous Peoples.

Further, the sample size was not justified in any of the 14 studies, and so no discussion is provided as to whether these studies were adequately powered to detect differences in their primary outcome. In addition, some Indigenous groups may restrain their expression of extreme emotions or have different rules of behavior that can be reflected in measurement tools.[49,66] Thus, researchers who collaborated with Indigenous communities were advised to remove the ITSEA item "[child] is constantly moving" (a symptom of externalizing behavior), as exploration, independence, and autonomy are very much encouraged in Indigenous cultures.[34] However, in

only 6 of the 14 studies were the questionnaires either adapted for use in Indigenous populations or the Indigenous communities were consulted prior to the onset of the research. Studies with measures that are not normed with Indigenous populations may misinterpret and overestimate the rates of externalizing behaviors in Indigenous offspring.[49] Aside from a lack of cultural validity, clinical interviews to measure parental mental health challenges were used in only 3 of the 14 studies, while the remainder of studies used questionnaires and cut-offs not normed to Indigenous groups. Using self-report questionnaires with low thresholds may not provide valid associations between poor parental health and offspring outcomes. Finally, 4 of the 14 studies were found to have a high methodological risk of bias and so results must be interpreted with caution.

Future Directions

In order to determine whether offspring of Indigenous parents with a mental health challenge are at a higher risk compared to their non-Indigenous peers, it is important that future studies recruit representative samples including non-Indigenous comparison groups, utilize measures that have been adapted and validated among the Indigenous group they are working with, and collaborate with Indigenous stakeholders to ensure the appropriate development and application of such measurements.

In future studies, researchers should aim to recruit representative samples from Indigenous communities along with matched controls from non-Indigenous populations. Representative samples may provide more accurate estimates of mental health challenges in Indigenous groups along with more accurate relative risks when non-Indigenous participants are recruited. These descriptive studies should be carried out with the ultimate goal of developing and tailoring interventions to the Indigenous Nation being examined.[67] Describing prevalence

rates may also guide appropriate earmarking of government funding and resources. Culturally appropriate questionnaires (and their cut-offs) and structured interviews must also be developed for use in different Indigenous populations to ensure that symptoms of psychopathology in parents and children are accurately captured and useful screening, intervention, and treatment protocols developed.

Paramount to the recruitment of representative populations and adaptation and validation of measurements is the full partnership of Indigenous researchers, leaders, and communities in all stages of research including research question formulation, data collection and analysis, and data dissemination.[68] Collaboration will ensure that items on standardized questionnaires are applicable for Indigenous child development. Community-level control of data should be provided for capacity-building, empowerment, and appropriate resource allocation.[26,68] Further, to facilitate the development of intervention and treatment protocols for Indigenous offspring and their parents, variables that mediate and/or moderate the relationship between parental and offspring psychopathology must be examined. Particular attention should be paid to elucidating resilience mechanisms and applying a strengths-based perspective.[8,53] The diversity of Indigenous Peoples must be acknowledged in the development of interventions as the same intervention may not demonstrate the same effects across Indigenous groups.[26]

Limitations

In addition to the issues raised above, the majority of studies were cross-sectional, which precludes us from drawing inferences on the temporal relationship between parental and off-spring psychopathology. Moreover, only 2 studies included a non-Indigenous comparison group, so point estimates could not be calculated. Finally, child outcomes in all but 2 studies were examined using only maternal or child reports of questionnaires that can be colored by parental

clinical status, leading to the overestimation of offspring internalizing and externalizing behaviors.[69]

Conclusion

The findings from this systematic review indicate that parental psychopathology is associated with offspring emotional and behavioral challenges among Indigenous populations, much as it is with non-Indigenous populations. However, whether the offspring born to Indigenous parents with mental health challenges have higher rates of psychopathology than children born to comparable non-Indigenous parents remains unclear. More studies are needed to better understand resilience and risk factors that may lead to suboptimal Indigenous child development, and future studies should recruit large, representative samples, utilize culturally adapted measurements, and engage Indigenous stakeholders. Findings from these studies can then help identify children at risk for psychopathology and isolate targets for intervention to help improve the mental health of families and future generations.

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Chapter 5: Determinants Of Socioemotional And Behavioral Well-Being Among First Nations Children Living Off-Reserve In Canada: A Cross-Sectional Study (Study 4)

Study 4 Overview

Title: Determinants Of Socioemotional And Behavioral Well-Being Among First Nations Children Living Off-Reserve In Canada: A Cross-Sectional Study

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Context and Overall Implications: In the previous studies I described that Indigenous perinatal individuals, parents, and their children may be at a greater risk for mental health challenges. For the final study in this thesis, I took a strengths-based approach to examining Indigenous children's health and also identified factors that were associated with better well-being. The study identified a range of generic and Indigenous-specific factors associated with First Nations children's well-being. These findings can empower communities to use their own cultural knowledge to optimize the well-being of children and contribute to their healthy development.

Acknowledgements: We would like to thank McMaster's Research Data Centre where the statistical analyses for this study were conducted

Conflicts of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding: This study was funded by the Canadian Research Data Centre Network Emerging Scholars Award

Under review at: Child Development

Abstract

This nationally representative, cross-sectional study examined Indigenous- and non-Indigenous-specific determinants associated with positive socioemotional and behavioral well-being among First Nations children living off-reserve in Canada. The parents or other caregivers of 2,990 two to five year-old children (50.6% male) reported on their socioemotional and behavioral well-being and a range of child, parent, and housing characteristics. Being taught an Indigenous culture, high levels of community cohesion, parental/other caregiver nurturing, very good/excellent parental/other caregiver health, and fewer household members were associated with better socioemotional and behavioral well-being. These results highlight the importance of leveraging Indigenous-specific determinants and acknowledging non-Indigenous-specific factors, to promote the socioemotional and behavioral well-being of First Nations children living off-reserve.

Keywords: First Nations, Indigenous-specific determinants, positive well-being

Introduction

Indigenous peoples are the original inhabitants of traditional lands prior to the establishment of country borders, and in the face of enduring colonialism, these nearly 500 million individuals around the world have displayed tremendous strength, resilience, and resistance (Dhir et al., 2020). Survivance, a term coined by Anishinaabe theorist Gerald Vizenor highlights that not only have Indigenous peoples survived concerted and systematic efforts to destroy their cultures, but continue to restore and revitalize their cultural practices, traditions, and languages (Vizenor, 1999). As one example, more Indigenous peoples in Canada can speak an Indigenous language today than over a decade ago, and young people in particular are learning them as their primary second language (Statistics Canada, 2017). Indigenous children and youth are often at the forefront of efforts aimed at cultural restoration and language revitalization, as well as serving as agents of political, social, and environmental change. Their commitment to activism emanates largely from their Indigenous cultures and teachings. Among First Nations – the most populous Indigenous group in Canada (Government of Canada, 2017) – their cultures teach the importance of children having autonomy and independence, emphasize their involvement in traditional cultural activities from a young age, and honor children as gifts from the Creator (Muir & Bohr, 2019). Since children are viewed as sacred individuals, great importance is placed on their development to ensure they grow into healthy, contributing citizens (Greenwood, 2005).

Despite the profound resilience and strength of Indigenous children and youth, the majority of research on Indigenous children's health is focused on negative outcomes, disparities, and deficits. For instance, in a systematic review of 47 studies of factors associated with mental health among Indigenous children, adolescents, and young adults, 87% of studies

included descriptions of negative health outcomes (Young et al., 2017). This focus is disadvantageous for several reasons. One, the focus on deficits stands in direct contrast to First Nations views of mental well-being in which mental health is conceptualized as strength-based and encompasses spiritual, emotional, physical, and community health (Vukic et al., 2011). Relationships with family, community members, land, culture, the environment, and the Creator are fundamental to First Nations' definition of well-being (Halseth & Greenwood, 2019), and differ from Eurocentric views in which the focus is on the assessment of psychopathology and problem behaviors. Two, the focus on health disparities among marginalized groups without the appropriate (historical) context can lead to stereotyping and stigmatization. These, in turn, negatively impact Indigenous people's development of cultural identity (Priest et al., 2012) and their desire to seek healthcare (Findling et al., 2019), thereby further worsening health disparities. Three, identifying positive promotive factors of mental well-being can guide the development of interventions that are more in keeping with First Nations views of mental health, potentially increasing uptake, and properly inform the allocation of resources aimed at improving their health and lives. Policymakers, researchers, and community members can then effectively leverage these factors to promote healthy child development in their communities.

In this study, we examine factors associated with positive socioemotional and behavioral well-being among First Nations children living off-reserve. Comprising 60% of the Indigenous population in Canada (Government of Canada, 2017), the more than one million First Nations individuals are from 634 culturally-diverse bands (Government of Canada, 2017). About 30% of First Nations individuals live on a reserve, tracts of land that are designated for use by First Nations according to treaty rights (Government of Canada, 2017), whereas the other 70% live off-reserve in rural or urban areas throughout Canada. Even though the majority of First Nations individuals live off-reserve, a number that is expected to increase in the future (Environics

Institute, 2010), the off-reserve population is significantly underrepresented in the Indigenous health literature (Nelson & Wilson, 2017).

The study of children living off-reserve also provides a unique opportunity to understand a population that is immersed in the dominant Eurocentric culture while still trying to uphold their own traditional cultural values. In a survey of 2,614 off-reserve First Nations, Métis, and Inuit adults (≥18 years old) living in 11 urban Canadian cities, 60% of the participants felt a strong connection with their traditional land and communities although 71% of them considered their current urban city "home" (Environics Institute, 2010). Feelings of belongingness and connection to traditional lands among adults can influence children given that their socialization is impacted by their family, neighborhoods, and communities (Causadias & Cicchetti, 2018; Shonkoff et al., 2012). Among First Nations communities, where extended family members and community members often partake in childrearing, the impacts may be even greater (Halseth & Greenwood, 2019). Examining culturally-relevant factors associated with positive well-being among Indigenous children may be particularly important to understanding how to strengthen community and cultural ties in an urban, off-reserve environment. Indeed, a key factor in taking pride in their Indigenous identity among those living off-reserve was community connectedness and belonging, and research has shown that Indigenous peoples living off-reserve who have a sense of cultural connectedness have better mental health than those who do not (Environics Institute, 2010). Additionally, one of the top priorities of off-reserve Indigenous parents and grandparents is for subsequent generations to be aware of and connected with their Indigenous culture (Environics Institute, 2010). Thus, the focus on an off-reserve population provides an important opportunity to study a large, growing population that has a strong desire to maintain cultural traditions and ties with their Indigeneity.

