Adverse Childhood Experiences and Postnatal Depression, Anxiety, and Stress in Aotearoa

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Kintsugi

Bringing beauty to brokenness

(Note: Reprinted with permission) (Che, 2023).

Kintsugi is the Japanese art of repairing broken pottery. If pottery is broken, rather than discarding the pieces, the fragments are put back together with a glue-like tree sap, and the cracks are adorned with gold. There are no attempts to hide the damage; instead, it is highlighted. The practice has come to represent the idea that beauty can be found in imperfection (Santini, 2019). Kintsugi has taught me a lot about trauma because it visualises that although the breakage is painful, it presents an opportunity for something even stronger and more beautiful.

Abstract

Background

Mental illness in the perinatal period can have far-reaching negative consequences. Maternal suicide is the leading cause of death in the perinatal period in Aotearoa, recording mortality rates five times higher per capita than in the United Kingdom. The deleterious effects of maternal depression, anxiety, and stress extend beyond the individual, with studies describing poorer physical, developmental, and emotional well-being in the children of affected mothers. Due to the significant burden that maternal mental illness presents intergenerationally, research that examines potential risk factors for maternal mental health (MMH) dysfunction is of paramount importance. A body of international literature examining mental health in the perinatal period has uncovered a significant relationship between experiences of early life adversity and later maternal mental illness.

Methods

Following a scoping review of the relevant literature, a cross-sectional study of 506 mothers was undertaken using established self-report-based assessment tools. Aotearoa mothers, in their first postnatal year, engaging with Whānau Āwhina services comprised the participant sample. The prevalence of adverse childhood experiences was measured using the Adverse Childhood Experiences-10 assessment tool (ACE-10). Postnatal mental health outcomes were assessed using the Patient Health Questionnaire 2+ (PHQ2+) screening for symptoms of depression and anxiety and the Depression Anxiety and Stress Scale-21 Scale (DASS-21), assessing for symptoms of depression, anxiety, and stress. Correlation analysis was undertaken to test for associations of the study's key variables.

Results

Approximately 72% of the maternal study population reported an ACE score of one or more, with 25% of participants reporting four or more ACEs. The results from the DASS-21 revealed that 39% of participants reported symptoms of depression, 38.5% reported symptoms of anxiety, and 45.7% reported symptoms of stress at the time the survey was conducted. There were significant associations between many of the socio-demographic characteristics measured in the survey and the mother's mental health outcomes; however, ordinal and binomial logistic regression models revealed that even with controlling for significantly correlated socio-demographic variables by adding them into the regression model as covariates, maternal ACEs remained the strongest predictor of maternal depression, anxiety, and stress symptoms in the first postnatal year.

Conclusion

These findings contribute a uniquely Aotearoa maternal perspective to the international literature that acknowledges that maternal ACEs present a significant risk factor for maternal mental illness in the postnatal period. There are opportunities to apply the results of this study through universal maternal ACE assessment in clinical practice settings, applying a two-generation approach to addressing ACEs. Early maternal ACE assessment would provide maternal and child health services (MCHS) such as Whānau Āwhina with insights into which mothers are most at risk of poor MMH outcomes. There would also be an added benefit of early identification of children with an increased risk of intergenerational ACE consequences due to their mother's ACEs. Maternal ACE assessment would allow for dual healing and prevention pathways, where targeted supports informed by international ACE best practice guidelines could ultimately reduce the impact of harm for ACE-affected women and their children in Aotearoa.

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Thesis overview

Research questions

1. Within the study population, what is the prevalence of depression, anxiety, and stress scored by the Patient Health Questionnaire-2+ (PHQ2+) and the Depression Anxiety and Stress Scale-21 (DASS-21) assessment tools?
2. Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool?
3. Are there any socio-demographic characteristics associated with depression, anxiety, and stress as measured by the DASS-21 tool?
4. Does a higher score on the ACE-10 tool increase the likelihood of having depression or anxiety as measured by the PHQ2+ questions?
5. Does a higher score on the ACE-10 tool increase the likelihood of having a higher level of depression, anxiety, and stress as measured by the DASS-21 tool?

Structure of the Thesis

The thesis is divided into seven chapters: • Chapter One provides an overview of the context for this research study, the motivation for the study and its importance within the clinical context of Aotearoa is also established. • Chapter Two provides the background rationale and outlines the significance of the current study. Specifically, it introduces and positions the topic of maternal mental health. The role of adverse childhood experiences (ACEs) in MMH risk is also described. Finally, this chapter highlights the importance of the current study in the context of the overall burden of ACEs. • Chapter Three presents a scoping literature review summarising the current body of evidence that has explored associations between maternal mental illness and childhood adversity. The scoping review identifies the research gap the current study addresses, namely to describe the associations between maternal childhood adversity and MMH and well-being in a diverse maternal population group in Aotearoa. • Chapter Four describes the methodological approach used to address the identified objectives of measuring maternal ACE scores, MMH, and well-being and to evaluate possible associations between these variables. The chapter presents the data analysis plan outlining the statistical methods and procedures employed for the data analysis. • Chapter Five presents the data analysis results and answers the study's research questions. The chapter begins with a summary of the study's descriptive statistics presenting the study population's sociodemographic characteristics. Data from the three principal measures are then reported by analysing the descriptive results for each measure, including the internal reliability of the three subscales of the DASS-21. The inferential statistics include Spearman's rank-order correlation coefficient and Pearson's Chi-square tests of independence that were used to test for possible associations between the sociodemographic characteristics and the

ACE-10, PHQ2+, and DASS-21 results. Finally, the binomial regression and logistic regression analysis results are reported. These results describe the associations between childhood adversity and mental health outcomes in the postnatal period, as measured by the ACE-10, PHQ2+, and DASS-21 tools. • Chapter Six presents an integrated discussion, combining evidence from the local and international literature with the research findings generated by the present study. Each of the study's significant findings are examined, and the study's strengths and limitations are critiqued. Recommendations for future research and suggestions for policy and clinical practice changes based on the findings are offered. • The thesis finishes by integrating the study's findings with a discussion of the outcomes, concluding the thesis in Chapter Seven.

Thesis rationale

Thesis Statement

Experiences of adversity in childhood are significantly associated with increased depression, anxiety, and stress symptoms in a postnatal maternal population enrolled with Whānau Āwhina services in Aotearoa.

Contribution to Knowledge

This thesis contributes to existing knowledge by examining the prevalence of childhood adversity within an adult maternal population of Aotearoa. Self-reported depression, anxiety, and stress were measured at a single point in time during the first postnatal year, with analysis revealing significant associations between ACEs scored over the first 18 years of life and increased symptoms of depression, anxiety, and stress in the first postnatal year, even after controlling for socio-demographic covariates.

The Importance of This Study

It is widely accepted that maternal mental illness in the perinatal period can result in deleterious consequences for both the mother and her children. Maternal suicide is the leading cause of death in the perinatal period, with mortality rates in Aotearoa five times higher per capita than in the United Kingdom (Health Quality & Safety Commission, 2022). The incidence of maternal depression, anxiety, and stress are also reported to be high in Aotearoa when compared internationally (Ministry of Health, 2021), with a significant over-representation of Māori, Pacific, and Asian mothers represented in the data (Abbott & Williams, 2006; Abel Fekadu et al., 2020; Black et al., 2017).

The adverse consequences of maternal mental illness extend beyond the individual, with studies examining the children of affected mothers describing increased risks for cognitive dysfunction, internalising and externalising behaviours, and lower achievement in learning and development (Coe et al., 2021; Letourneau et al., 2019; McDonald et al., 2019; Menke et al., 2018).

Despite a wealth of international studies reporting a relationship between the experiences of early life adversity and later maternal mental illness in the perinatal period, this topic is yet to be examined in Aotearoa. Without current and authoritative Aotearoa-based data to guide policymakers, maternal and child health services (MCHS), such as Whānau Āwhina Plunket, who work alongside whānau in Aotearoa, are not directed to offer universal maternal ACE assessment. It has been argued that the introduction of an early, universal maternal ACE assessment would have a dual benefit: First of all, the timely identification of mothers at an increased risk of maternal mental illness due to their ACE history would allow for targeted intervention and support to reduce the risks of maternal mental

illness and its related consequences (ACEs Aware, 2018; Bränn et al., 2023; Chang et al., 2021; Letourneau et al., 2019). Secondly, a universal maternal ACE assessment would also allow for the early identification of children of ACE-affected mothers, which represents an opportunity for education and support aimed at preventing the intergenerational transmission of ACE-related harm (Choi & Sikkema, 2016; Cooke et al., 2019; Hatch et al., 2020; Lisa et al., 2011; Powers et al., 2020).

Motivation for the research

As a Registered nurse with nearly two decades of experience, I have had the privilege of working closely with mothers and whānau, observing firsthand the profound impact that early life adversity can have on maternal mental health. Throughout my career, I have encountered numerous cases where ACEs have appeared to be associated with the emotional and psychological well-being of mothers during the perinatal period. Transitioning to parenthood provides a key milestone in life for reflection on their own experiences of being parented. So often mothers would describe to me the experiences of their childhood that were painful, that they intentionally do not want to repeat for their children. So often, over time, despite the best intentions of the parents, I would observe these same harmful behaviours being repeated. These observations have fueled my curiosity to better understand the deeper connections between ACEs and maternal mental health outcomes in Aotearoa.

Despite the wealth of anecdotal evidence in clinical practice and international evidence describing associations between these important variables, I have recognised a gap in New Zealand-specific research that quantifies and explores these relationships. This lack of data presents a significant challenge for clinicians who wish to deliver evidence-based care tailored to the unique experiences of mothers and whānau in Aotearoa. This gap motivates my research and drives my commitment to advancing our understanding of how adverse childhood experiences affect maternal mental health in Aotearoa.

Through my study, I aim to contribute to a growing body of knowledge that will validate the experiences I have witnessed in my nursing practice and provide a foundation for improving maternal care and outcomes. I hope this work will empower healthcare providers to better identify and support women at risk, ultimately benefiting mothers and their children in Aotearoa and beyond.

Chapter One: Introduction

Introduction

This chapter provides an overview of the issue of maternal mental illness in the perinatal period. It outlines the focus of this study on assessing the links between maternal mental illness and other sociodemographic factors. The chapter is structured as follows: First, an examination of the issue of perinatal mental illness is provided, followed by a discussion of the context of this issue internationally. There will be a focus on the hypothesised associations between ACEs and maternal mental illness, an exploration of these issues within Aotearoa, and finally, the identification of the current gap that this thesis will examine.

The perinatal period presents a time of increased risk for new-onset and recurrent mental illness. Maternal mental illness is a significant issue in Aotearoa, affecting between 12-20% (n = 7,491-12,486) of all mothers and a prevalence of over 30% reported by some Aotearoa population groups (Abbott & Williams, 2006; Ministry of Health, 2021). Maternal suicide is the leading cause of death in women during the perinatal period, with maternal mortality rates in Aotearoa five times higher than the rates in the United Kingdom (Health Quality & Safety Commission, 2022). Māori, the indigenous people of Aotearoa, as well as Pacific mothers, are the most significantly impacted by maternal suicide. Asian mothers living in Aotearoa have also been found to be more significantly burdened by mental illness in the perinatal period when compared to NZE mothers (Maternal Care Action Group New Zealand, 2022).

The adverse outcomes associated with maternal mental illness extend beyond the individual, with studies describing a higher risk of poorer physical, emotional, psychological, social, and developmental outcomes in the children of affected mothers (Brittain et al., 2022; Chang et al., 2021; Coe et al., 2021; Esteves et al., 2020; Lomanowska et al., 2017; McDonald et al., 2019; McDonnell & Valentino, 2016a; Racine et al., 2018a; Zhang et al., 2023). There is also evidence that maternal mental illness negatively impacts the attachment relationship between a mother and her infant (Centre on the Developing Child, 2016; Chau et al., 2023). This is significant as the success of this attachment determines the foundations of the early neural pathways that will later inform all brain architecture as the child grows (Centre on the Developing Child, 2016; Chau et al., 2023). Due to the significance of this issue and its intergenerational consequences, research examining the risk factors for the early detection of maternal mental illness is considered a public health priority (Ministry of Health, 2021; Satyanarayana et al., 2011; World Health Organisation, 2022).

In recent years, an evolving body of research has emerged that has examined the role of childhood adversity and its associations with the mental health outcomes of mothers. It is widely accepted that

early life experiences, both positive and negative, form the foundation for health and development across the lifespan (Centre on the Developing Child, 2016; World Health Organisation, 2008, 2022). Adverse childhood experiences (ACEs) are defined by the World Health Organisation (WHO) (2020) as some of the most intensive and frequently occurring sources of stress that children may suffer in their first 18 years of life. ACEs were first described in 1998 in a seminal study conducted by Felitti et al. (1998) through the Centre of Disease Control in Kaiser Permanente, in The United States of America (US). This study involved over 17,000 participants, and the results uncovered a graded relationship between ACEs and poorer physical, psychological, and social health consequences in adulthood (Felitti et al., 1998). The ACE assessment tool (ACE-10) developed from the findings of this study has become a widely accepted measure of childhood trauma in research studies and has been applied as a childhood trauma screening tool within clinical settings internationally (ACEs Aware, 2020; Gears & Schulman, 2022; Hardt & Rutter, 2004).

There is now growing evidence that ACEs are associated with many of the leading mental health complaints experienced by women in the perinatal period (Racine et al., 2021). International systematic reviews of the available literature describe that women who have experienced childhood adversity are at an increased risk for depression, anxiety, and stress both in pregnancy and postnatally (Ayers et al., 2019; Dennis et al., 2017; Hughes et al., 2017; Racine et al., 2021) and as such, maternal ACEs have the potential to increase the associated health risks for mothers and their children. This growing body of evidence along with international best practice guidelines supports universal maternal ACE assessment for the early detection of symptoms of mental illness and encourages MCH clinical services to integrate ACE assessment into routine clinical practice (Gears & Schulman, 2022). There has been a significant delay in translating ACE research findings into meaningful clinical practice change in Aotearoa. One reason for this could be the limited research examining childhood adversity in diverse populations of Aotearoa. Although two Aotearoa-based longitudinal cohort studies have applied retrospective ACE assessment to their data sets (Danese et al., 2009; Walsh et al., 2019a), to date, no research has been conducted that has set out to test for associations between ACEs and MMH outcomes specifically for mothers in Aotearoa.

The current body of ACE knowledge has been informed predominantly by studies set in the US and Canada, with limited studies examining childhood adversity in more diverse and indigenous population groups worldwide. As a result, it is unclear how significant ACEs are for mothers in Aotearoa. So far, no data has been collected on how adversity is distributed across our increasingly diverse maternal population. What is known from the research is that the incidence of mental illness in the perinatal period is increasing for mothers in Aotearoa. This is an issue that is compounded by the current mental healthcare system and funding model, which has been described as outdated and

inadequate to meet the increasingly complex mental health needs of our maternal population (Ministry of Health, 2021).

If ACE data collection can be shown to be a valid and reliable way of identifying women at risk of adverse MMH outcomes, then introducing systematic universal ACE assessments and the collection of data on MMH symptoms would benefit policymakers, service providers, and clinicians. Such data would present the most value for MCHS, including Whānau Āwhina, the national provider of the Well Child Tamariki Ora Programme (WCTO) in Aotearoa, a clinical service offering universal health visits and support, free to all whānau with children from six weeks up to five years of age (Ministry of Health, 2013). WCTO nurses are uniquely positioned within trusted relationships to offer universal maternal ACE assessment as a routine service delivery component.

Prior to any practice change, there is a requirement to scope the available literature to examine the validity and reliability of the ACE-10 assessment tool. The relationship between ACEs and MMH outcomes requires examination through a research study to consider how adversity in childhood and potentially associated mental illness could be tested within an Aotearoa maternal population. There appears to be very little research literature that examines these topics within the context of Aotearoa. It is hypothesised that ACEs lead to increased symptoms of depression, anxiety, and stress in the perinatal period. If this holds true (i.e. if research has established this), then MCHS can identify at-risk women early and tailor effective support and intervention for mothers and their whānau. Thus, a study examining ACEs and MMH outcomes would offer novel insights into the prevalence of ACEs within a maternal population, contributing to the maternal mental health literature by offering a uniquely Aotearoa maternal perspective.

Conclusion

The introductory chapter has considered the issue of perinatal mental illness in the Aotearoa context and internationally offering a potential gap in the research for further examination. The following chapter provides the background and context for the clinical topic of maternal mental illness. It examines the significance of this issue as a current health focus in Aotearoa and the associations between ACEs and MMH outcomes.

Chapter Two: Background

Introduction

This chapter provides relevant background to the proposed study and describes the research problem, thereby offering a rationale for the study and highlighting its significance to MMH care in Aotearoa. The chapter opens with definitions relevant to perinatal mental health and ACEs, explores the funding and structure of MMH services in Aotearoa, and provides an overview of current MMH service delivery.

The current chapter provides relevant background to the research problem addressed in this study: Are ACEs a significant issue for mothers in Aotearoa, and do associations exist between maternal ACEs and maternal mental illness in Aotearoa? The structure of this chapter will focus on my motivation to quantify the anecdotal relationship between maternal ACEs and poorer MMH outcomes observed in clinical practice and will reflect my professional background as a WCTO nurse. An argument will be made that the relationship between maternal ACEs and MMH presents a critical issue, with this chapter highlighting the gaps in the current evidence that require further examination. The chapter is presented in three key sections. The first section discusses key definitions related to MMH and the prevalence of relevant symptomology. Furthermore, the context in which the research will be undertaken is explored. Local and international incidence data are then analysed with a focus on the current inequity of MMH outcomes in Aotearoa. The chapter then discusses studies that have examined associations between ACEs and maternal mental illness internationally. Next, an overview of the structure and provision of MMH services in Aotearoa is offered. This chapter concludes by presenting an argument that there is a need to examine whether associations between ACEs and symptoms of maternal mental illness are significant in Aotearoa.

Mental Health in the Perinatal Period

The perinatal period is the timeframe that includes pregnancy through the first postnatal year (Ministry of Health, 2021; World Health Organisation, 2022). This period presents a high-risk window for new-onset and recurrent mental illness for women (World Health Organisation, 2022). In 2021, The New Zealand Perinatal and Maternal Mortality Review Committee reported death by suicide as the leading cause of mortality among women in the perinatal period, with maternal suicide rates in Aotearoa reported to be five times higher per capita than in the United Kingdom (Health Quality & Safety Commission, 2022). Although it is recognised in the scientific literature that maternal mental illness does not stem from any one cause, disruption to MMH is commonly attributed to the significant physiological and psychosocial adjustments that are required of women in the perinatal period (World Health Organisation, 2022). Pregnancy, birth, and early parenthood can increase the strain on a woman's mental health due to changes in their role and identity, physical and

hormonal health, and economic situation (Dennis et al., 2017; Woody et al., 2017). The World Health Organisation (2022) describes additional factors that increase a mother's risk of maternal mental illness, including a history of mental health problems, a lack of support, and previous trauma, including physical, emotional, or sexual abuse, isolation (physical, mental, cultural), stressful life events, and a history of drug and alcohol abuse.

The consequences of poor MMH can be detrimental to mothers with negative outcomes extending to impact their children and their whānau. Women who experience maternal mental illness are at a higher risk of obstetric complications and suicide and are less likely to engage with antenatal health and support services (Adane et al., 2021; Black et al., 2017; World Health Organisation, 2008). Untreated maternal mental illness can lead to an increased risk of poor birth outcomes for infants, with studies reporting increased social and mental health difficulties in the children of affected mothers (Field et al., 2010; Lasater et al., 2017). Due to the significant burden of maternal mental illness on both mothers and their children, studies that aim to uncover risk factors that increase the likelihood of perinatal mental illness are considered an international public health priority (Ministry of Health, 2021; Satyanarayana et al., 2011; World Health Organisation, 2022).

Maternal mental illness is a broad term that includes perinatal depression, anxiety, stress, and psychosis (Garcia et al., 2017). Depression and anxiety are the most prevalent MMH disorders reported in Aotearoa and internationally (Maternal Care Action Group Aotearoa, 2022; Racine et al., 2021; Wallander et al., 2021; World Health Organisation, 2022). For the purpose of this research, perinatal psychosis has been excluded from examination in this study due to the unique complexity and pathophysiology of the disorder as well as its lower prevalence within the population of Aotearoa when compared with maternal anxiety, depression, and stress (Ministry of Health, 2011, 2021).

Perinatal Depression, Anxiety, and Stress

This research focuses on the topics of depression, anxiety, and stress as they are the most frequently reported mental health complaints that arise during the perinatal period (Ministry of Health, 2011, 2021; World Health Organisation, 2022). The following definitions were developed by Lovibond (1995) for use in the Depression, Anxiety, and Stress Scale (DASS-21) assessment tool. The DASS-21 definitions have been selected due to their inclusion of each of the mental health conditions of interest in this study, namely depression, anxiety, and stress. The DASS-21 is a self-assessment measure that asks patients to answer a series of questions about their mental health over the preceding week. The Likert scales used for self-assessment range from 0 (did not apply to me at all) to 4 (applied to me very much, or most of the time) (Lovibond, 1995). The summed totals of each of the three subscales result in allocation to the scaled levels of depression, anxiety, and stress ranging from normal to extremely severe (Lovibond, 1995). Depression in the perinatal period is measured by

Lovibond (1995) through the combined symptoms of dysphoria (feeling down or depressed), hopelessness, devaluation of life, self-depreciation, lack of interest in involvement, anhedonia (inability to experience positive feelings), and inertia (a lack of energy and motivation). For anxiety, autonomic arousal (increased heart rate, perspiring, dryness of the mouth), skeletal muscle effects (shakiness or trembling), situational anxiety, and subjective experience of anxious affect are measured (Lovibond, 1995). Stress is measured through the combination of symptoms of difficulty relaxing, nervous arousal, becoming easily upset/agitated, irritable or over-reactive, and impatient (Lovibond, 1995).