Socioemotional And Behavioral Well-Being In Early Childhood

Early childhood is a critical period for the optimal development of socioemotional and behavioral well-being, abilities that encompass effective communication and social interactions with peers and adults, the ability to express, understand, and regulate emotions, and effectively manage and control behaviors in line with sociocultural norms (Campbell et al., 2016). Developmental psychology models support the notion that early life experiences shape the trajectory of adult life. The ecobiodevelopmental framework examines how the intersection of neuroscience, epigenetics, and ecology (relationships between people and their environment) influence early childhood development and long-term health (Shonkoff et al., 2012). Importantly, this framework highlights the impact that both proximal (i.e., parent mental health) and distal (i.e., community structure and supports) factors experienced in early childhood can have on not only shaping behavioral well-being in young children but in later adult life as well (Shonkoff et. al. 2012). Accordingly, positive socioemotional and behavioral well-being is associated with academic achievement, school attendance, and fewer mental health challenges in adulthood (Carneiro et al., 2007). Included in the definition of socioemotional and behavioral well-being is prosocial behavior. Prosocial behavior is any behavior that is meant to benefit others (Eisenberg, 1986) and can include helping, sharing, and comforting behaviors (Dunfield, 2014). A wide range of individual, family, and societal factors influence the socioemotional and behavioral well-being of children. Risk factors for reduced well-being include maternal depression, inconsistent and/or harsh parenting, low parental education, single parenthood, and socioeconomic disadvantage (Eamon, 2001; Maggi et al., 2010; Sameroff, 2006). While such risk factors can negatively shape life trajectories and mental health, promotive factors can reduce or mitigate the adverse effects of these risk exposures (Sameroff, 2006). Promotive factors of positive socioemotional and behavioral well-being include nurturing parenting styles, positive

peer interactions, family cohesion, and access to social supports (Masten et al., 1999; Sameroff, 2006).

Socioemotional And Behavioral Well-Being In Indigenous (Including First Nations) Children

Much of our knowledge about healthy child well-being is based on studies of white children as considerably less attention has been paid to other cultural groups including Indigenous children. Indigenous children are born into legacies of colonialism, oppression, and racism that have enduring effects on their socioemotional and behavioral well-being. For example, in Canada The Indian Act gave the federal government powers over Indigenous peoples and allowed them to govern Indigenous political hierarchies, forbid cultural ceremonies, and restrict residential mobility through the pass system (Kirmayer et al., 2016). One of the most harmful aspects of the Indian Act was the creation of Indian Residential Schools (IRS) that were intended to assimilate Indigenous children into the dominant EuroChristian culture (Kirmayer et al., 2016). In these settings, children were forcibly separated from their parents, forbidden to speak their Indigenous languages, forced to participate in manual labor and/or domestic duties, and subjected to emotional, physical, and sexual abuse in some cases (Kirmayer et al., 2014, 2016). Today, the institution of IRS have been recognized as a cultural genocide by the Truth and Reconciliation Commission of Canada (Truth and Reconciliation Commission of Canada, 2015). After the staggered closure of IRS, there was a widespread effort in the 1960s and 1970s to remove Indigenous children from their homes and place them in the care of non-Indigenous families (known as the Sixties Scoop) (Kirmayer et al., 2016). Ultimately, these colonial policies broke apart traditional family units, exposed children to abuse from authority figures in their most formative years, and stripped children of their opportunity to learn their culture, language, and traditional parenting practices (Kirmayer et al., 2003). These experiences have resulted in

not only long-term effects, where survivors of residential/boarding schools have reported feelings of anger, hopelessness, sadness, and other disruptions in their emotion regulation and capacity (Brave Heart, 1999), but intergenerational effects as well. Intergenerational trauma has been noted by several scholars where children and grandchildren of survivors of IRS, Sixties Scoop, and other relocation policies have shown poorer psychological well-being (Hackett et al., 2016; Walls & Whitbeck, 2012), more substance use (Walls & Whitbeck, 2012), a lack of warm parenting (Walls & Whitbeck, 2012), and suicidality (Hackett et al., 2016). Intergenerational trauma also contributes to the overrepresentation of Indigenous children in the Canadian foster care system where Indigenous youth (≤14 years old) comprise 53.8% of the population despite only making up 7.7% of youth in Canada (Government of Canada, 2022). Beyond overrepresentation in the foster care system, the enduring effects of colonialism have resulted in housing and food insecurity, lack of clean water access, overrepresentation in the criminal system, disadvantaged socioeconomic status, and lack of access to healthcare.

Given exposures to these structural disadvantages, early intervention may be especially powerful to improving the lives of children (Halseth & Greenwood, 2019). Indeed, some evidence suggests that investments in early childhood can produce long-term benefits in children coming from disadvantaged backgrounds. In some groups, data have shown that for every dollar invested in early childhood programs, there is up to a three dollar return in terms of health, social, and economic benefits – with benefits being even higher for those in disadvantaged environments (Alexander & Ignjatovic, 2012). For instance, participating in early childhood programs has been associated with higher rates of high school completion and college attendance (Smokowski et al., 2004), lower rates of adolescent and adulthood delinquency (Reynolds et al., 2007; Smokowski et al., 2004), and better adolescent and adult mental health (Reynolds et al., 2007; Smokowski et al., 2004). The Aboriginal Head Start Urban and Northern Program, which

serves up to 5,000 preschool-aged Indigenous children across 134 centers in Canada, has found that participation in the program is associated with increased participation in traditional activities, speaking an Indigenous language, greater awareness of Indigenous cultures, greater school readiness, improved math, reading, and writing skills, higher school attendance, and a more positive attitude toward school (Health Canada & Public Health Agency of Canada, 2017). Other early childhood programs in Canada and the USA aimed at supporting Indigenous children (e.g., Martin Family Initiative, Family Spirit Program) have been associated with stronger literacy skills (O'Sullivan, 2021, 2021), and fewer internalizing (Barlow A. et al., 2015), externalizing (Barlow A. et al., 2015), and dysregulation problems (Barlow A. et al., 2015) in preschool- and school-aged children.

Given the similar histories of colonialism among the CANZUS nations (Canada, Australia, New Zealand, and the US), data from Indigenous communities in the other countries can inform our general understanding of Indigenous child development within the context of risk and resilience. For example, among 348 5-6-year-old Aboriginal and Torres Strait Islander children in Australia, O'Brien et al. (2020) found that they were almost three times more likely to have conduct problems, hyperactivity/inattention, emotional difficulties, and total difficulties on the SDQ than their non-Indigenous peers. In a study of American Indian Northern Plains toddlers (i.e., Indigenous peoples in the USA) (n=110), Sarche et al. (2009) found that a significant number scored above the 'Of Potential Concern' cut-off for externalizing (18.6%), internalizing (10.8%), and competence (22.1%) problems using the Infant-Toddler Social and Emotional Assessment. Finally, in a nationally representative survey of 1,983 Māori children, researchers used the Child Health Questionnaire-Parent Form-28 Item and found that Māori children (≤14 years old) had poorer parent-reported emotional, behavioral, and overall health compared to children in the general population (n=3,039) (Ministry of Health, 2008).

These data have informed our general understanding of Indigenous child development and helped identify which mental health challenges may be more common in some Indigenous communities than others. However, a greater focus is needed on positive aspects of well-being and identifying factors that can positively influence health. Collection of such data would align with First Nations views of well-being, reduce stereotyping by highlighting strengths, and guide the development of interventions to promote and sustain positive well-being among First Nations preschool-aged children. For instance, research suggests that there may be cultural differences in prosocial behavior (Chen & French, 2008). Other data indicate that Indigenous-specific (including First Nations) parenting practices include teaching children about sharing roles in the community and helping others from a very young age (Byers et al., 2012). These parenting practices are in line with Indigenous worldviews of health where personal and community health are interconnected (Chandler, 2011). Yet, there are no data describing prosocial behavior in First Nations preschool-aged children, nor data on factors that may influence this behavior. Some studies have been conducted within First Nations children in Canada; however, they have typically been focused on older children and youth. For instance, in a study of family and peer factors associated with parent reports of psychological disorders in a group of 6-14 year-old Indigenous children living off-reserve in Canada (n=12,366), Kaspar (2013) found that higher quality parent-child and peer relationships were associated with a decreased likelihood of having psychological difficulties. In a separate study of 6-18 year-old First Nations children living on-reserve in Western Canada, Mykota and Schwean (2006) found that academic performance was a strong predictor of better psychosocial health (assessed through teacher reports of the Behavior Rating Profile-2nd Edition). Additional work identified that self-esteem and optimism were associated with lower levels of depression in 12 year-old Indigenous youth living off-reserve in Canada (Ames et al., 2015). Studies that involve Indigenous preschool-aged children (but not

First Nations) have found that being female, having fewer health problems, private health insurance at birth, having moved residences less than three times, parents without home duties, not being exposed to prenatal smoking, having a mother who received antenatal care within the first 20 weeks gestation, and having a mother with higher education were associated with better socioemotional and behavioral well-being (Williamson et al., 2016; Williamson et al., 2019).

Although these common determinants contribute to Indigenous children's well-being, they represent only part of the developmental process. Cultural processes can influence developmental trajectories and their examination can enrich the study of developmental psychology (Causadias & Cicchetti, 2018). In particular, Indigenous-specific determinants are factors relevant to the sociopolitical context of being Indigenous in Canada including connection with land, understanding or speaking an Indigenous language, engaging in Indigenous cultural activities, having a relative who attended IRS, and the experience of systemic racism. Identifying and understanding the influence of Indigenous-specific determinants is important because many First Nations individuals draw strength from their cultural knowledge and teachings (Kirmayer et al., 2003). Indeed, cultivating strong cultural restoration could have significant benefits for children, families, and communities, especially among First Nations communities for whom a greater engagement of cultural continuity (e.g., having titles over traditional lands, Indigenous self-governance, access to cultural facilities, and control over education, police/fire, and health care services) have been associated with lower rates of youth suicide (Chandler & Lalonde, 1998). Examining Indigenous-specific determinants of health can empower First Nations individuals to utilize existing Indigenous ways of knowing in prevention and treatment strategies while providing a more holistic understanding of the full experience of First Nations children, their developmental pathways, and set the stage for the development of more effective early interventions.

The Current Study

The aim of the current study is to identify Indigenous and non-Indigenous-specific determinants of socioemotional and behavioral well-being among two to five year-old First Nations children living off-reserve in Canada. This work can advance scholarship in Indigenous child health literature by: a) focusing on preschool-aged children given the importance of early intervention and prevention, b) examining positive aspects of socioemotional and behavioral well-being, c) examining factors associated with socioemotional and behavioral well-being (including Indigenous-specific determinants) to potentially identify targets for intervention, and d) utilizing representative, Canadian data for a population (First Nations children living off-reserve) that is grossly underrepresented in the child health literature.