Maternal Depression, Anxiety, and Stress in Aotearoa

In Aotearoa in 2021, approximately 7,445 to 11,168 women (12-18%) experienced depression, anxiety, or another mental illness during the perinatal period (Ministry of Health, 2021). In 2016, The New Zealand Health Promotion Agency (HPA) undertook a cross-sectional study of 805 new mothers to assess the prevalence of postnatal depression (PND) using the Edinburgh Postnatal Depression tool (EPDS) (Health Promotion Agency, 2016). The HPA (2016) identified that 14% of all respondents met the criteria for EPDS-PND. The prevalence of PND varied significantly across the ethnic groups in the study, with a 12% prevalence in Māori participants, 13% in the European/Other group, and a 23% prevalence of PND in the Asian participant group. Unfortunately, Pacific participants were excluded from the analysis due to insufficient participant numbers. Higher rates of antenatal depression in Māori mothers were reported in the 'E Moe, Māmā: Maternal Sleep and Health in New Zealand/Aotearoa' study, which examined factors that contribute to sleep in the perinatal period (Signal et al., 2017). Signal et al. (2017) found that 22% of Māori mothers in their cohort screened positive for depression in late pregnancy (compared with 15% of non-Māori), and 25% screened positive for anxiety (compared with 20% of non-Māori). A previous study (2006) focussed on the prevalence of EPDS-PND in Pacific mothers living in Aotearoa. Abbott and Williams (2006) reported a broad range of PND prevalence across the different Pacific participant population groups in their sample. This prevalence ranged from 13.6% in Samoan mothers to 30.9% in mothers who identified as Tongan (Abbott & Williams, 2006). An important consideration when assessing the prevalence of maternal mental illness in Aotearoa is that Pacific people have been found to underreport symptoms of mental illness due to the ongoing social stigma surrounding mental illness within some Pacific population groups (Abbott & Williams, 2006; Ran et al., 2021).

Signal et al.'s (2017) study examined the prevalence of anxiety and stress in late pregnancy by applying the EPDS. Their findings revealed that of the 406 Māori and 738 non-Māori women who participated in the study, 25% of Māori participants reported symptoms of anxiety compared with 20% of participants who were non-Māori. The difference in prevalence between Māori and non-Māori was even more striking when comparing rates for significant life stressors; 55% of Māori participants

reported significant life stressors in pregnancy compared with 30% of non-Māori. Another finding of interest in this study was that less than 50% of all women who had experienced symptoms of mental illness persisting for more than two weeks of their pregnancy had sought formal mental health assessment or support. This finding highlights the current gaps that exist for women in accessing mental health care in Aotearoa (Signal et al., 2017).

Perinatal Mental Illness Internationally

Studies that have examined perinatal depression, anxiety, and stress internationally provide a more comprehensive, systematic overview of these clinical topics than what can be surmised from the limited amount of research that has been conducted on these topics in Aotearoa. An international meta-analysis examining the prevalence of PND determined that across the 15 articles included in the review (n = 37,294 women), the pooled prevalence of PND was 17% in healthy mothers without a prior history of depression (Shorey et al., 2018). Shorey et al. (2018) described notable differences in the prevalence of depression reported across geographical regions. Thus, participants from the Middle East recorded the highest prevalence of PND at 26%, while participants from Europe registered the lowest prevalence of PND at 8% (Shorey et al., 2018). A further meta-analysis conducted in 2017 examined the prevalence of maternal anxiety in both the antenatal and postnatal periods. This meta-analysis included 102 studies (n = 221,974 women) across 34 countries (Dennis et al., 2017). Anxiety prevalence was categorised as either self-reported anxiety symptoms or a clinical diagnosis of any anxiety disorder. Dennis et al. (2017) uncovered a pooled antenatal prevalence of self-reported anxiety symptoms in 18.2% of participants in the first trimester, 19.1% in the second trimester, and 24.6% of participants in the third trimester of pregnancy. A clinical diagnosis for any antenatal anxiety disorder was recorded by 15.2% of the pooled pregnant participants. Postnatally, anxiety prevalence rates were seen to decrease in the review, with self-reported anxiety prevalence (weeks 1-24 postpartum) reported by 15% of the pooled participants and a postnatal anxiety diagnosis recorded for 9.9% of the pooled participants (Dennis et al., 2017).

International studies have examined maternal stress as a measure of maternal mental health in the perinatal period. A systematic review conducted by Roddy Mitchell et al. (2023) examined post-traumatic stress disorder symptoms (PTSD) in 33 studies included in their review (n = 22,452 women). A prevalence of perinatal PTSD was found in 8.3% of the pooled study participants (Roddy Mitchell et al., 2023). A Brazilian cross-sectional study nested within a population-based cohort study assessed stress more broadly than the clinically diagnosed symptoms of PTSD, applying the self-reported Perceived Stress Scale (PSS) to their maternal cohort (n = 1,279) (Lopes et al., 2023). Lopes et al.'s (2023) findings revealed a prevalence of high-stress levels in 23.5% of their maternal sample. In contrast, the prevalence of stress was notably lower in an Italian cohort study that measured self-reported maternal stress at three months and six months postpartum using the Parenting Stress

Index—Short Form (Vismara et al., 2016). At three months postpartum, 14.9% of mothers reported a prevalence of stress, with 3.8% of mothers reporting stress symptoms persisting to six months postpartum (Vismara et al., 2016). The differences observed in the prevalence of stress across these international studies likely reflect the differences in the timing of the assessment of stress, with symptoms of stress typically reported as being higher during pregnancy compared with postnatally. There were also differences in the assessment tools applied across the studies, which likely contributed to the variation in stress prevalence (Barat et al., 2023; Cheng & Pickler, 2014; Štěpáníková et al., 2020).

When comparing the prevalence of depression and anxiety in Aotearoa against international figures, Aotearoa rates appear high, particularly among Māori, Pacific, and Asian maternal populations (Abbott & Williams, 2006; Signal et al., 2017). Maternal stress comparisons are more challenging to analyse due to the range of definitions of stress and the different tools being used to assess perinatal stress. Some studies have approached the topic of stress by assessing for stressful life events (Carmichael et al., 2007; Elvira et al., 2019; Tran et al., 2022), while others have measured stress by assessing for symptoms of PTSD (Glaus et al., 2021; Roddy Mitchell et al., 2023; Schobinger et al., 2022). This discrepancy highlights the need for the current study to apply a validated and reliable tool that clearly defines the concept of stress to then measure the prevalence of maternal stress in Aotearoa.

Adverse Childhood Experiences and Maternal Mental Health Risk

Due to the significant burden that maternal mental illness has on mothers and their children across their lifespan, research examining the risk factors for maternal mental illness represents a public health priority (Ministry of Health, 2021; Satyanarayana et al., 2011; World Health Organisation, 2022). International best practice guidelines developed by WHO (2022) support the integration of perinatal mental health assessment and support into MCH organisations worldwide as a strategy to reduce maternal mental health risk. Studies published in the US and Canada have identified an increased incidence of maternal mental illness in mothers who were affected by childhood adversity (McDonald et al., 2019; Meltzer-Brody et al., 2018; Racine et al., 2021; Watters et al., 2021). The following section introduces the concept of adverse childhood experiences as an environmental and developmental factor that can influence intergenerational outcomes.

Adverse Childhood Experiences

It is widely accepted that early life experiences form the foundation for health and development across the lifespan (Centre on the Developing Child, 2016; World Health Organisation, 2008, 2022). ACEs are defined by the World Health Organisation (2020) as some of the most intensive and frequently

occurring sources of stress that children may suffer in their first 18 years of life. The term ACE was first described in 1998 in a seminal study conducted by Felitti and Anda (1998) through the Centre of Disease Control at Kaiser Permanente, US. This study, with over 17,000 participants in its first wave, uncovered for the first time the graded relationship that exists between the experiences of early life adversity and poorer physical, psychological, and social health consequences in adulthood (Felitti et al., 1998). The survey instrument subsequently developed from the study, the ACE-10 assessment tool, was designed to measure the ACE scores of adult participants over their first 18 years of life. The ten items of adversity measured in the ACE-10 are physical abuse, sexual abuse, emotional abuse, physical neglect, emotional neglect, parent substance use, parent divorce/ separation, parent incarceration, parent mental health problems, and exposure to domestic violence. For each item of childhood adversity experienced, participants scored one ACE (Felitti et al., 1998). ACE items were then summed, resulting in a score from zero to ten on the ACE scale. Felitti et al. (1998) then tested participant ACE scores against adult risk behaviour, health status, and disease variables. They uncovered a strong, graded relationship between the breadth of exposure to childhood adversity measures and multiple risk factors for several of the leading causes of death in adults worldwide (Felitti et al., 1998).

Felitti et al.'s (1998) foundational ACE study identified that 64% of participants had been exposed to one or more of the ACEs measured, with one-quarter exposed to two or more categories of adversity. From there, a vital pattern emerged: The authors observed a stepwise relationship between participants' total ACE scores and a range of adverse health and social consequences the participants experienced themselves at the time of the study. Additionally, as participant ACE scores increased, so did each health risk behaviour and disease outcome in a stepwise or 'dose-response' pattern (Felitti et al., 1998). For example, when comparing the results of participants with an ACE score of four or more with those with an ACE score of zero, a four to 12-fold increase in health risk was observed for alcoholism, drug abuse, depression, and suicide attempts. A two- to four-fold increase was observed in smoking status, poor self-rated health, and sexually transmitted diseases, and a 1.4- to 1.6-fold increase was observed in physical inactivity and severe obesity. Thus, Felitti and Anda's (1998) ground-breaking ACEs study highlighted, for the first time, the graded relationship that exists between ACEs and later deleterious health consequences. These findings have since been replicated in multiple studies across various population groups worldwide (Choi & Sikkema, 2016; Hughes et al., 2017; Merrick et al., 2018; Racine et al., 2021; Su et al., 2022).

The Mechanisms of ACE Harm

Since the foundational study by Felitti et al. (1998), the causative mechanisms between ACE and health outcomes have been further investigated. The current understanding of the mechanisms for how childhood adversity results in poorer health and social well-being in adulthood is believed to be a

consequence of a maladaptive stress response system. In an acute response to stress, the sympathetic nervous system stimulates the adrenal glands to release catecholamines, including adrenaline and noradrenaline. These hormones increase the heart rate, blood pressure and respiration rate, a process commonly called the 'fight, flight, freeze' response (The American Institute of Stress, 2023). When functioning normally, the body systems return to pre-arousal function levels between 20-60 minutes after removing the perceived threat (The American Institute of Stress, 2023). However, experiences of early life adversity that are severe, prolonged, or repetitive can cause a hyperarousal of the sympathetic nervous system's 'fight, flight, freeze' response, resulting in the dysfunction of the neuroendocrine-immune response system. This dysfunction allows for prolonged cortisol activation and a chronic state of inflammation, with failure of the body to normalise these functions once the stressor has been removed (Franke, 2014; Gears & Schulman, 2022; World Health Organisation, 2020). This is particularly significant in the first 18 years of life as the developing brain is more plastic and permeable to the harmful hyper-arousal stress hormones, risking permanent damage to the development and function of the systems of the growing body and brain (Centre on the Developing Child, 2016; Danese et al., 2009; Franke, 2014; World Health Organisation, 2020).

Studies examining the biological consequences of early life adversity on the developing brain have determined measurable differences in several brain regions of affected children, namely in the amygdala, hippocampus, insula, prefrontal cortex, and cingulate (De Bellis & Zisk, 2014). When compared to non-trauma-affected children, children who had experienced ACEs are found to have a hyper-activated amygdala. This hyperactivation is associated with difficulties with thinking clearly, focusing, staying self-aware, and using healthy coping strategies (De Bellis & Zisk, 2014). In contrast, the hippocampus region of the brain is smaller and under-active in ACE-affected children. These changes are associated with memory difficulties and challenges with learning (Centre on the Developing Child, 2016). In ACE-affected children, the insula is often dysregulated; over-activation of the insula is associated with increased emotional reactivity and outbursts, while under-activation is associated with increased symptoms of dissociation and numbing (De Bellis & Zisk, 2014). It is typical for the prefrontal cortex to become underactive in a trauma-affected brain. This underactivity is associated with difficulty concentrating, decision-making challenges, difficulties connecting with others, and self-awareness (Centre on the Developing Child, 2016). Finally, the cingulate cortex is often underactive in the traumatised brain, leading to difficulties with emotional regulation, thought regulation, and decision-making (De Bellis & Zisk, 2014).

Adverse Childhood Experiences and the Social Determinants of Health

Growing evidence suggests that negative social determinants of health and ACEs are highly comorbid (Brittain et al., 2022; Coe et al., 2021; Mersky & Janczewski, 2018). This is reflected in higher ACE scores in populations negatively impacted by the social determinants of health. WHO (2024) defines

the social determinants of health as the conditions in which people are born, grow, work, live, and age and the wider set of forces and systems shaping the conditions of daily life. The social determinants are income, education, employment, working conditions, food security, housing, access to basic amenities and nature, early childhood development, social inclusion and non-discrimination, structural conflict, and access to affordable health services (World Health Organisation, 2024). Research that examines the relationship between ACEs and the social determinants of health provides valuable insights into potential risk factors for childhood adversity and potential opportunities for Government policymakers to target equity-driven population health strategies to reduce ACE-related adverse outcomes for those most significantly affected (Brittain et al., 2022; Doi & Fujiwara, 2019; Erickson et al., 2019; Esteves et al., 2020; Ilter Bahadur et al., 2021; Johnson et al., 2017; Kim et al., 2020a; McDonald et al., 2019; Mersky & Janczewski, 2018b; Shin et al., 2021; Williams et al., 2023; Zhang et al., 2023).

Adverse Childhood Experiences in Aotearoa

Several of the longitudinal research studies that have advanced the field of ACE research internationally were conducted in Aotearoa, such as Danese et al. (2009), McKay et al. (2021), Morton (2019), Morton et al. (2022), Neumann et al. (2019), Reuben et al. (2016), and Wallander et al. (2021). One of the most critical longitudinal studies on this list is the 1972 Dunedin Multidisciplinary Health and Development Study (The Dunedin Study) (Danese et al., 2009). The Dunedin Study has followed a cohort of 1,037 South Island children and their whānau since 1972 and has collected extensive data for over 40 years (Poulton et al., 2015). A post-hoc retrospective investigation into the ACE scores of participants of the Dunedin study was published in 2009 when study members were 32 years of age (n = 972) (Danese et al., 2009). The ACE prevalence (i.e. an ACE score of 1-10) when applying the original ACE-10 tool (Felitti et al., 1998) in the Dunedin cohort was 59.5%, with 15% of participants recording four or more categories of ACE. These findings are comparable to Felitti et al.'s (1998) original ACEs study in the US. Danese et al.'s (2009) study, therefore, demonstrates the prevalence of ACEs in an adult population of Aotearoa, which highlights the need to explore the impacts of adversity and related health outcomes in Aotearoa further.

One of the main issues with the Dunedin Study is that the socio-demographic characteristics of the participants no longer reflect the increasing diversity of the children in Aotearoa today (Danese et al., 2009, Stats NZ, 2018a; Walsh et al., 2019a). Further evidence has emerged from the retrospective analysis of data from the Growing Up in New Zealand study (GUiNZ). The GUiNZ birth cohort is the most extensive, contemporary longitudinal study in Aotearoa, comprising over 6,000 children born between 2009 and 2010. The cohort's socio-demographic characteristics remain broadly generalisable to the population of children in Aotearoa today (Growing Up in NZ, 2023a). In 2019, an Auckland-based research team measured the prevalence of childhood adversity in the GUiNZ cohort by

retrospectively applying an adapted ACE tool that measured 9 out of 10 conventional ACEs. The ACE item of childhood sexual abuse was omitted from the original GUiNZ data collection and, therefore, could not be included in the analysis. In the 54-month data collection wave, when the GUiNZ participants were around four and a half years old, the prevalence of at least one ACE was determined in 52.8% of participants, with 2.6% of children already reporting four or more ACEs (Walsh et al., 2019). These prevalence findings appear high when compared with the Dunedin Study's ACE prevalence in an adult population over 18 years of age. This is particularly concerning as the GUiNZ participants still had a further 14 years of potential ACE exposure before they would reach the same 18 years of ACE exposure as the Dunedin Study participants (Danese et al., 2009). The GUiNZ ACE prevalence at four and a half years of age already exceeds the ACE prevalence rates reported in many recent international studies of adult populations (Chang et al., 2021; Do et al., 2021a; Ilter Bahadur et al., 2021; Letourneau et al., 2019; Meltzer-Brody et al., 2018; Racine et al., 2021). The ACE-10 assessment tool was designed to measure adversity across the first 18 years of life (Felitti et al., 1998). Participants in the GUiNZ study were only four and a half years old when the ACE assessment took place (Walsh et al., 2019). This factor, combined with the reduced ACE measure applied in the study (9 out of 10 ACEs measured) and a considerable non-response in the GUiNZ study surveys, leads to an assumption that the ACE prevalence reported for this cohort is likely an underrepresentation of the true lifetime ACE prevalence of this sample, and thus of New Zealanders in general today (Walsh et al., 2019). This is why measuring ACEs in an adult population of Aotearoa is essential to provide current and accurate ACE prevalence data that can inform intergenerational policy and practice change.

ACEs and Intergenerational Outcomes

Since 2017, a growing number of researchers have become interested in the intergenerational effects of ACE-related risks from parents to their offspring (Chang et al., 2021; Lang & Gartstein, 2018; Lomanowska et al., 2017; McDonald et al., 2019; McDonnell & Valentino, 2016; Meltzer-Brody et al., 2018; Plant et al., 2017; Racine et al., 2018). This movement stemmed from research that has recognised that parental experience of ACEs correlates with increased ACE-related risk in their offspring. Evidence suggests maternal ACEs are more significant than paternal ACEs in terms of their intergenerational impact (Folger et al., 2018; McDonnell & Valentino, 2016b; Schickedanz et al., 2021; Schmitz et al., 2019). Explanations offered for this finding are the potential influence of maternal ACEs and their consequences in utero and the early postnatal period, as well as differences in parenting roles and behaviours between mothers and fathers (Schickedanz et al., 2021). Maternal ACEs are defined as the exposure to the ten measures of childhood abuse and neglect, and household dysfunction, as described in the original ACEs study, over the first 18 years of a woman's life (Lomanowska et al., 2017; McDonald et al., 2019; Racine et al., 2018b; World Health Organisation, 2020). Research studies have revealed that maternal ACEs are associated with poorer physical,

emotional, psychological, social, and developmental outcomes in the children of ACE-affected mothers (Chang et al., 2021; Esteves et al., 2020; Lomanowska et al., 2017; McDonald et al., 2019; McDonnell & Valentino, 2016b; Racine et al., 2018b). Available healthcare services cannot address some of these environmental and socio-demographic risk factors that impact outcomes across the lifespan. Significantly, research has demonstrated that the maternal experience of ACE is associated with mental health outcomes during the perinatal period, and it has been argued that mental health issues associated with ACE during the perinatal period have negative consequences for the next generation (Khan & Renk, 2018; Kim et al., 2023; Lang & Gartstein, 2018; Lomanowska et al., 2017; Zhu et al., 2023). If this is the case, then health service providers have an opportunity to identify early those affected by ACEs and intervene to prevent an ongoing cycle of intergenerational ACE transmission and related harm.

To date, only one study has collected ACE prevalence data in a maternal population in the Southern Hemisphere (Chau et al., 2023). However, growing evidence describes universal maternal ACE screening as a successful approach to identifying families with an increased intergenerational ACE risk (Gears & Schulman, 2022; Gupta et al., 2021; Schickedanz et al., 2021). These screening programmes and interventional research studies have allowed clinical services to take an informed approach to addressing ACEs and to explore related treatment and interventions, targeted education, and prevention strategies applying best practice clinical guidelines to reduce intergenerational ACE transmission (Gears & Schulman, 2022; Gupta et al., 2021; Schickedanz et al., 2021). Despite the growing research and international best practice guidelines for implementing universal ACE assessment and systematic perinatal MMH assessment and interventions in clinical settings (Gears & Schulman, 2022; World Health Organisation, 2022), universal maternal ACE assessment has yet to be adopted as a public health strategy within Aotearoa. As a result, there is currently limited Aotearoa-based data to inform childhood adversity-focused practice changes within organisations that work with mothers and their whānau in Aotearoa.

In 2022, Gears and Schulman from the US-based Centre for Health Care Strategies conducted a qualitative study on the service providers' perspectives on administering ACE assessment. For their study, they interviewed 14 Medi-Cal providers from 12 clinics across California in the US. The objective of the interviews was to understand the approaches that healthcare providers use in offering child and adult ACE assessments within their clinical settings, gaining insights into trauma-informed clinical practices. The results of the CHCS interviews were grouped into seven themes, creating the steps for a clinical pathway that healthcare services can follow when implementing ACE assessment into their model of care. The CHCS best practice clinical guidelines provide an evidence-based framework for how MCHS could be integrated into current WCTO clinical practice models (Gears & Schulman, 2022).

The following section describes the current methods used by health providers in Aotearoa to address perinatal mental illness.

Maternal Mental Health Service Provision

Here in Aotearoa, a contemporary review of maternal health services will offer some understanding of the capacity to respond to and support mothers with mental health needs. This will help to provide context for my practice observations that those struggling with poorer postnatal mental health will often report histories of childhood adversity. By understanding existing service provision, potential gaps and opportunities for future support can be explored. In 2021, The New Zealand Ministry of Health (now Te Whatu Ora) commissioned a review of all MMH services across the District Health Boards. This was in response to the repeated recommendations for a review of services by the Perinatal and Maternal Mortality Review Committee (PMMRC) and in response to the recommendations set out in the Child and Youth Wellbeing Strategy (CYWS) (The Department of the Prime Minister and Cabinet, 2019). The newly developed CYWS described how children's health and well-being outcomes are inextricably linked to their caregivers' health and well-being (The Department of the Prime Minister and Cabinet, 2019). The Stocktake of Maternal Mental Health Services Report (2021), (the 2021 Stocktake report) described how, for Aotearoa to achieve the objectives of the CYWS, timely access to high-quality, culturally responsive MMH care is imperative, as the health, happiness, and development of children in Aotearoa is reliant on the health and well-being of their caregivers (Ministry of Health, 2021).