Methods

Participants

The Aboriginal Children's Survey (ACS) is a cross-sectional, nationally representative survey assessing the development and well-being of Indigenous children (i.e., First Nations, Métis, and Inuit) under six years of age (by October 31, 2006) living off-reserve throughout Canada (Statistics Canada, 2008). The ACS was conducted between October 2006 and March 2007. Children living on-reserve or in institutions were excluded. The ACS was created in collaboration with Indigenous stakeholders and contained a wide range of measures designed to understand Indigenous (including First Nations) experiences. To date, the ACS is the most recent nationally representative survey on First Nations preschool-aged children's health, development, and well-being. The description of socioemotional and behavioral well-being, along with its determinants, in this population can lay the foundation for researchers that aim to compare trends in well-being over time, or how contemporary situations (e.g., the cultural revitalization of

Indigenous peoples) can influence well-being in young Indigenous children. The sampling frame of the ACS included children under the age of six years that were identified as Indigenous (First Nations, Métis, or Inuit and/or had Indigenous ancestors and/or was a Status First Nations and/or had First Nations band membership) by parents or other caregivers on the 2006 Canadian Census (Statistics Canada, 2008). Of the 17,472 children identified, 14,170 had the survey (81.1% response rate) completed by their parent or other caregiver (Statistics Canada, 2008). The parent or other caregiver of the children aged two to five years old completed the 2-4 year-old version of the Strengths and Difficulties Questionnaire (SDQ) (https://www.sdqinfo.org/). Telephone interviews were conducted unless participants lived in the Northwest Territories (except Yellowknife), Labrador, or Inuit communities, where in-person interviews were conducted. In accordance with the suggestions of many Indigenous researchers and the United Nations (United Nations, 2019), we did not aggregate all Indigenous children who participated in the ACS into a single homogenous group since doing so neglects the rich diversity among Indigenous groups and prevents the identification of community-specific data (Chandler, 2011). Rather, we only included First Nations children as they are the most populous Indigenous group in Canada (Government of Canada, 2017), but remain underrepresented in the Indigenous health literature (Nelson & Wilson, 2017).

Determinants Of Socioemotional And Behavioral Well-Being

Indigenous-Specific Determinants. Indigenous-specific factors that could influence First Nations well-being were selected for analysis. Specifically, speaking an Indigenous language (Hallett et al., 2007; Kirmayer et al., 2014), being taught an Indigenous culture (Andersson & Ledogar, 2008), and strong community cohesion (Salmon et al., 2019; Young et al., 2017). We also

included whether the parent/other caregiver was ever removed from their family by child welfare agencies, church, or government officials, as a measure of intergenerational trauma.

Child speaking an Indigenous language was assessed by asking the parent or other caregiver: 'What language does the child speak or understand even if he/she only knows a few words'? Responses were categorized into any Indigenous language (Algonquin, Atikamekw, Blackfoot, Carrier, Cree, Dakota/Sioux, Dene, Haida, Innu/Montagnais, Inuktitut/Inuvialuktun, Micmac/Mi'kmaq, Michif, Ojibway, Oji-Cree, or another Indigenous language) vs. None (i.e., English or French).

The teaching of Indigenous culture was measured in a binary response format (Yes/No) by asking the parent or other caregiver: "Does anyone help the child to understand First Nations, Métis, or Inuit culture and history?".

Community cohesion was measured on a 5-point Likert scale (Poor to Excellent) by asking the parent or other caregiver to rate six aspects of their community, including their satisfaction with the community as a place with First Nations, Métis, and Inuit cultural activities. The responses were grouped into two categories: Excellent/Very good (1 point) and Good/Fair/Poor (0 points). We created a community cohesion scale by summing scores across the six items (range 0-6). Internal consistency was satisfactory (α=.80).

Family separation experienced by the parent or other caregiver (or their spouse) was measured in a binary response format (Yes/No) by asking the parent or other caregiver: "Were you or your spouse ever removed from their family by child welfare agencies, church, or government officials?".

Non-Indigenous-Specific Determinants. In addition to Indigenous-specific determinants, we also sought to identify well-established factors linked to socioemotional and behavioral well-being among both children in the general population and Indigenous children. Based on the literature, we identified parent or other caregiver self-reported health (Maggi et al., 2010; Sameroff, 2006), household size (Sameroff, 2006), and parent or other caregiver nurturing behavior (Eamon, 2001; Sameroff, 2006; Williams & Berthelsen, 2017) to be associated with socioemotional and behavioral well-being among children. These variables were also included in our analysis.

Parent or other caregiver self-reported health was measured on a 5-point Likert scale. The responses were categorized as Excellent/Very good (1 point) vs. Good/Fair/Poor (0 points).

Household size was measured on a continuous scale by asking the parent or other caregiver about the number of adults and children who lived in the household.

Parenting or other caregiver nurturing behavior was measured using three items from a 13 item-nurturing scale in the ACS. The three items selected were consistent with other parenting behavior scales from national surveys (e.g., National Longitudinal Survey of Children and Youth) and resulted in the greatest decrease of Cronbach's alpha if removed from the 13-item scale. Items included were: "How often do you give him/her the opportunity to watch you or other people do things?", "How often is he/she shown approval using gestures or body language?", and "How often is he/she given a 'time out' or sent to his/her room?". The responses were categorized as At least once a day vs. Once a week or less.

Covariates

A priori, child age, child sex, and household income were selected as covariates given their associations with our predictor variables and links to socioemotional and behavioral well-

being in the general population. Child age was measured in years at the time of the survey and examined as a continuous variable. Child sex was measured by asking the parent or other caregiver the sex of their child. Responses were 'Male' or 'Female'. Household income was assessed by asking the parent or other caregiver whether their household income was above the low-income threshold. A household was considered low-income if their household income (after tax) was less than the median adjusted household income across Canada. Responses were categorized as 'Yes' or 'No'. While we defined low-income as a dichotomous outcome, for context, the average low-income cut-off in 2006 for a household of four persons living in an urban area (population > 15,000) was $28,483 (Statistics Canada, 2007).

Outcomes

Socioemotional and behavioral well-being. Parents or other caregivers of children aged two to five years completed the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997). The SDQ is used to measure socioemotional and behavioral issues in children over the past six months and consists of five subscales which are each scored from 0-10: emotional difficulties, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behavior. Higher scores are indicative of greater problems, with the exception of the prosocial scale for which higher scores are indicative of more positive prosocial behavior. All of the subscales (except the prosocial subscale) are summed to create a total difficulties score (0-40) with higher scores representing more problems. The SDQ was selected for use in the ACS after consultations with Indigenous and non-Indigenous stakeholders who wanted to use an accessible screening tool to examine well-being among Indigenous children (Oliver et al., 2009). In this study, we use the version of the SDQ for 2-4 year-old children, which has satisfactory reliability for the emotional, conduct, hyperactivity/inattention, and prosocial behavior subscales (Croft et al.,

2015). The peer relationship problems scale performs less well but is still satisfactory (Croft et al., 2015). Among this group of First Nations children, internal reliability is satisfactory for all subscales ($\rho \geq 0.70$), with the peer problems subscale approaching the reliability cut-off ($\rho = 0.61$) (Oliver et al., 2009). The SDQ has also been successfully used and validated within other Indigenous children and youth from around the world (Williamson et al., 2014). Since valid clinical cut-points have not been established for First Nations children living in Canada, continuous scores are used in this study.

Statistical Analyses

Characteristics of the study population are described using proportions and percentages for categorical data and mean (*M*) and standard deviations (*SD*) for continuous variables. Two separate multiple linear regression models were conducted. One model examines associations between determinants and total difficulties, and the other examines associations between determinants and prosocial behavior. Each regression model includes all of the variables and covariates entered simultaneously. Participants with missing data on determinants or SDQ scores are not included in the analyses. Standardized weights are applied to the number of participants to represent the size of the First Nations population, as well as to adjust for non-response (Statistics Canada, 2008). All of the data were vetted by a Statistics Canada personnel and cell counts <10 were not released. Statistical significance was set at $p < 0.05$ (two-tailed). All statistical analyses were conducted in SPSS (Version 26).

Results

The sociodemographic characteristics of the study population are presented in Table 1. Of the 2,990 two to five year-old First Nations children living off-reserve (*M*=3.65 years, *SD*=1.16), 50.6% are male. About one-third of participants can speak or understand at least one

Indigenous language and just over half (50.9%) are taught their Indigenous culture. In terms of their parents or other caregivers, two-thirds report very good/excellent health (65.7%) and 45.6% have at least a college education. Finally, 55% of households are above the low-income threshold.

Determinants of SDQ Total Difficulties Scores

Three Indigenous-specific determinants are associated with fewer total difficulties after adjusting for all other variables: Being taught an Indigenous culture, living in a community with high levels of perceived community cohesion, and the parent or other caregiver (or their spouse) not experiencing family separation (Table 2). Non-Indigenous-specific factors associated with fewer total difficulties adjusting for all other variables include: Very good/excellent parental/other caregiver health, being shown approval at least once a day, watching the parent or other caregiver at least once a day, being given a time out once a week or less, fewer household members, living in a household above the low-income threshold, older child age, and being female (Table 2).

Determinants of SDQ Prosocial Behavior Scores

Two Indigenous-specific determinants are significantly associated with greater prosocial behavior after adjusting for all other variables: Being taught an Indigenous culture and living in a community with high levels of perceived community cohesion (Table 3). Non-Indigenous-specific determinants of greater prosocial behavior that were statistically significant after adjusting for all other variables are: Very good/excellent parental/other caregiver health, being shown approval at least once a day, being given a time out once a week or less, fewer household members, older child age, and being female (Table 3).