The key findings of the 2021 Stocktake report noted the increasing complexity of women's psychosocial and mental health needs in Aotearoa (Ministry of Health, 2021). The report identified that a significant proportion of Aotearoa mothers have unmet MMH needs. While the report describes the inequities of MMH outcomes, Māori, Pacific, and Asian women are underrepresented in the data for mental health service uptake in the report. This is despite evidence that these population groups carry the highest incidence of maternal mental illness in Aotearoa, reflecting the inequities in access to timely and appropriate mental healthcare provision (Abbott & Williams, 2006; Signal et al., 2017). In fact, the inequitable access to specialised services experienced by these same population groups was a key finding (Ministry of Health, 2021). This is likely, at least in part, attributable to a lack of culturally responsive MMH services currently offered in Aotearoa. The review determined that only ten of the 20 DHBs in Aotearoa offer Kaupapa Māori (by Māori, for Māori) MMH services, with very few DHBs reporting service offerings that are designed to serve Pacific and Asian women (Ministry of Health, 2021). This lack of culturally appropriate MMH care options for Māori, Pacific and Asian mothers contributes to the inequity of outcomes that exist for these population groups reflected in Aotearoa mental health data sets (Abbott et al., 2006; Health Promotion Agency, 2016). Another

important finding in the review was the apparent overburden on MMH services within tertiary healthcare settings. These findings were attributed to significant community and primary mental healthcare deficiencies reported in almost every DHB area (Ministry of Health, 2021). MMH screening was described in the report as haphazard, with apparent gaps and variations identified in the care pathways of those seeking MMH assessment and care. All but one DHB reported that they did not have the number of mental health professionals required to meet the needs of those seeking maternal mental healthcare services (Ministry of Health, 2021).

The 2021 Stocktake report revealed apparent systemic inequities experienced by wahine Māori (Māori women) and their whānau, breaching the commitments of the Crown to Māori outlined in the Treaty of Waitangi- Te Tiriti ō Waitangi (Durie, 2002). Māori mothers are not alone in their burden of MMH inequity, with Pacific and Asian mothers over-represented in self-reported MMH data of Aotearoa (Abbott & Williams, 2006; Health Promotion Agency, 2016). Along with an ineffective structure, the models of care for MMH services in Aotearoa are described as outdated, with inadequate funding that no longer reflects the increasingly complex mental health needs of mothers, resulting in a growing number of primary caregivers of the next generation of Aotearoa with unmet mental health needs (Abbott & Williams, 2006; Health Promotion Agency, 2016).

The 2021 Stocktake report further highlighted how the devolved nature of the healthcare services delivered by the District Health Board (DHB) model leads to service and reporting fragmentation (Ministry of Health, 2021). The fragmented approach to service provision and the inconsistent data collection may be reduced with the introduction of Te Whatu Ora, which was established in July 2022. Te Whatu Ora is the new national entity that manages the delivery of all primary and tertiary healthcare services nationwide. In contrast to the DHB system, which saw services operated and provided through 20 DHBs, Te Whatu Ora manages primary healthcare provision through four regional divisions, a strategy that was adopted to promote equity and the continuity of healthcare service provision for all people of Aotearoa (New Zealand Government, 2022). The new health system structure may improve the continuity of care and streamline referral pathways and systems that support timely access to MMH services in Aotearoa.

To summarise, the 2021 Stocktake report has identified significant gaps in the funding, access, and availability of appropriate MMH services in Aotearoa (Ministry of Health, 2021). The report's findings suggest that the current system is outdated and needs to reflect better the evolving mental health needs of the diverse maternal population of Aotearoa. The inequity of mental health outcomes experienced by Māori, Pacific, and Asian mothers should be prioritised in future service planning and provision.

In 2022, WHO developed a guide for integrating perinatal mental health assessment and support into MCHS. This guide outlines an evidence-based approach for services that support women and children to develop and sustain high-quality, integrated mental health services for women during the perinatal period (World Health Organisation, 2022). It brings together the best available evidence to support MCH providers in promoting good mental health, identifying symptoms of mental illness early and responding in a needs-based way adapted to local and cultural contexts (World Health Organisation, 2022). The WHO guide (2022) provides an example of how MCHS, such as Whānau Āwhina, can extend their current mental health service offering using existing service delivery models.

Well Child Tamariki Ora Practice

The WCTO programme is a series of health and development contacts free to all whānau in Aotearoa with children from around six weeks up to five years of age (Ministry of Health, 2013). Whānau Āwhina is the largest and only national provider of the Well Child Tamariki Ora (WCTO) programme in Aotearoa (Whānau Āwhina Plunket, 2023c).

Whānau Āwhina

Formerly known as the Society for the Promotion of the Health of Women and Children and, more recently, Plunket, Whānau Āwhina was founded in Aotearoa in 1906. As well as providing Karitane hospitals for the nurse and midwife inpatient care of under two-year-olds, the service evolved to offer nurse-led clinic and home visits focussing on the topics of domestic hygiene and breastfeeding promotion (Whānau Āwhina Plunket, 2023b). Although Whānau Āwhina Plunket, Whānau Āwhina, and Plunket are used interchangeably in Aotearoa, for clarity and consistency, the organisation will be referred to as Whānau Āwhina in this thesis. Today, Whānau Āwhina is the largest national health provider offering the WCTO programme to children under five and their whānau. Approximately 80% of infants in Aotearoa are enrolled with Whānau Āwhina at birth, giving them universal access to free primary healthcare promotion, assessment, and support (Whānau Āwhina Plunket, 2023c). Te Whatu Ora partially funds Whānau Āwhina clinical services, and they are also registered as a charity (Whānau Āwhina Plunket, 2023b). The WCTO programme, delivered by registered Whānau Āwhina nurses, karitane, and kaiawhina health workers, offers a universal series of health and development-themed contacts with a focus on assessment, prevention, health promotion, and education for topics that are relevant to the under-five population and their whānau (Ministry of Health, 2013). Mothers are generally the primary contact point for Whānau Āwhina services as they are more commonly the primary caregivers of children in Aotearoa (Ministry of Business Innovation and Employment, 2023).

Whānau Āwhina Screening

Depression in the perinatal period affects more than 11,000 women and their whānau in Aotearoa each year (12-18%) (Maternal Care Action Group New Zealand, 2022; Ministry of Health, 2021). Since 2013, the WCTO Schedule (Ministry of Health, 2013) has directed targeted PND screening using the Patient Health Questionnaire tool (PHQ-3) at the first and third scheduled contacts, at around six weeks and three months postpartum. The purpose of the PHQ-3 tool is to screen for symptoms of depression by asking the following three questions: 1) 'During the past month, have you often been bothered by feeling down, depressed, or hopeless?' 2) 'During the past month, have you often been bothered by little interest or pleasure in doing things?' 3) 'Is this something with which you would like help?' (New Zealand Guidelines Group, 2008). Any of the questions answered with an affirmative indicate symptoms of PND, resulting in the nurse being directed to refer the mother to her General Practitioner for advanced mental health assessment and intervention (Ministry of Health, 2013, 2021; New Zealand Guidelines Group, 2008).

In addition to the PHQ-3 screening for PND, the WCTO Schedule (Ministry of Health, 2013) directs WCTO nurses to undertake a family violence assessment, where possible, at each of the seven core contacts with mothers. The Family Violence Intervention Guidelines (Ministry of Social Development, 2002) describe family violence assessment as a routine enquiry for intimate partner violence (Ministry of Health, 2002). Postnatal depression screening and family violence assessment represent two out of the ten items covered in the ACE-10 assessment tool (Felitti et al., 1998). As the other eight items of the ACE-10 tool are currently not assessed for in clinical practice, the ability of the nurses to conduct an ACE assessment and apply international research insights is restricted, which represents a significant gap in current practice in Aotearoa (Felitti et al., 1998; Gears & Schulman, 2022; Ministry of Health, 2013).

Conclusion

Chapter two has provided relevant background to current maternal mental healthcare provision in Aotearoa and explained the significance of the present study's approach. The potential associations between childhood adversity and later MMH outcomes present this topic as worthy of further examination. The inequity of MMH outcomes experienced by Māori, Pacific, and Asian maternal populations in Aotearoa has been described. The 2021 Stocktake report revealed significant gaps in the ability of non-Pakeha women to access culturally appropriate maternal mental healthcare in Aotearoa, particularly within primary and community settings (Ministry of Health, 2021). Transformational change in the maternal mental healthcare system is required to meet the increasingly complex MMH needs of women of Aotearoa effectively. This is important as, currently, there is no national clinical direction for services working alongside whānau to screen for maternal ACEs, which evidence has indicated can be a useful predictor for postnatal MMH risk.

Two best practice guides have been introduced to provide examples of how ACE assessment and expanded MMH assessment and intervention could be integrated into existing models of care in MCHS in Aotearoa, such as Whānau Āwhina. The following chapter presents a scoping review of the available literature examining the associations between maternal ACEs and depression, anxiety, and stress in the perinatal period.

Chapter Three: Scoping Review

Introduction

The objective of the scoping review, guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses, extension for Scoping Reviews (PRISMA-ScR) (Tricco et al., 2018) and Arksey and O'Malley's (2005) Five-Stage Scoping Review Framework is to systematically search for and map the scope of the available literature on the topics of maternal childhood adversity and later MMH outcomes over the perinatal period. The scoping review will determine the extent and range of the current research studies in this field, applying the Patterns, Advances, Gaps, Evidence for practice and Research recommendations (PAGER) Framework for the analysis (Bradbury-Jones et al., 2022). The findings of this scoping review provide a foundation of research evidence on which the current study can build. This evidence will be used to develop the research questions that guide this study.

Background

The World Health Organisation (WHO) (2020) describe adverse childhood experiences (ACEs) as some of the most intensive and frequently occurring sources of stress that children may suffer early in life. The ACE-10 assessment tool contains five measures for child abuse and five measures for household dysfunction (Felitti et al., 1998). Previous studies have demonstrated that the accumulation of ACEs increases an individual's risks of chronic health problems, including mental illness and substance misuse in adulthood (Bränn et al., 2023; Brittain et al., 2022; Danese et al., 2009; Felitti et al., 1998; Jasthi et al., 2021; Merrick et al., 2018; Merrick et al., 2019). In recent decades, a subset of the literature examining ACEs has shifted from focussing on individual ACE outcomes to examining the links between the ACEs of mothers and the subsequent outcomes for their children (Chang et al., 2021; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016b; Racine et al., 2018b). Previously, international studies have already detailed the significant correlations that exist between maternal ACEs and later mental health dysfunction in the perinatal period in some populations (Aasheim et al., 2012; Chang et al., 2021; Do et al., 2021a; Ilter Bahadur et al., 2021; Johnson et al., 2017; McDonald et al., 2019; McDonnell & Valentino, 2016b).

Beyond maternal consequences, studies have reported adverse outcomes in the health, learning, development, and behaviour of children with mothers affected by mental illness, highlighting the importance of timely MMH assessment and intervention (Brittain et al., 2022; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016; Racine et al., 2018; Zhang et al., 2023). Twenty-seven publications were included in this scoping review of the literature, of which six patterns were identified from the studies. The patterns described within the sourced literature include (1) maternal ACEs and their associations with MMH, (2) maternal ACEs and MMH in higher-risk/vulnerable populations, (3) maternal ACEs, MMH, and parenting stress, (4) maternal

ACEs, MMH, and intergenerational outcomes, (5) maternal ACEs, MMH, and intimate partner violence, and (6) maternal ACEs, MMH, and the role of social support. While there is an increasing body of international research examining maternal ACEs, MMH, and their associated risks, there are currently no studies that have examined these critical topics within a maternal population of Aotearoa, which limits our grasp of the significance of these issues nationally and hinders any translation of ACE research findings into clinical practice change.

Method

Arksey and O'Malley's (2005) five-stage scoping review framework was used to determine: What is known from the existing literature regarding women in the perinatal period who have a positive ACE score and experience symptoms of depression, anxiety, or stress? A scoping review of qualitative and quantitative research studies was determined to be the most comprehensive approach to mapping the available literature, identifying research gaps on the study's topics of maternal ACEs and maternal mental health and well-being (Arksey & O'Malley, 2005). Unlike systematic reviews that typically focus on a narrow range of high-quality studies, scoping review methods are adopted to determine the breadth of available literature for broader topic areas, accessing a variety of study methodologies and designs to evaluate and present the current evidence (Arksey & O'Malley, 2005; Daudt et al., 2013). A mixed-methods approach, drawing on both qualitative and quantitative literature sources, is commonly used in scoping reviews as it allows for the examination of the full extent and range of available evidence to be reviewed (Daudt et al., 2013). A further strength of scoping reviews is their efficiency in mapping the key concepts and themes underpinning a research area and identifying gaps in the existing literature (Daudt et al., 2013).

The scoping review presented in this chapter follows Arksey and O'Malley's (2005) five steps, as detailed below:

- Stage 1. Identify the research question
- Stage 2. Identify relevant studies
- Stage 3. Study selection
- Stage 4. Charting the data
- Stage 5. Collating, summarising, and reporting the results.

The following sections outline how these steps were implemented in the present scoping review.

Framework Stage 1: Identify the Research Question

The research question developed for this scoping review is: What is known from the existing literature regarding women in the perinatal period who have a positive ACE score and experience symptoms of depression, anxiety, or stress? The research question was intentionally phrased as broad enough to

include all relevant studies yet specific enough to narrow down the population and examination timeframe (Arksey & O'Malley, 2005).

Framework Stage 2: Identifying Relevant Studies

A search strategy was developed in coordination with an Auckland University of Technology Health Librarian and was applied to the following electronic databases for the critical review of the available literature: CINAHL complete via Ebsco, Medline via Ebsco, Pubmed, Science Direct, PsycInfo, Joanna Briggs Institute, and Midirs. The search strategy was refined in response to the relevance of the literature sourced. The final search strategy applied to the journal databases is presented in Table 1 below.

Table 1 ***Process for Identifying and Refining Search Terms***

Final Search Terms	Boolean Command
("adverse childhood experience*" OR ace* OR maltreatment OR "child abuse" OR "child neglect" OR "child* trauma")	AND
(postnatal OR postpartum OR puerperium OR perinatal)	AND
mental* OR psych* OR depress* OR anxiet* OR stress	AND
mother* OR matern* OR parent* OR wom*	
*Following initial results that yielded several studies focused on mothers under the age of eighteen (exclusion criteria), additional search terms were applied.	NOT
teen OR adolescents OR teenagers OR "high school student*" OR youth	

Moreover, various limits were placed on the sourced literature. These restrictions included that sources had to have been published in academic journals between 2014 and 2024, be available in full-text and in English, and be primary research studies only. The search yielded 905 articles from CINAHL Complete via Ebsco, 544 articles from MEDLINE via Ebsco, and 215 articles from Pubmed. PsycInfo, Joanna Briggs Institute, and Midirs databases were searched, and no results aligned with the study's search terms were found. A total of 1,664 articles were exported to Endnote for further analysis.

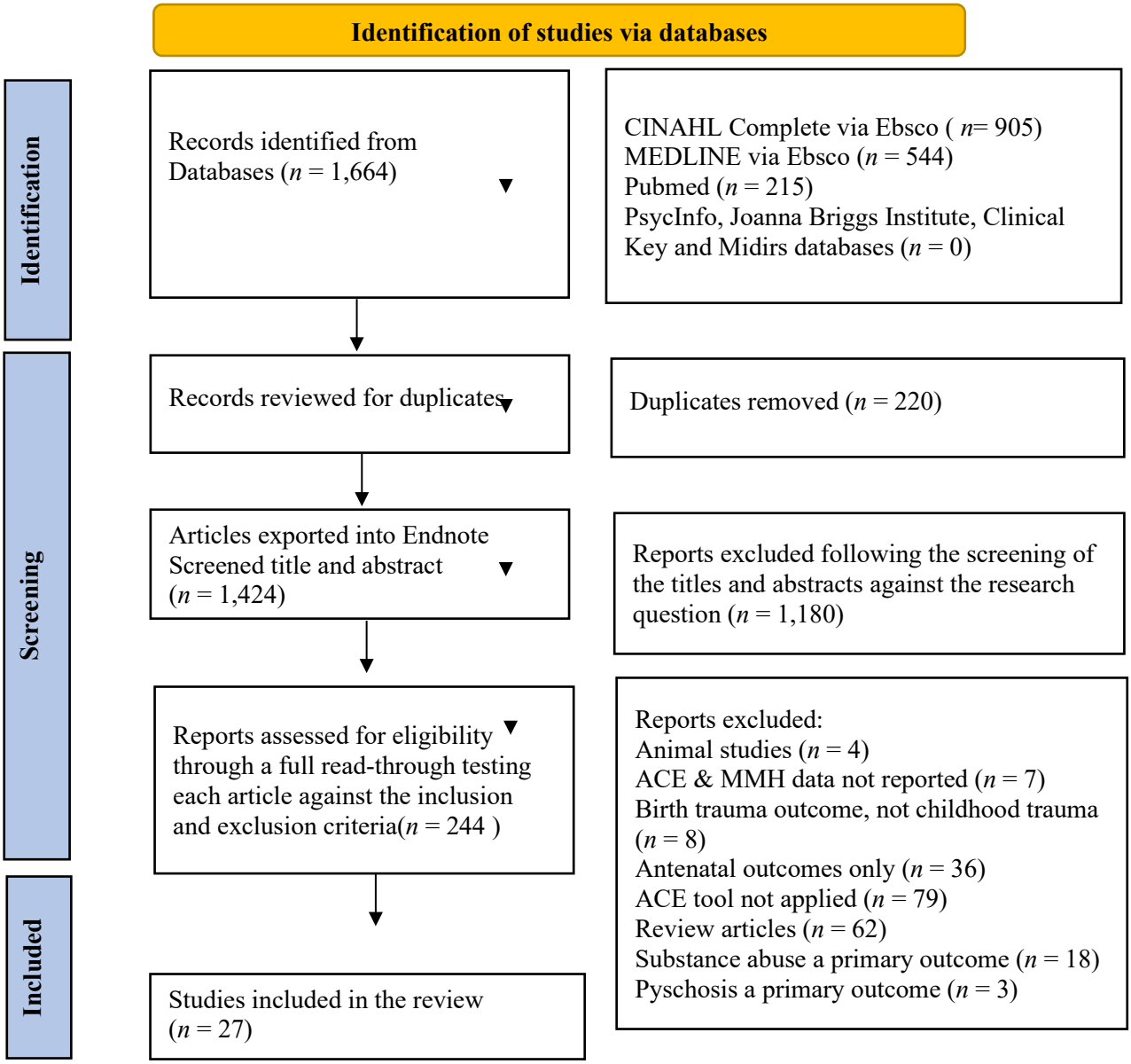
Framework Stage 3: Titles and Abstracts of the Sourced Literature Screened

Each title and abstract were then screened for relevance to the research question, which led to the exclusion of 1,180 texts. This was followed by the removal of 220 duplicates. At this point, the number of eligible articles was reduced to 244. Next, the inclusion and exclusion criteria presented in Table 2 below were applied to each remaining piece of sourced literature. With an increasing familiarity with the literature, the criteria were further refined. This led to the exclusion of a further 217 articles, leaving 27 texts to be included in the review.

Table 2 ***Inclusion and Exclusion Criteria***

Inclusion Criteria	Exclusion Criteria
Literature that examines the relationship between maternal ACEs and perinatal depression, anxiety, or stress.	Studies not available in English.
Published primary research studies, both experimental and non-experimental.	Editorials.
	Single case studies.
	ACE tool is not used to assess childhood adversity.
	Studies focused on the pregnancy/prenatal/antenatal/ or birth period only.
	Studies focused on substance abuse outcomes.
	Maternal psychosis focus for mental health outcomes.
	Child ACEs only explored, not maternal ACEs.
	Mental health/ACE associations not clearly described.
	Animal studies.
	Non-research studies.
	Review articles.

Figure 1 *Prisma Diagram*



Note. Adapted from Page M. et al. (2021). PRISMA 2020 explanation and elaboration: Updated guidance and exemplars for reporting systematic reviews. *BMJ.* Copyright 2021 by PRISMA. Adapted with permission.

After testing each article against the inclusion and exclusion criteria, a complete read-through of each study was undertaken, resulting in 27 articles being selected for inclusion in the scoping review. All 27 of the included articles were quantitative in design. The articles were published between 2016 and 2023, with more published towards the end of the timeframe. The most frequent year for publication was 2021 (*n* = 7). Most publications originated in the US (*n* = 13), followed by Canada (*n* = 5). Taiwan (*n* = 1), Vietnam (*n* = 1), Australia (*n* = 1), Turkey (*n* = 1), Pakistan (*n* = 1), Japan (*n* = 1), South Africa (*n* = 1), Iceland (*n* = 1), and Sweden (*n* = 1) made up the diverse remaining countries of study origins.

Framework Stage 4: Charting the Data

Data included in the final review were extracted and charted in Microsoft Excel (version 2312) using the following headings: Title, country of study, population studied, sample size, sample characteristics, design, primary findings, secondary findings, MMH tool applied, version of ACE tool applied, citation, total ACE prevalence, the perinatal period examined, depression associated with ACES (Yes or No, antenatally/postnatally), anxiety associated with ACEs (Yes or No, antenatally/postnatally), stress associated with ACEs (Yes or No, antenatally/postnatally), and intergenerational outcomes described. A patterning chart was developed to group the critical themes identified in the sourced literature. The charting process was iterative, where the researcher extracted data and updated the data charting forms as required (Arksey & O'Malley, 2005). In total, 27 articles were analysed and charted (Appendices A & B).