Table 1. Sociodemographic Information On 2,990 First Nations Children And Their Parents Or Other Caregivers In The Aboriginal Children's Survey

Sociodemographic Characteristics	First Nations (N=2,990)
Child characteristics	
Child age in years (M (SD))	3.65 (1.16)
Sex (%)	
Male	50.6%
Female	49.4%
Missing	0.03%
Can speak at least one Indigenous language (%)	
Yes	31.5%
No	68.4%
Missing	0.1%
Is taught about Indigenous culture (%)	
Yes	50.9%
No	48.3%
Missing	0.8%
Parent/Other caregiver characteristics	
Self-reported health status (%)	
Very good or excellent health	65.8%
Good, fair, or poor health	33.2%
Missing	1.0%
Education level (%)	
College education and above	45.6%
High school education and below	53.6%
Missing	0.8%
Parent/Other caregiver (or spouse) taken away from home by child welfare agencies, church, or government officials (%)	
No parent/other caregiver (or spouse) taken away	45.3%
1 parent/other caregiver (or spouse) taken away	9.2%
Both parents/other caregivers and spouse taken away	1.1%
Missing	44.4%

Household/Community characteristics	
Number of individuals living in the household (n, (SD))	4.39 (1.55)
Household income (%)	
Above low-income threshold	55.0%
Below low-income threshold	41.5%
Missing	3.5%
Community cohesion scale (0-6) (M (SD))	2.73 (2.11)
Parent or other caregiver nurturing characteristics	
Child is shown approval (%)	
At least once a day	89.5%
Once a week or less	9.3%
Missing	1.2%
Child watches the parent/other caregiver or other people doing things (%)	
At least once a day	95.2%
Once a week or less	3.7%
Missing	1.1%
Child is given 'time out' or sent to their room (%)	
At least once a day	23.0%
Once a week or less	75.6%
Missing	1.4%
Socioemotional and behavioral well-being	
Total difficulties score (0-40) (M (SD))	9.11 (5.55)
Prosocial score (0-10) (M (SD))	8.58 (1.66)

Note. M=Mean, SD=Standard Deviation

Table 2. Total Difficulties Determinants Among Two To Five Year-Old First Nations Children

Indigenous- and non-Indigenous-Specific Determinants	**Total Difficulties (lower scores indicate better socioemotional and behavioral well-being)**	
	β (95% CI)	***p*-value**
Child understands Indigenous language	0.03 (-0.01-0.07)	0.137
Someone teaches child Indigenous culture	-0.04 (-0.08- -0.01)	0.028*
High levels of community cohesion	-0.04 (-0.08- -0.01)	0.027*
1 Parent/Other caregiver experienced family separation	0.05 (0.01-0.09)	0.006*
Both parents/other caregivers experienced family separation	0.05 (0.01-0.08)	0.013*
Very good or excellent parent/ other caregiver health	-0.14 (-0.18 - -0.11)	<0.001*
Household size (continuous variable)	0.06 (0.02-0.10)	0.001*
Child shown approval at least once a day	-0.04 (-0.08- -0.01)	0.027*
Child watches parent/other caregiver do things at least once a day	-0.04 (-0.08- -0.01)	0.037*
Child given time out once a week or less	-0.20 (-0.24- -0.16)	<0.001*
Child age (continuous variable)	-0.09 (-0.13- -0.06)	<0.001*
Child is female	-0.05 (-0.09- -0.02)	0.005*
Household above low-income	-0.09 (-0.13- -0.05)	<0.001*

Note. β=standardized beta; CI=Confidence Interval

Table 3. Prosocial Behavior Determinants Among Two To Five Year-Old First Nations Children

Indigenous- and non-Indigenous-Specific Determinants	**Prosocial behavior (higher scores indicate greater prosocial behavior)**	
	β (95% CI)	***p*-value**
Child understands Indigenous language	-0.01 (-0.05-0.04)	0.823
Someone teaches child Indigenous culture	0.10 (0.06-0.14)	<0.001*
High levels of community cohesion	0.12 (0.08-0.16)	<0.001*
1 Parent/Other caregiver experienced family separation	0.02 (-0.02-0.06)	0.333
Both parents/other caregivers experienced family separation	-0.03 (-0.07-0.01)	0.110
Very good or excellent parent/other caregiver health	0.05 (0.02-0.09)	0.006*
Household size (continuous variable)	-0.09 (-0.13- -0.05)	<0.001*
Child shown approval at least once a day	0.05 (0.01-0.08)	0.016*
Child watches parent/ other caregiver do things at least once a day	0.03 (-0.01-0.07)	0.121
Child given time out once a week or less	0.08 (0.04-0.12)	<0.001*
Child age (continuous variable)	0.16 (0.13-0.20)	<0.001*
Child is female	0.07 (0.03-0.11)	<0.001*
Household above low-income	0.02 (-0.02-0.06)	0.381

Discussion

Using a nationally representative sample, we identified Indigenous-specific and non-Indigenous-specific determinants associated with the socioemotional and behavioral well-being of two to five year-old First Nations children living off-reserve in Canada. The determinants that were associated with fewer total difficulties on the SDQ included being taught an Indigenous culture, living in a community rated to have high cohesion, having a parent or other caregiver who did not experience family separation, better parent or other caregiver health, parental/other caregiver nurturance, smaller household size, higher household income, older child age, and being female. We also found that being taught an Indigenous culture, living in a community rated to have high cohesion, better parent or other caregiver health, being shown approval at least once a day, being given a time out once a week or less, fewer household members, older child age, and being female were all associated with greater prosocial behavior.

Consistent with the evidence of culture being integral to well-being among Indigenous youth, we identified a number of Indigenous-specific determinants of well-being that are unique to First Nations children. While these are initial findings of promotive factors among preschool-aged First Nations children, the positive influence of these Indigenous-specific determinants has been reported with regards to older children's well-being. In a study with 9 to 16 year-old Indigenous youth living on-reservation in the USA, Yoder et al. (2006) found that greater involvement in traditional cultural activities, a stronger cultural identity, and spirituality were all associated with lower levels of suicidal ideation. Similarly, in a study of 11 to 19 year-old First Nations youth living in their own community, Flanagan et al. (2011) found that a stronger First Nations identity was associated with lower levels of physical and relational aggression as reported by the youths.

There could be a few reasons why being taught an Indigenous culture was associated with fewer parent/other caregiver reports of total difficulties in First Nations preschool-aged children. One, the cultural teachings and knowledge may have directly contributed to the children's well-being. For example, many First Nations cultures espouse the importance of connectedness with family, community, and land (Halseth & Greenwood, 2019). Cultivating a strong sense of belonging in early life could promote a sense of identity which can contribute to well-being in First Nations children. A sense of belonging may be especially important in the Indigenous context in which colonial assimilation efforts attempted to eradicate Indigenous cultural and personal identities (Burack & Schmidt, 2014). Indeed, 82% of off-reserve Indigenous peoples totally or somewhat agree that initiatives must be taken to protect their Indigenous cultures from external influences (Environics Institute, 2010). Two, children who are taught an Indigenous culture may also have access to resources and trusting, nurturing adults who transmit cultural information, which could in turn positively impact their socioemotional and behavioral well-being.

We also found that children whose parents or other caregivers rated their communities as having high community cohesion had fewer total difficulties. Families that live in communities with greater cohesion could have greater access to kinship which could positively influence children's development and well-being since they have multiple caregivers to look after them in case of a less nurturing primary caregiver (Muir & Bohr, 2019). Although our study participants lived off-reserve –and therefore were potentially distant from kinship–the majority of off-reserve First Nations individuals consider their urban city 'home' and maintain a close connection with other First Nations individuals in their urban city (Environics Institute, 2010). Moreover, Indigenous peoples living off-reserve may have a more encompassing definition of who belongs to their community (i.e., family, friends, other Indigenous peoples in the city, co-workers,

Indigenous friendship or healing centers, or Indigenous peoples from their band) in comparison to those living on-reserve (Environics Institute, 2010). Therefore, living in communities where members are well-connected and support children's learning about their Indigenous culture may have positive impacts on their socioemotional and behavioral well-being.

The finding that the absence of parent or other caregiver family separation (due to removal from home by child welfare agencies, church, or government officials) was also associated with fewer total difficulties is not surprising. Consistent with other studies, offspring with parents and/or grandparents who attended IRS have poorer psychological well-being (Hackett et al., 2016), a history of childhood abuse (Elias et al., 2012), and higher suicidal ideation (Elias et al., 2012; Hackett et al., 2016). Additionally, since children were not exposed to positive role modelling in IRS and formed dysfunctional relationships with adults during formative years, survivors of IRS struggled with parenting in their adult life (Burack & Schmidt, 2014). Indeed, offspring of survivors of residential schools noted that they had negative relationships with maternal figures that negatively impacted their well-being (Roy & Thurston, 2015) and their own ability to parent (Ussher et al., 2016).

We also identified a number of non-Indigenous-specific determinants of well-being in Indigenous children that are consistent with the literature. For example, among five year-old Aboriginal children in Australia, being female, having private health insurance and high maternal education (proxies for household income) were all associated with better social and emotional development (Williamson et al., 2019). Other researchers have found that positive parent-child relationships (Kaspar, 2013; Silburn et al., 2007) and better parental health (Silburn et al., 2007; Whitbeck et al., 2006) are associated with less psychopathology among Indigenous children and youth. Fewer data are available examining the association between household size and

Indigenous children's mental health. However, one study among Inuit 2-5-year-old children found that parent reports of crowded housing was associated with greater parent reports of offspring emotional and conduct problems, and poorer child health overall (Kohen et al., 2015). This evidence highlights that First Nations and non-First Nations children may share some similar determinants of positive socioemotional and behavioral well-being.

High levels of prosocial behavior were associated with being taught an Indigenous culture and living in a community with high cohesion. Data on the prosocial behavior on Indigenous children in Canada and around the world are very scarce. One study of 119 Aboriginal youth aged 12-17 years-old living in Australia found that physical activity and having a family member that the youth could talk to were associated with greater levels of prosocial behavior (Young et al., 2019). Being taught an Indigenous culture could be associated with greater prosocial behavior as the child may have access to caring, trusting adults. Indeed, positive relationships with caring adults has been shown to be a potent predictor of resilience among Indigenous youth (Andersson & Ledogar, 2008). Similarly, living in a community rated to have high community cohesion may allow children more opportunities to share, interact with peers, and engage in prosocial relationships.

Speaking an Indigenous language was not associated with fewer total difficulties nor with prosocial behavior in the children. This was somewhat unexpected since speaking an Indigenous language can represent cultural resistance and revitalization and is foundational to positive well-being among many First Nations cultures. For example, positive associations have been cited between knowledge of an Indigenous language and well-being, including more positive mental health (Hodge & Nandy, 2011), lower rates of past-month drug use (Greenfield et al., 2018), and lower rates of suicide (Hallett et al., 2007). However, these were studies of adult participants,

who may be more likely to benefit from learning an Indigenous language to build and maintain relationships, increase social capital, and pass on traditional knowledge, as compared to children and youth who may be too young to properly grasp the language or reap the benefits of it. Indeed, in a study of 6-14 year-old Indigenous children living off-reserve in Canada, Kaspar (2013) found that speaking an Indigenous language at home or school was not protective against the development of psychological or nervous difficulties. Another reason for our null finding could be that our measure of speaking an Indigenous language did not accurately distinguish among levels of language learning, knowledge, and application. Since better language proficiency is associated with lower prevalence and severity of mental health problems (Montemitro et al., 2021), aggregating children of varying levels into a single group may mask any potential associations between knowledge of an Indigenous language and well-being.

The strengths of this study include the use of nationally representative data from the largest dataset available in Canada on First Nations children living off-reserve, and a focus on positive aspects of First Nations well-being, an approach that is rarer in the Indigenous health literature. We also acknowledge both Indigenous- and Western-based ways of knowing by identifying Indigenous-specific determinants in addition to non-Indigenous-specific factors associated with socioemotional and behavioral well-being to provide a more complete description of First Nations preschool-aged children's well-being. Moreover, by providing disaggregated data for First Nations children living off-reserve, we support the development of targeted, context-specific solutions and interventions. Finally, by focusing on young children and examining factors promoting their well-being, we align with and honor First Nations worldviews that prioritize the health and security of young people (Greenwood, 2005).

This study also has limitations. One, its cross-sectional nature precludes us from drawing conclusions about developmental pathways in preschool-aged children. Two, the ACS was conducted in 2006 and so it may not be as informative about the contemporary lives of Indigenous peoples and their connections with culture and socioemotional and behavioral well-being. However, since the ACS is the only nationally representative survey of off-reserve First Nations children in Canada with the most recent data on socioemotional and behavioral well-being on young children, our study can provide a foundation for future researchers. For example, future studies can examine how the continued Indigenous cultural revitalization and implementation of the 94 Calls to Action have impacted the well-being of Indigenous preschool-aged children. Three, since the ACS did not include a measure of gender identity, we were unable to assess the influence of being two-spirit on children's well-being. Gender identity and sexuality and its impact on the socioemotional and behavioral well-being of Indigenous children should be an area of further inquiry for researchers. Four, we used parent or other caregiver reports of children's socioemotional and behavioral well-being rather than structured diagnostic interviews. However, the SDQ has been shown to be correlated with psychiatric ICD-10 diagnoses, especially conduct, oppositional defiant, attention-deficit/hyperactivity, and some anxiety disorders (Goodman et al., 2000). Five, despite the SDQ demonstrating satisfactory reliability among study participants, it is not a First Nations-specific measurement of socioemotional and behavioral well-being. However, in the absence of other reliable measures to examine a widely understudied topic, utilizing the SDQ can further our understanding of positive socioemotional and behavioral well-being. Other studies should continue to partner with Indigenous communities and invest in tailoring measures relevant to the community. Six, our effect sizes were small suggesting that these associations are likely to be impactful at a

population level only. Still, detecting these associations in childhood, even if small, can be impactful given the importance of early intervention.

Using cross-sectional data from the largest, nationally representative survey of young Indigenous children in Canada, we found that both Indigenous-specific (e.g., being taught an Indigenous culture, living in a community with high cohesion, parent or other caregiver not experiencing family separation) and non-Indigenous-specific (e.g., very good/excellent parental/other caregiver health, parental/other caregiver nurturance, smaller household size, greater household income, older child age, and female sex) factors were associated with positive socioemotional and behavioral well-being of two to five year-old First Nations children living off-reserve. These findings are further evidence of the extent to which the intergenerational transmission of Indigenous culture is essential to the well-being of Indigenous children even, or especially, for those who live off-reserve. These data can guide First Nations community members, policymakers, and researchers in leveraging these cultural factors, along with non-Indigenous-specific determinants, and identifying targets for intervention to promote healthy child socioemotional and behavioral well-being. These interventions can help maximize and sustain positive well-being in First Nations preschool-aged children, their families, and communities.

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Chapter 6: Discussion

Summary

The enduring effects of colonialism have disproportionately exposed Indigenous peoples to risk factors for mental health challenges. Examining the prevalence of such challenges, their associated factors, and intervening early in life can contribute to the reduction of these difficulties and help optimize the health and well-being of Indigenous families. The studies contained in this thesis aimed to examine mental health among Indigenous pregnant persons and birthing parents, mechanisms of transmission, and offspring risk. Study 1 found that Indigenous perinatal individuals from around the world were 62% more likely to experience mental health challenges. Study 2 found that Métis individuals were at a 47% and 36% increased risk for having depression and anxiety during pregnancy, respectively, compared to their non-Métis counterparts and that pre-pregnancy medical conditions, smoking/alcohol use/recreational substance use during pregnancy, and living in an urban location were associated with these difficulties. In Study 3, Indigenous children born to parents with psychopathology were observed to be at a greater risk of mental health challenges than Indigenous children of healthy parents, an association that may be stronger in Indigenous than non-Indigenous families. Finally, in Study 4, we found that learning an Indigenous culture and living in a community with high cohesion was associated with better well-being among preschool-aged First Nations children.

Contributions to the field of Indigenous mental health

Our body of work suggests that Indigenous perinatal individuals, including Métis pregnant persons are at a greater risk for mental health challenges compared to their non-Indigenous peers. Only one other meta-analysis, to my knowledge, found that Indigenous postpartum individuals were at an 87% increased risk of experiencing postpartum depression

(k=5 studies) (Black et al., 2019). Our data are consistent with and extend extant literature by synthesizing prevalence estimates for both pregnancy and postpartum, and including mental health challenges than just postpartum depression (e.g., anxiety, post-traumatic stress disorder, substance use, panic disorder). These comprehensive data can inform the development of culturally-safe screening and treatment protocols for Indigenous perinatal individuals.

Moreover, our research contributes to much needed data on an underrepresented group in the Indigenous health literature: Métis. The National Collaborating Centre for Aboriginal Health has highlighted the lack of data on the health of Métis individuals (National Collaborating Centre for Aboriginal Health, 2011) and in part due to their underrepresentation in the literature, they are referred to as the "forgotten people" (Sealey & Lussier, 1975). Indeed, in a scoping review of 223 articles on the mental health of Indigenous peoples in Canada, just seven included data on Métis individuals (Nelson & Wilson, 2017). Data on perinatal Métis individuals are even more limited. Studies have described that Métis pregnant persons and birthing parents experience high exposure to stressors including low self-esteem (Rieger & Heaman, 2016), low social support (Chantal et al., 2018; Rieger & Heaman, 2016), abuse before or during pregnancy (Chantal et al., 2018; Rieger & Heaman, 2016), high residential mobility (Rieger & Heaman, 2016), and discrimination (Monchalin et al., 2020; Rieger & Heaman, 2016), that can increase the risk for prenatal stress (Rieger & Heaman, 2016) and postpartum depressive symptoms (Daoud et al., 2019). Our research adds to these findings by demonstrating that Métis pregnant persons are more likely to have mental disorders during pregnancy, and this risk could be contributed to by the disproportionate exposure to the aforementioned risk factors that existing literature has outlined. Future researchers can use our findings as a foundation to examine other research questions that our study was unable to address (e.g., influence of Métis-specific determinants on

perinatal mental health). Partnering with the Métis Nation of Alberta can also facilitate the utilization of our study findings in meaningful and relevant ways.

Our body of work has also contributed to the field of Indigenous children's health. The Scientific Director of the CIHR Institute of Indigenous Peoples' Health Dr. Margo Greenwood lists "a lack of data for [off-reserve] Indigenous children under 6 years of age" as a knowledge gap on Indigenous early childhood development in Canada (Halseth & Greenwood, 2019). Indeed, in a systematic review of 28 studies on the mental health of Indigenous children and youth (0-18 years old), just four included data on young children (<6 years old) (Owais et al., 2022). These four studies identified the prevalence of mood/anxiety disorders (Findlay & Janz, 2015; First Nations Information Governance Centre, 2018), ADHD (Findlay & Janz, 2015), psychological nervous difficulty (MacMillan et al., 2010), emotional/behavioural problems (MacMillan et al., 2010), and mental health diagnoses (Latimer et al., 2018) among Indigenous children (<6 years old). While these studies have been helpful in establishing benchmarks of mental health challenges from which progress can be measured over time, our study advanced the field by not only describing the association of parent and offspring psychopathology in an Indigenous context, but also identifying factors that may be associated with positive well-being in young First Nations children. Such findings could contribute to efforts to design interventions to promote a healthy start to life. Indeed, this thesis took a strengths-based approach to examine young First Nations children's well-being (Study 4). This approach is important given that the discourse around Indigenous health remains deficits based where only negative health outcomes are described despite gains in some health and educational outcomes over the years (Anderson, 2021; Carrière & Bougie, 2023; Statistics Canada, 2020). In a systematic review of factors associated with Indigenous children's mental health, 41 out of the 47 studies focused on negative health outcomes (Young et al., 2017). This deficits-based discourse is also represented in the

global media where 74% of media stories on Aboriginal and Torres Strait Islanders in Australia reported only on negative health outcomes (Stoneham et al., 2014). Highlighting strengths can motivate individuals to pursue healthy behaviours and result in positive feedback loop where positive beliefs about oneself and their community contribute to long-term positive health outcomes which can then reinforce one's belief system (Cohen & Sherman, 2014).

Another research gap described in the Indigenous children's literature is "a lack of data using culturally relevant health and health determinant indicators" (Halseth & Greenwood, 2019). Indeed, prior to our work, there were no studies, to my knowledge, that examined culturally-relevant factors associated with positive well-being among young (<6 years old) Indigenous children. Among youth and young adults, however, studies have described associations of involvement in cultural activities (Yoder et al., 2006), strong cultural identity & spirituality (Flanagan et al., 2011; Yoder et al., 2006), and knowledge of an Indigenous language (Greenfield et al., 2018; Hallett et al., 2007) with positive well-being. Our study findings extend the literature by not only identifying culturally-relevant factors, but examining their influence in early development. These findings could have the potential to help community members and researchers leverage their cultural knowledge and design targets for intervention to provide the opportunity to intervene earlier in life.

Implications of current thesis

Consider screening Indigenous perinatal individuals for mental health challenges

This body of work has implications for clinical practice. Given the thesis findings that Indigenous perinatal individuals are more likely to have mental health challenges, healthcare providers may consider universal screening for depression and anxiety among Indigenous individuals during pregnancy and in the postpartum. This recommendation is consistent with

United States Preventive Services Task Force (USPSTF) guidelines (Siu et al., 2016) and the Australian Clinical Practice Guidelines by Centre of Perinatal Excellence (Austin et al., 2017), that suggest that universal screening for perinatal depression is recommended. It is important to note that while the Canadian Task Force on Preventive Healthcare has not recommended universal instrument-based screening for perinatal depression, this conditional recommendation was based on low-quality evidence (Lang et al., 2022). Despite the publishing of these clinical practice guidelines, uptake of them remains low, with 20-35% of pregnant persons not being offered screening (Moss et al., 2020; Reilly et al., 2013), numbers that are higher among ethnic, low-income, and single parent perinatal individuals (Harrison et al., 2023). Indeed, Indigenous perinatal individuals are less than half as likely to be screened for depression than non-Indigenous individuals in Australia (San Martin Porter et al., 2019). Reasons for underscreening can include time constraints, lack of staff, and being poorly equipped to handle a positive screen (Henry et al., 2020). These reasons are exacerbated for Indigenous communities where they may fear consequences of a positive screen, perceive a lack of culturally-congruent interventions, and experience feelings of stigma and personal intrusion. While these drawbacks can hinder the implementation of universal screening among Indigenous perinatal individuals, approaches can be taken to address these drawbacks.