This review uses the PAGER framework to describe and present The literature and evidence. The PAGER framework was advanced by Bradbury-Jones et al. (2022) to provide a systematic approach to presenting and reporting the analysis of scoping reviews. The framework instructs using a patterning chart to group and summarise the identified Patterns observed in the sourced literature. Next, the theoretical and methodological Advances in the research field are examined over time. This stage positions the sourced literature within the broader body of work contributing to the research landscape. Over time, this process of positioning the research within its context will lead to the emergence of Gaps in the research literature. These Gaps in the knowledge provide researchers with potential areas for future research to address. The Evidence-based practice section of the PAGER framework applies to the broad interpretation of the extracted findings of the scoping review being applied clinically to inform implications for patients and carers, clinicians, academics, and policymakers. The final element of the PAGER framework is the domain of Research Recommendations. This section builds on the identified gaps from the scoping review and complements the reporting of the evidence for practice. The primary activity of the researcher is to consider how the review's findings could inform future research, what identified gaps inform that research, what that research might look like, and what is already known from the literature. These five

steps come together to provide a structured approach to the scoping review process and presentation. The five steps will provide the headings to present the results of the current scoping review of the literature.

Framework Stage 5: Collating, Summarising, and Reporting the Results

Quality Appraisal

Quality appraisal was undertaken by applying the Newcastle-Ottawa Quality Assessment Scale (NOS) tools (Wells et al., 2000). The two NOS scales, one for cross-sectional studies and one for cohort studies, each contain eight items, which are further categorised into three dimensions: Selection, comparability, and, depending on the study's design, the outcome for cohort studies or exposure for cross-sectional studies. The NOS tools apply a star scoring system of 0-8 to assess the study quality quantitatively. The higher the number of stars allocated, the higher the quality of the study (Wells et al., 2000).

Findings

Quality Appraisal Results, Newcastle-Ottawa Scale

Each of the 27 sourced articles was appraised by applying the NOS tools (Wells et al., 2000), with the results of the appraisals in this scoping review ranging from three to eight stars (the higher the number of stars reflecting a higher quality study) (Appendix C). The cross-sectional studies scored highly in the scoping review when compared with the cohort studies. When assessed on the NOS scale, one cross-sectional study was found to have no methodological flaws (Bränn et al., 2023). Two cross-sectional studies scored seven stars, with Doi and Fujiwara (2019) losing a star as they did not appear to control (assess) for lifetime mental illness. In contrast, previous mental health history was included in the analysis of the Williams et al. (2023) study; however, they lost a star for the small sample size of only 119 participants. Ilter Bahadur et al. (2021) cross-sectional study scored six stars, omitting the quality measures of sample representativeness and the ascertainment of the exposure (risk factor), as lifetime mental illness did not appear to be controlled for in this study. Similarly, the Australian cross-sectional by Chau et al. (2023) also lacked representation in their participant sample, and lifetime mental illness was not assessed. Chau et al. (2023) also lacked representation of higher risk or vulnerable participant populations and reported a small sample size (n = 191), resulting in the study receiving only three out of a possible eight stars in the NOS quality appraisal.

The 21 cohort studies were more varied in their appraised quality when compared with the cross-sectional studies in this scoping review, with one study found to have no methodological flaws when

assessed by the NOS tool for cohort studies (Prentice et al., 2022). The study by Menke et al. (2019) was awarded seven stars, losing one star for not demonstrating that the outcome of interest was not present at the start of the study. Esteves et al. (2020) scored seven stars, losing one star as the study did not appear to control (assess) lifetime mental illness. Erickson et al. (2019) cohort study was one of the few cohort studies that demonstrated the outcome of interest was not present at the start of the study; however, the appraised quality was reduced due to the self-reporting of ACE and MMH data, and the assessment of the findings was not generated through independent blind assessment or applying cross-referencing with health records, resulting in being awarded six out of a possible eight stars. The study by Kim et al. (2020a) was also awarded six stars, where the data was generated through self-reporting and not blind assessment, and there was no evidence of cross-referencing of the data using health records.

Six of the 21 cohort studies in the review were awarded five stars in the NOS quality appraisal (Allen et al., 2023; Ångerud et al., 2018; Coe et al., 2021; LeMasters et al., 2021; Letourneau et al., 2019; McDonald et al., 2019). Four of the six studies were deemed to have sample characteristics that were somewhat representative of the exposed cohort. Letourneau et al. (2019) study was found to have limited generalisability beyond middle and upper-class populations, and the study by McDonald et al. (2019). had an over-representation of low-needs families when compared to their wider cohort, reducing their appraised quality by one star. Ångerud et al. (2018) and Letourneau et al. (2019) each had a star deducted due to self-reporting their study's ACE and MMH measures. Three of the six studies did not provide evidence that the outcome of interest was absent at the start of the study (Allen et al., 2023; Coe et al., 2021; LeMasters et al., 2021). All six of the studies omitted evidence that they had controlled for lifetime mental illness. Further, there was no evidence of blind assessment or cross-referencing of the findings in any of the six studies.

Seven of the 21 cohort studies scored four out of a possible eight stars in their quality assessment (Brittain et al., 2022; Chang et al., 2021; Johnson et al., 2017; Mersky & Janczewski, 2018a; Racine et al., 2018; Racine et al., 2020; Zhang et al., 2023). Six of the seven studies relied solely on self-reported measures for their study's variables of interest, reducing their appraised quality; however, Johnson et al. (2017), along with self-reported measures, included evidence of clinical assessment data in their analysis. Three of the studies did not provide evidence that the outcome of interest was not present at the start of the study (Brittain et al., 2022; Chang et al., 2021; Zhang et al., 2023). All seven of the studies scoring four stars did not appear to control for lifetime mental illness. Further, there was no evidence of blind assessment or cross-referencing of the findings in any of the studies. The study by Mersky and Janczewski (2018a) did not clearly report their assessment follow-up timing. The studies by Johnson et al. (2017), Racine et al. (2018), and Racine et al. (2020) did not provide evidence of adequate follow-up of their study cohorts reducing their star quality ratings.

Finally, the four cohort studies that were the NOS appraised as being the lowest quality cohort studies in the scoping review scored three out of a possible eight stars (Benzies et al., 2021; Do et al., 2021; McDonnell & Valentino, 2016; Shin et al., 2021). Three of the four studies relied solely on self-reporting as their data collection method reduced their appraised quality score; in contrast, Benzies et al. (2021) included clinical assessment findings combined with their self-reported measures. Only Shin et al. (2021) demonstrated that the outcome of interest was not present at the start of the study. None of the studies that scored four stars showed evidence that they had controlled for lifetime mental illness in their studies, limiting the comparability of the findings between each cohort. McDonnell and Valentino (2016) was the only study of the four studies that provided evidence for record linking of the results including clinical records in their data analysis. Only one of the four studies was deemed to provide adequate time for the study outcomes to occur (Do et al., 2021), and of the four studies, not one of them provided evidence of adequacy of follow-up with their study cohorts.

Maternal Adverse Childhood Experiences

The prevalence of maternal childhood adversity varied significantly across the studies in the review, from 8.8% in a Turkish prospective cohort study of 900 mothers (Ilter Bahadur et al., 2021) to 88% in a US prospective cohort study of 295 ethnically diverse, low-income mothers (Coe et al., 2021). The pooled prevalence of maternal ACEs was calculated across the 23 studies that provided ACE prevalence data in the review. ACE prevalence data was not reported by Allen et al. (2023), Chau et al. (2023), Erickson et al. (2022), or Menke et al. (2019). The average ACE prevalence across the 23 studies was 61.3%, lower than the original ACE study prevalence of 69.8% (Felitti et al., 1998). One possible reason for the studies' lower pooled ACE prevalence was discussed in the articles themselves. Two studies that reported lower-than-expected ACE prevalence rates for their study populations discussed the role of social stigma and cultural belief systems in disclosing childhood adversity (Ilter Bahadur et al., 2021; LeMasters et al., 2021). Thus, it is likely that in some study populations, particularly in countries where the socialisation of the topic of childhood adversity is less accepted, there will be an underreporting of the true ACE prevalence due to a range of complex sociocultural factors (Ilter Bahadur et al., 2021).

Patterns within the literature

Six key patterns were identified during this scoping review. They are 1. Maternal ACEs and their associations with MMH; 2. Maternal ACEs and MMH in higher risk/vulnerable populations; 3. Maternal ACEs, MMH, and parenting stress; 4. Maternal ACEs, MMH, and intergenerational outcomes; 5. Maternal ACEs, MMH, and intimate partner violence, and 6. Maternal ACEs, MMH, and the role of social support.

Maternal Adverse Childhood Experiences and Maternal Mental Illness. Reflecting the first inclusion criteria, maternal childhood adversity and its associations with later MMH was the most frequently occurring pattern across the literature, and it was examined in all 27 of the articles included in the review. Reflecting the exclusion criteria, the postnatal period was examined in all 27 studies, and 15 studies extended their examination to both the antenatal and postnatal periods. Depression was the most frequently assessed mental health disorder, and it was examined in all 27 studies. This was followed by stress, examined in 12 studies, and anxiety, examined in ten scoping review studies. Most studies assessed for symptoms of mental illness by applying a combination of mental health assessment tools. The most common tool used to assess for symptoms of mental illness was the Edinburgh Postnatal Depression Scale (EDPS), which was applied in 19 of the studies. Six studies applied the nine-question version of the Patient Health Questionnaire to screen for depression (PHQ-9), and one applied the two-question version (PHQ-2). Five studies applied the Generalised Anxiety Disorder Screening tool GAD-7, and one used the two-question version, the GAD-2, to assess for symptoms of maternal anxiety. Stress was measured using the greatest variety of tools, as eight different measures were used across 12 studies. There were no studies included in the review that applied a mental health assessment tool designed to assess maternal depression, anxiety, and stress through a singular measure.

Again, reflecting the first inclusion criteria of the current study, all 27 pieces of research applied a version of the Adverse Childhood Experiences tool to assess maternal childhood adversity. Nineteen studies in the scoping review applied the original ACE-10 assessment tool designed by Felitti et al. (1998). Of the nineteen, one omitted the emotional neglect measure as insufficient data was collected. Three studies applied the ACE International Questionnaire (ACE-IQ), a 39-question version of the ACE tool developed by the World Health Organisation (2020). This version of the tool assesses the same areas as the ACE-10 of abuse, neglect, and household dysfunction and adds questions about exposure to violence. The questions in this area address peer violence, witnessing community violence, and exposure to collective violence (World Health Organisation, 2020). One study in the scoping review applied a 12-question version of the ACE-IQ. The four remaining studies applied extended versions of the ACE-10 tool with additional assessment questions that reflected the unique risk factors of their study populations of interest.