First, the purpose of screening and who will have access to their responses must be clearly explained to the Indigenous perinatal individual. Screening could be undertaken using the EPDS, the free, gold standard scale for screening for perinatal depression, as it has been validated for use among Indigenous perinatal individuals living in Canada (Clarke, 2008) and has been translated in over 60 languages, including Cree and Inuktitut. Interpreters can also be available through hospital services (e.g., LanguageLine). Second, in order for screening to be meaningful, healthcare providers must be equipped to respond to a positive screen meaning that

follow-up is conducted and culturally-relevant treatments are offered. Culturally-relevant psychosocial and home-visiting programs for Indigenous perinatal individuals exist (Barlow A. et al., 2015; Ginsburg et al., 2012; Ingalls et al., 2022; Walkup et al., 2009), as well as Aboriginal Patient Navigator programs, Indigenous-specific mental health phone/text lines (e.g., Hope for Wellness Help Line, Talk4Healing), and Indigenous-specific mental health centres where patients can receive counselling (e.g., Wabano, Qualia Counselling Services, Indigenous Perinatal Mental Health Program). Additionally, there is no evidence to suggest that Indigenous perinatal individuals respond differently to pharmacotherapy than non-Indigenous perinatal individuals, so those suffering from moderate-to-severe depression or anxiety can be offered medication if that is their preferred treatment (MacQueen et al., 2016). Employing some of these approaches to increase uptake of screening protocols, especially among Indigenous perinatal individuals, can be of significant benefit given that perinatal depression screening is associated with increased treatment referrals and treatment engagement (Miller et al., 2021). Identifying and treating more individuals with perinatal mental health challenges could then lead to positive outcomes for the birthing parent, offspring, and family.

Intergenerational, culture-based programs may be impactful in improving child socioemotional and behavioural well-being

Our findings from Study 3 describing the association of psychopathology among parents and offspring are consistent with a framework proposed by Dr. Amy Bombay which outlines the role of adverse childhood experiences on the development of poor coping mechanisms, cognitions, and appraisals, making individuals more vulnerable to mental health challenges (Bombay et al., 2009). These challenges can then negatively influence parenting quality resulting in their offspring experiencing adverse childhood experiences and perpetuating the cycle of

intergenerational trauma (Bombay et al., 2009). However, not included in this framework are potential factors that can break the cycle of intergenerational trauma. Our body of work adds to this framework by identifying factors associated with fewer socioemotional and behavioural difficulties among First Nations children living off-reserve. Indeed, we found that nurturing caregiving style was associated with greater prosocial behaviour and fewer socioemotional and behavioural problems compared to children who did not receive nurturing caregiving. Other research has also shown a similar relationship in Indigenous children and youth (Kaspar, 2013; Tolliver-Lynn et al., 2021; Wurster et al., 2020). Taken together, these findings suggest that intergenerational interventions which include both the caregiver(s) and child may be impactful. Based on our finding that knowledge of an Indigenous culture and strong community cohesion were associated with lower scores on the Strengths and Difficulties Questionnaire, culture-based programming should be explored. For example, Family and Child Education (FACE) is a family-based literacy program designed for American Indian families with children aged 0-5 years old (Yarnell et al., 2020). The program involves weekly or bi-weekly home and/or centre visits where trained American Indian educators deliver an evidence-based curriculum (Parents as Teachers) to promote parent-child interactions, develop children's school readiness, and promote American Indian cultures and languages (Yarnell et al., 2020). With nearly 23,000 American Indian families served, research has shown that program enrolment has been associated with child literacy and vocabulary skills higher than the national average, greater parental involvement in their children's education than parents from general populations, and 66% of parents reporting that the program has helped them use their American Indian language more (Yarnell et al., 2020). Future studies should assess child socioemotional and behavioural well-being and determine how parental involvement and/or knowledge of Indigenous culture influences offspring development.

Future Directions

To continue contributing to the Indigenous health research landscape, we recommend three areas for researchers to focus on: 1) conducting longitudinal studies, 2) prioritizing cultural adaptation of mental health measurements, 3) developing and implementing interventions for Indigenous pregnant persons, birthing parents, and young children (0-5 years old)

Conducting longitudinal studies

To take a life course approach to Indigenous children's health and understand their developmental trajectories, longitudinal studies are needed. Longitudinal studies follow a cohort of participants over a certain time frame and are designed to detect changes in outcomes over time, draw temporal associations between a predictor and outcome, and identify the differential influence of predictors on outcomes over different stages of the life course. The majority of longitudinal research on Indigenous children's health comes from Australia including cohorts such as Footprints in Time: Longitudinal Study of Indigenous Children (Thurber et al., 2015), Study of Environment of Aboriginal Resilience and Child Health (The SEARCH Investigators, 2010), and the South Australian Aboriginal Birth Cohort (Jamieson et al., 2021) to name a few. Longitudinal data on Indigenous children's health in a Canadian context are scarce which is severely hindering the ability to measure patterns in health over time and establish benchmarks (Halseth & Greenwood, 2019). To address these lack of data, CIHR developed the Healthy Life Trajectories Initiative where up to $14 million has been earmarked to understand a life course perspective in Indigenous peoples (Government of Canada, 2017a).

With the aim of identifying early life influences associated with Indigenous child socioemotional and behavioural well-being, researchers can consider recruiting pregnant Indigenous individuals and following them, their offspring, and their partners until five years.

Indeed, the first five years of life have been identified as periods of rapid brain development (Tottenham, 2020), an age range that is culturally sacred (Neckoway et al., 2007), and also one where data are limited (Halseth & Greenwood, 2019). Recruitment can occur through primary care clinics, local Indigenous midwifery centres, ultrasound clinics, and Aboriginal Head Start centres. Researchers can consider collecting data in the third trimester, 12 weeks postpartum, 6 months postpartum, 12 months postpartum, and annually after that, which are timepoints consistent with other pregnancy/birth cohorts (Jamieson et al., 2021; Kaplan et al., 2012). In line with Indigenous worldviews that interrelationships between family, community members, and land influence health (Vukic et al., 2011), and Shonkoff's ecobiodevelopmental model (Shonkoff et al., 2012), studies should identify individual-, family-, and community- level factors of health. Some examples of variables to measure include: offspring Indigenous identity, socioemotional and behavioural well-being, temperament, and knowledge of Indigenous culture (including speaking/understanding an Indigenous language). Caregiver variables can include: Indigenous identity, mental health during pregnancy, current health, education, marital status, parenting style, social capital, cultural participation and connectedness, adverse childhood experiences, household income and composition, and exposure to IRS, boarding schools, Sixties Scoop, Millennium Scoop, or other relocation policies. Community-level variable can include: living on-reserve or off-reserve, access to cultural resources, and neighborhood satisfaction. There should be a particular focus on how macro-level factors (e.g., discrimination, colonialism, dispossession from lands) influence Indigenous children's health given their paucity in the literature (Lloyd-Johnsen et al., 2021). To facilitate recruitment and minimize attrition, researchers must partner with Indigenous communities and organizations to guide the generation of research questions, selection of variables, and data interpretation. Researchers must also follow local Indigenous research guidelines to build research capacity within the community

(Government of Canada, 2019). Designing and conducting longitudinal studies can allow researchers to better understand the early development pathways of Indigenous children in Canada, risk and resilience mechanisms, and help design targets for intervention.

Cultural adaptation of mental health measurements

The reviews contained in this thesis (Study 1 and 3) and the extant literature (Bombay et al., 2009; Bowen et al., 2014; Smylie & Anderson, 2006; Thomas et al., 2010; Walls et al., 2019; Williamson, Andersen, et al., 2014) have identified that the majority of studies do not use culturally adapted and/or validated measurements for the Indigenous group under study. Therefore, based on this thesis' findings, along with repeated calls from Indigenous organizations and leaders, future studies should culturally adapt and validate measures for the specific community under study. The adaptation and validation of measures must be balanced against a community's immediate need to collect data and address urgent issues (e.g., suicide crises) (Walls et al., 2019). Researchers that aim to adapt existing measures for Indigenous communities should follow measurement development frameworks specific for Indigenous populations (Walls et al., 2019).

To save time, costs, and resources, researchers can first consider identifying existing measures and determining their utility for the Indigenous community under examination. To translate and adapt existing measures, International Test Commission Guidelines for Translating and Adapting Tests should be followed (International Test Commission, 2017). Specifically, researchers should first get permission from the original scale authors to adapt their test (International Test Commission, 2017). Next, focus groups with Indigenous cultural experts and members from the community under study should determine whether the construct being measured is understood the same way among the Indigenous community (Kotz et al., 2016;

Williamson, McElduff, et al., 2014). Once construct equivalence has been established, translators that are experts in both the language and culture can be recruited to ensure accurate translation of the instrument (International Test Commission, 2017). Bilingual respondents can then complete both versions of the test and comment on their equivalence. Finally, representative samples can be recruited to assess its reliability and establish convergent and discriminant validity (International Test Commission, 2017). The utilization of culturally adapted measurements can contribute to more accurate estimates of mental health challenges, identification and assessment of culture-bound syndromes, and prioritization of Indigenous knowledge and research methodologies.

Development and implementation of evidence-based programs for Indigenous pregnant persons, birthing parents, and children (0-5 years old)

This thesis, along with other studies, described an association between Indigenous parent and offspring psychopathology (Bombay et al., 2009; Costello E.J. et al., 1997; Young et al., 2017) and identified individual-, family-, and community-level factors which can positively influence the well-being of young Indigenous (First Nations) children (Ames et al., 2015; Hopkins et al., 2018; Williamson A. et al., 2016; Young et al., 2017). Future research should subsequently focus on program development and implementation to reduce mental health disparities. Studies 1 and 2, along with the literature (Black et al., 2019; Daoud et al., 2019; Rieger & Heaman, 2016), suggest that pregnancy and the early postpartum may present as opportune times to intervene given the prevalence of mental disorders during this period among Indigenous individuals. In line with the recommendations of the United States Preventive Services Task Force to prevent perinatal depression, counselling programs (e.g., cognitive behavioural therapy, interpersonal therapy) should be explored as first-line treatments for

Indigenous perinatal individuals (Curry et al., 2019). Studies have shown that evidence-based psychotherapies are effective for reducing distress (Beckstead et al., 2015; Mathieson et al., 2012; Tighe et al., 2017), depression (Goodkind et al., 2010; Listug-Lunde et al., 2013; Morsette et al., 2009; Tighe et al., 2017), anxiety (Goodkind et al., 2010; Listug-Lunde et al., 2013), trauma (Goodkind et al., 2010; Morsette et al., 2009), and recreational substance use (Donovan et al., 2015; D'Silva et al., 2011; Mushquash et al., 2007; Patten et al., 2013) among Indigenous youth and adults. More research is needed on the development and implementation of psychotherapies for Indigenous perinatal individuals.

Psychoeducational and home visiting programs designed to improve Indigenous pregnant persons' mental health have been found to be effective in increasing parental knowledge (Walkup et al., 2009) and maternal involvement (Walkup et al., 2009), and reducing maternal depression (Ginsburg et al., 2012), other internalizing symptoms (Barlow A. et al., 2015), maternal substance use (Barlow A. et al., 2015), and parenting challenges (Ingalls et al., 2022). Only one Indigenous-focused psychoeducational perinatal program (delivered during pregnancy and postpartum) has assessed child outcomes. This program involved approximately 34 home visits from the third trimester of pregnancy until 36 months postpartum from an American Indian paraprofessional who delivered culturally-congruent information on parenting, positive maternal health behaviours, offspring issues, and substance use (Barlow A. et al., 2015). This study found that offspring internalizing, externalizing, and dysregulation problems decreased at 12 months postpartum (Walkup et al., 2009) and that these gains were maintained at three years postpartum (Barlow A. et al., 2015).

While the aforementioned psychoeducational and home-visiting studies have advanced our knowledge of perinatal interventions in Indigenous parents, more work is needed to design,

and implement evidence-based psychotherapies among Indigenous perinatal individuals. First, psychotherapies must be culturally-adapted for the specific community under study. In addition to being more effective (Hall et al., 2016), culturally-adapted interventions can aid in participant recruitment, retention (Fisher et al., 1996), and engagement (Brave Heart et al., 2020; Pomerville et al., 2016). This is an important consideration for Indigenous participants since in general population samples from high-income countries, only 22.4% gain access to psychotherapy treatment (Thornicroft et al., 2017). These numbers are likely lower for Indigenous communities who face significant barriers to treatment including lack of access to healthcare resources, culturally-inconsistent care, and discrimination in mainstream healthcare. Once programs are in the implementation stage, researchers can refer to the Canadian Psychological Association's guidelines for providing culturally-appropriate psychotherapy to Indigenous peoples (Task Force on Responding to the Truth and & Reconciliation Commission of Canada's Report, 2018). Second, programs should consider long-term follow-up. There are a paucity of longitudinal data on young Indigenous children, as well as the influence that early childhood programming can have on their development. For instance, if the program is delivered during pregnancy and/or the early postpartum, follow-up can occur to 5 years postpartum to assess the intervention's impact on offspring socioemotional and behavioural well-being. Given the duration between program delivery and follow-up, it may be difficult to determine whether outcomes at 5 years postpartum are a result of the treatment or simply due to the postnatal environment. Researchers can better tease out intervention effects by measuring variables in the postnatal environment (e.g., caregiver skills, primary caregiver mental health, family socioeconomic status, major life stressors) that can influence offspring health (Maggi et al., 2010). Ultimately, evidence-based culturally-adapted programs with long-term follow-up can provide insight into the improvement of mental health among Indigenous perinatal individuals and their offspring's early development pathways.

Limitations

The limitation of studies contained in this thesis must be discussed. First, all studies had an observational research design so causal associations cannot be drawn. Second, all studies were either reviews (Studies 1 and 3), secondary analyses (Study 4), or had data taken from administrative health databases (Study 2), so we had limited control over which variables to analyze. Third, we were unable to examine Indigenous-specific determinants of perinatal mental health for Studies 1 and 2, and of psychopathology among Indigenous families in Study 3. Fourth, all participants from Studies 1 and 4 were of Indigenous peoples living off-reserve so the perinatal mental health and preschool-aged children's health of those living on-reserve remains unknown. However, more Indigenous peoples live off-reserve/reservation than on-reserve in Canada (Government of Canada, 2017b) and the USA (Norris et al., 2012), and individuals living off-reserve are underrepresented in the Indigenous health literature (Nelson & Wilson, 2017). Finally, while Studies 1 and 3 were up-to-date reviews of the literature, Study 2 and 4 used data from 2006-2016 and 2006, respectively. Therefore, these studies may contain data that may not reflect contemporary lives of Indigenous peoples.

Conclusion

Indigenous peoples experience many structural disadvantages that can increase their risk for mental health challenges. The work presented in this thesis highlights the higher prevalence of mental disorders among Indigenous perinatal individuals and dyads and lends insight into potential targets for early intervention. Continued efforts to conduct longitudinal studies, culturally adapt mental health measurements, and design and implement culturally-relevant interventions for perinatal individuals and young children, can support the optimization of mental health of Indigenous perinatal individuals, their offspring, and families. To sustain gains

in health outcomes the basic human rights of Indigenous peoples must be met including access to clean running water, housing and food security, access to recreational centres, and decolonizing healthcare, education, child welfare, and justice systems. Eliminating health inequities among Indigenous and non-Indigenous peoples, especially early in life, can help contribute to healthier societies worldwide.

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Appendix

Declaration of Academic Achievement

Two journal articles (Studies 1 and 3) have been published in peer-reviewed journals and were reused in this dissertation. The publisher of these journal articles is SAGE Publications and the journal articles contain the following citation information:

- **Owais S**, Faltyn M, Johnson AVD, Gabel C, Downey B, Kates N, et al. The Perinatal Mental Health of Indigenous Women: A Systematic Review and Meta-Analysis. *Can J Psychiatry*. 2020 Mar 1;65(3):149–63. doi: 10.1177/0706743719877029.
- **Owais S**, Faltyn M, Zou H, Hill T, Kates N, Burack JA, et al. Psychopathology in the Offspring of Indigenous Parents with Mental Health Challenges: A Systematic Review: Psychopathologie Des Descendants De Parents Autochtones Ayant Des Problèmes De Santé Mentale: Une Revue Systématique. *Can J Psychiatry Rev Can Psychiatr*. 2021 Jun;66(6):517-536. doi: 10.1177/0706743720966447

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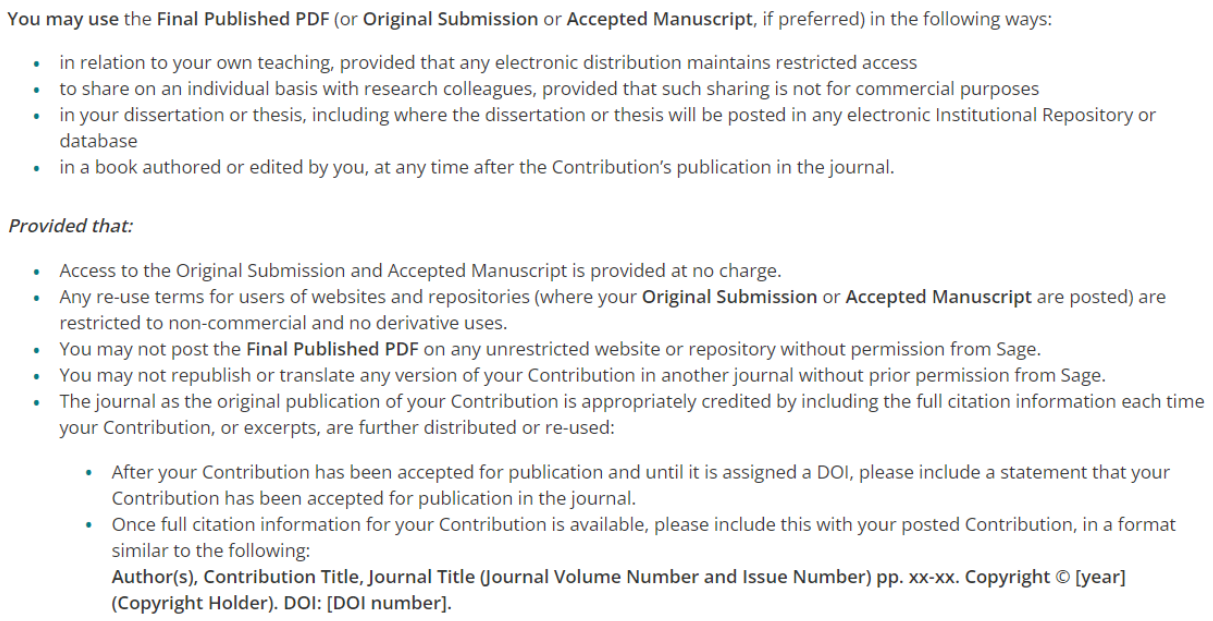

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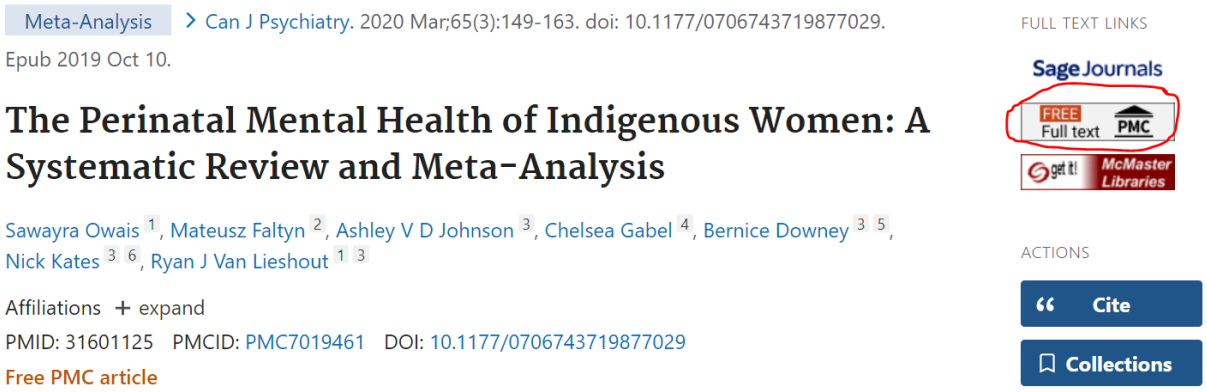

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Chapter 2: The Perinatal Mental Health of Indigenous Women: A Systematic Review and Meta-Analysis (Study 1)

Table S1. Risk of Bias for Cohort Studies as assessed by The Newcastle Ottawa scale.

Author, Year	Representativeness of exposed cohort (selecti bias)	Selection of non-exposed cohort (selection bias)	Ascertainment of exposure (selection bias)	Demonstration that outcome was not present at start of study (selection bias)	Comparability of cohorts (comparability bias)	Ascertainment of outcome (outcome bias)	Adequate follow-up (outcome bias)	Adequacy of follow-up of cohorts (outcome bias)	Total score
Signal et al., 2017 [29]	*	*	Standardized questionnaires	*	* *	Self-report	*	*	7/9
Buist et al., 2014 [35]	*	*	Standardized questionnaires	*	* *	Self-report	*	> 70% attrition	6/9
Gavin et al., 2011 [32]	*	*	Standardized questionnaires	No	* *	Self-report	*	*	6/9
Liu et al., 2018 [47]	*	*	Standardized questionnaires	No	* *	Self-report	*	*	6/9
Liu et al., 2016 [44]	*	*	Standardized questionnaires	No	* *	Self-report	*	*	6/9
Abbott & Williams, 2006 [36]	*	Non-Pacific Islanders were not represented	Standardized questionnaires	No	* *	Self-report	*	*	5/9
Becares & Atatoa, 2016 [37]	*	*	Standardized questionnaires	*	* *	Self-report	Measured beyond the highest risk for PPD	> 30% attrition	5/9
D. Hayes et al., 2010 [45]	Not representative	*	Standardized questionnaires	No	* *	Self-report	Unspecified	*	4/9
Roberson et al., 2015 [46]	Not representative	Not representative	Standardized questionnaires	*	* (controlled for other factors but not age)	Self-report	*	*	4/9

Stock et al., 2012 [34]	Not representative	Not representative	Standardized questionnaires	*	* (controlled for other factors but not age)	Self-report	*	*	4/9
Wei et al., 2008 [48]	Not representative	Not representative	Standardized questionnaires	No	* *	Self-report	*	*	4/9
Bowen et al., 2008 [39,52]	*	Not mentioned	Standardized questionnaires	No	No	Self-report	*	*	3/9
B. Hayes et al., 2010 [33]	Not representative	Not representative	Standardized questionnaires	No	* *	Self-report	Unspecified	*	3/9
Huang et al., 2007 [42]	*	*	Standardized questionnaires	No	No	Self-report	No	*	3/9
Morland et al., 2007 [53]	Not representative (clinic sample)	Not reprehensive (clinic sample)	Standardized questionnaires	*	* (controlled for other factors but not age)	Self-report	Beyond risk period for Antenatal PTSD	*	3/9
Shah et al., 2011 [40]	*	Not representative	Standardized questionnaires	No	No	Self-report	*	*	3/9
Wang et al., 2003 [49]	No	No	Standardized questionnaires	No	* (controlled for other factors but not age)	Self-report	*	*	3/9
Goebert et al., 2007 [30]	Not representative	Not representative	Standardized questionnaires	No	No	Self-report	*	*	2/9
Sugarman et al., 1994 [43]	Not representative of all urban American Indian women	*	Standardized questionnaires	No	No	Self-report	No	*	2/9
Webster et al., 1994 [38]	Not representative (deliberately excluded Pacific Islanders)	*	Standardized questionnaires	No	No	Self-report	No	*	2/9

Mah et al., 2017 [54]	*	No comparison group	Standardized questionnaires	No	No	Self-report	Beyond risk period for Antenatal PTSD	Significant attrition (>80%)	1/9
Onoye et al., 2009 [31]	Not representative (clinic sample)	Not representative (clinic sample)	Standardized questionnaires	No	No	Self-report	*	Significant attrition (>50%)	1/9

There are 8 criteria of the NOS which are represented in each column. A maximum of one star can be allocated to each criterion, with the exception of comparability bias, where two stars can be allocated. The greater the number of stars, the higher the quality of the study

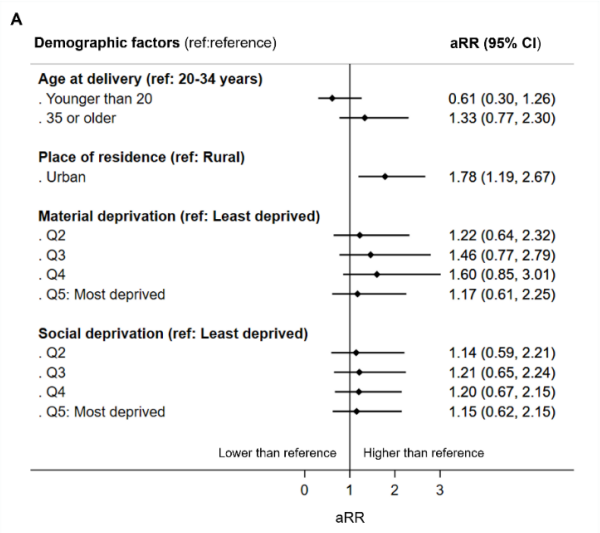
Table S1 (Continued). Risk of bias for Case-Control studies as assessed by The Newcastle Ottawa scale.

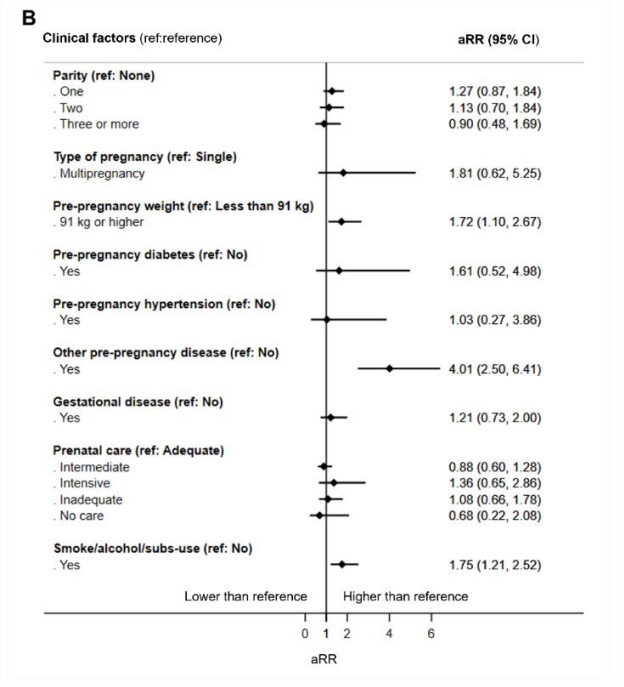
Author, Year	Adequate definition (selection bias)	Representativeness (selection bias)	Selection of controls (selection bias)	Definition of controls (selection bias)	Comparability of cases and controls (comparability bias)	Ascertainment of exposure (exposure bias)	Non-response rate (exposure bias)	Total score
Burns et al., 2006 [50]	*	*	Hospital controls	*	**	*	*	7/8
Burns et al., 2006 [51]	*	*	Hospital controls	*	**	*	*	7/8
Dodgson et al., 2014 [41]	Self-report	*	Hospital controls	*	* *	Self-report	*	5/8

There are 8 criteria of the NOS which are represented in each column. A maximum of one star can be allocated to all categories, with the exception of comparability bias, where two stars can be allocated. The greater the number of stars, the higher the quality of the study

Chapter 3: Prevalence and Determinants of Depression, Anxiety, and Post-Traumatic Stress Disorder Among Métis Pregnant Persons in Alberta: A Population-Based Cohort Study (Study 2)

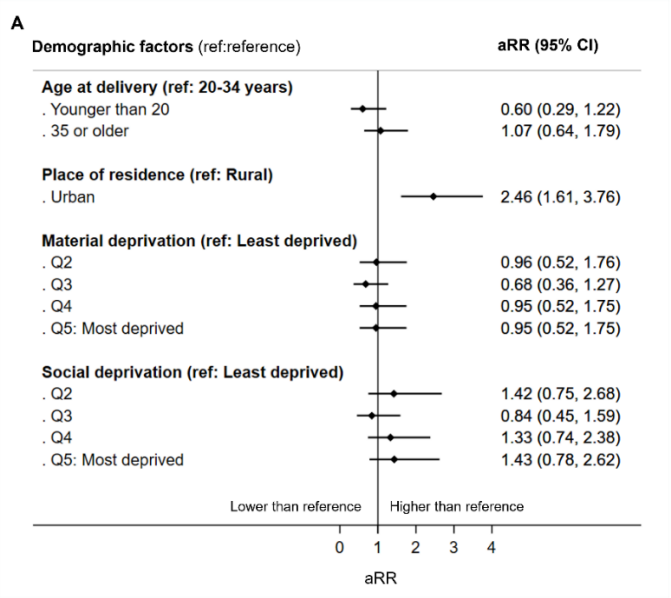
Figure S1. Adjusted risk ratios for demographic (A) and clinical (B) factors comparing depression and non-depression cases among the Métis cohort.

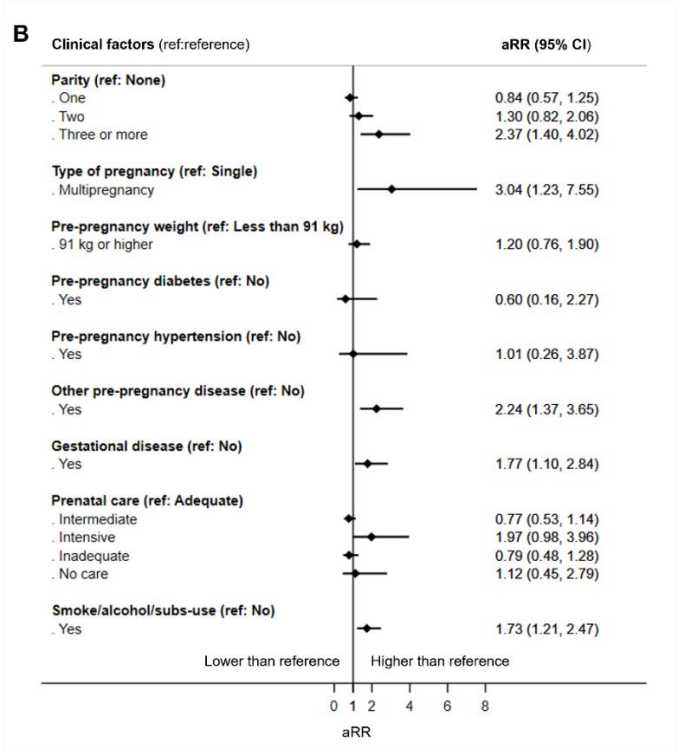




Multivariable model including maternal age, parity, multifetal pregnancy, weight ≥91 kg, pre-pregnancy depression or anxiety, pre-pregnancy diabetes, pre-pregnancy hypertension, other pre-pregnancy medical conditions, gestational medical conditions, adequacy of prenatal care, smoking/alcohol use/recreational substance use during pregnancy, urban environment, and material and social deprivation.

Figure S2. Adjusted risk ratios for demographic (A) and clinical (B) factors comparing anxiety and non-anxiety cases among the Métis group.





Multivariable model including maternal age, parity, multifetal pregnancy, weight ≥91 kg, pre-pregnancy depression or anxiety, pre-pregnancy diabetes, pre-pregnancy hypertension, other pre-pregnancy medical conditions, gestational medical conditions, adequacy of prenatal care, smoking/alcohol use/recreational substance use during pregnancy, urban environment, and material and social deprivation.