Maternal ACEs were found to be significantly and positively associated with antenatal depression in all sixteen of the studies that assessed for maternal depression in pregnancy and in 21 of the 24 studies that reported postnatal depression associations. The most extensive study in the scoping review is a cross-sectional study in Iceland that examined associations between ACEs and perinatal depressive symptoms in 16,831 participants (Bränn et al., 2023). Bränn et al. (2023) reported an ACE prevalence

in 77.5% of their maternal cohort, with the total number of ACEs positively associated with PND (PR 1.11 per ACE, 95% CI [1.10,1.11]. ACEs were further analysed by the ACE category. Bränn et al. (2023) reported that all individual ACE items (n = 13) were positively associated with PND, with the most pronounced associations observed between PND and the emotional neglect ACE (PR 1.53, 95% CI [1.47, 1.59]. In a Swedish longitudinal study, Ångerud et al. (2018) determined an ACE prevalence of 58.8% in their antenatal population of 1,257 mothers, with 7% of participants (n = 88) reporting an ACE score of five or more. Ångerud et al. (2018) reported EDPS-measured depression in 23% (n = 277) of the women in their study. Regression analyses determined a positive association between the EPDS score and maternal ACEs, cigarette smoking prior to pregnancy, body mass index (BMI), and psychiatric disorders, with education levels found to be inversely correlated as higher ACE scores in participants were associated with lower levels of education in their data (Ångerud et al., 2018). A further longitudinal study examining associations between maternal ACEs and MMH outcomes determined that antenatal depression was lower in first-time mothers when compared to second-time mothers and thereafter (r = -.19, p = .028) (Chang et al., 2021). Chang et al. (2021) also found that mothers who had delivered prematurely reported higher scores for PND (r = .21, p = .016). Antenatal and postnatal depression each presented an indirect pathway for maternal ACEs to be associated with adverse child developmental outcomes in the children of ACE-affected mothers (Chang et al., 2021).

In a retrospective cohort study set in rural Pakistan, LeMasters et al. (2021) reported an ACE prevalence of 58% in their study population, with the most frequently reported ACE being family violence, which was reported by 38.3% of participants. An interesting observation from LeMasters et al. (2021) was the length of exposure to depression symptomology in ACE-affected mothers. The positive associations observed between maternal ACE scores and clinical depressive symptoms persisted from late pregnancy until 36 months post-partum in their affected mothers (Letourneau et al., 2019). This observation aligned with a large Canadian longitudinal study that tested the associations between maternal ACEs antenatally through to 36 months postpartum (McDonald et al., 2019). In their cohort of 1,994 mothers, McDonald et al. (2019) reported an ACE prevalence of 62%. McDonald et al. (2019) described that along with higher rates of extended postnatal depression, maternal ACEs were positively associated with single marital status, lower educational achievement, and lower household income. Higher ACE scores were also found to be associated with increased risk-taking behaviours, including maternal smoking and binge drinking, as well as lower reports of parenting morale and maladaptive strategies for coping with parenting stress (McDonald et al., 2019).

A study of 353 low-resourced mothers set in South Africa reported a high ACE prevalence applying the ACE-IQ (84%), with the most frequently reported ACEs being parental separation/death and the experience of community violence, each reported by 52% of the women in their cohort (Brittain et al., 2022). Brittain et al. (2022) reported that increased ACE scores were strongly associated with

depressive symptoms, alcohol use, and intimate-partner violence. Similarly, in a further study set in the US that examined maternal ACEs and their associations in low-resource mothers, ACE prevalence was again determined to be high as the authors reported that 85% of the study participants were affected by childhood adversity (Mersky & Janczewski, 2018a). Mersky and Janczewski (2018a) reported that 37.1% of participants' scores met the criteria for antenatal depression, and 23% of mothers met the criteria for postnatal depression.

Seven studies in the scoping review examined anxiety in the antenatal period, and ten studies extended their investigations into the postnatal period. Of the seven antenatal studies, six reported positive associations between maternal ACEs and increased levels of anxiety in pregnancy. Postnatally, nine out of the ten studies reported significant positive associations between the variables of maternal ACEs and postnatal anxiety. McDonald et al. (2019) included a measure for anxiety assessment in their examination of ACE associations in their low-risk Canadian maternal sample (n = 1,994). This longitudinal study reported significant positive associations between maternal childhood adversity and antenatal and postnatal anxiety levels in the maternal population (McDonald et al., 2019). McDonald et al. (2019) analysed anxiety by ACE-risk group, categorising those with an ACE score of three or less as low-risk and those with an ACE score of four or more as high-risk. Of the women in the low-risk ACE group, 34.7% reported diagnostic levels of anxiety compared with 52.6% of women in the high-risk ACE group (McDonald et al., 2019). Higher reports of anxiety in mothers affected by childhood adversity were also found by Letourneau et al. (2019). Along with MMH outcomes, the mental health outcomes of the children of ACE-affected mothers were also examined up to the age of 36 months. Letourneau et al. (2019) determined that anxiety in pregnancy and postnatally were each found to be the mediating factors for the associations of maternal ACEs on adverse mental health outcomes in their children. The prenatal mediator model they developed determined that the combined factors of maternal ACEs, antenatal depression, and anxiety resulted in the most significant adverse mental health outcomes for children, reflecting a cumulative effect of the study's mental health variables for this population group (Letourneau et al., 2019). Antenatal anxiety as a mediating factor was described in a further prospective cohort study of 130 low-risk pregnant mothers in Taiwan (Chang et al., 2021). Although direct associations between maternal ACE scores and antenatal and postnatal anxiety were found to be insignificant in this population, Chang et al. (2021) reported that one of the three indirect effects that maternal ACEs had on child development was through pre- and postnatal anxiety and depression (β = -.05, SE = .04, 95% CI [-.209, -.011]). Similarly, Johnson et al. (2017) found no differences in the postnatal anxiety scores of mothers who had experienced childhood adversity compared with those who did not, with each group reporting a mean ACE score of 2.5 (SD = 2.4, 2.0) in their low-resource maternal study population.

A large US-based prospective cohort study (n = 831) focused on the postnatal period and applied the GAD-7 to assess for symptoms of maternal anxiety (Zhang et al., 2023). This study sample reported a high ACE prevalence of 83%, with a moderate-to-severe level of postnatal anxiety reported by 22.7% of participants (Zhang et al., 2023). Postnatal anxiety was found to be highly correlated with maternal ACE scores (r = .34, p = <.01), adult adversity measures (r =.50, p = <.01), and PND (r = .83, p <.01) (Zhang et al., 2023). The comorbidity of mental health concerns was a theme described in a further US study of mothers who reported a high ACE prevalence (81.5%) set in a neonatal intensive care unit (Williams et al., 2023). In this population of 119 postnatal mothers, clinically significant symptoms of anxiety were reported by 51.3% of participants, with 34.5% reporting clinically significant symptoms of PND and 39.5% qualifying for a diagnosis of acute stress disorder (Williams et al., 2023). Williams et al. (2023) analysis revealed that of the mothers who met the criteria of acute stress disorder, 81% met the criteria for postnatal anxiety, and 66% met the criteria for PND, reflecting the comorbidity of mental health dysfunction in this maternal population.

In a US study of women receiving inpatient care for perinatal mental illness (n = 159), maternal ACEs were found to be positively correlated with maternal anxiety (Erickson et al., 2022). This finding contrasted with a further US study of women receiving inpatient mental healthcare (Menke et al., 2019). Menke et al. (2019) found no associations between maternal ACEs and antenatal or postnatal anxiety in their participant population of 578 mothers (Menke et al., 2019).

Five antenatal studies in the scoping review included measures for maternal stress in pregnancy (Chang et al., 2021; Do et al., 2021; Johnson et al., 2017; Kim et al., 2020b; Menke et al., 2018). However, as three of the studies did not include the stress variable in their primary analysis, only two reported stress-related results. Menke et al.'s (2019) study used the Impact of Events Scale-revised to assess for symptoms of post-traumatic stress disorder (PTSD) in their pregnant participant sample. Maternal ACE scores were found to be significantly associated with PTSD symptomology both antenatally and postnatally in their study population, with women who had an ACE score of four or more determined to be the most significantly affected (β = .51, p = .05) (Menke et al., 2019). Chang et al.'s (2021) study assessed stressful events in pregnancy using the Social Readjustment Rating Scale (SRRS). Over a third of participants in their study reported stressful events during pregnancy, with the most common stressors being conflicts with family members reported by 16.9% of women (Chang et al., 2021). Chang et al. (2021) reported that maternal ACEs were positively correlated with stressful events in pregnancy (r = .27, p = .002). Antenatal stress was also found to be positively correlated with pre- and postnatal depression and pre- and postnatal anxiety (r = -.21 ~ -.17, p =.016 ~ .043), highlighting the significant associations for antenatal stress in the mental health outcomes of mothers in this population (Chang et al., 2021).

Postnatal stress symptomology was examined in seven of the articles in this review. However, similarly to the studies examining antenatal stress, only four of the studies reported stress-related outcome data. A US prospective cohort study with an overall ACE prevalence of 76.13% reported that higher ACE scores were significantly associated with higher prenatal maternal stress (PNMS) scores ($p = 0.39$, $p < .001$) and lower socioeconomic status ($p = .34$, $p < .001$) (Esteves et al., 2020). Esteves et al. (2020) reported that higher PNMS scores were also associated with an increased risk of PND (OR = 2.10, 95% CI [1.54, 2.86], $p < .001$). Zhang et al. (2023) reported similar associations between maternal ACE scores and stress levels. However, their study was based on a different maternal stress measure, namely the Primary Care PTSD screen. In their maternal population of 831 mothers, 20.4% recorded stress symptom levels that indicate probable PTSD (Zhang et al., 2023). Zhang et al. (2023) reported significant associations between maternal ACE scores ($r = .16$, $p < .01$) and maternal PTSD symptoms ($r = .21$, $p < .01$) with poorer socio-emotional functioning in the children of affected mothers between the ages of 12 and 48 months.

To summarise, maternal ACEs and associations with maternal mental illness were the most commonly examined pattern within the scoping review. The pooled ACE prevalence from the studies that reported ACE prevalence data was 61.3%, lower than the original ACE study prevalence of 69.8% (Felitti et al., 1998). All 27 studies examined postnatal depression, with 15 studies extending their examination to include the antenatal period. Twelve of the studies examined stress in the perinatal period. However, only seven of the studies included stress as a primary research measure and, thus, did not include stress-related findings in their results. Perinatal anxiety was examined in ten studies in the review. Maternal ACEs were found to be significantly associated with maternal depression in almost every study in the review. The associations between maternal ACEs and maternal anxiety and stress were generally consistent across the literature, with a small number of studies reporting no associations found between the variables of interest.

Maternal Adverse Childhood Experiences and Maternal Mental Health in Higher-Risk/Vulnerable Populations. The second most frequently occurring association investigated by the studies considered in this scoping review was maternal childhood adversity and MMH in higher-risk/vulnerable populations, described in 19 of the 27 studies. Examining the sourced literature, the associations between maternal ACEs and MMH outcomes appear even more pronounced in populations negatively impacted by the social determinants of health (SDH). This is illustrated in a US prospective cohort study examining ACEs in a population of perinatal women experiencing moderate to severe mental illness (Kim et al., 2020a). While Kim et al. (2020a) reported an overall ACE prevalence of 87% for their study population, their data includes alarming differences in the ACE scores of black women when compared to the white women in their sample. Participants who identified as black were younger (M = 28 years versus 32 years in white women) with lower

education levels (university attendance was 37.5% for black participants vs. 58% for white mothers) and were less likely to be privately insured (25% vs. 79%). Black women reported higher food insecurity, more unstable housing, and limited transportation (Kim et al., 2020a). When comparing ACE prevalence data, along with a significantly higher overall ACE prevalence, black women reported five times higher rates of child sexual abuse, four times higher rates of physical abuse, and seven times higher rates of witnessing family violence when compared to the white participants in this sample (Kim et al., 2020a). The comorbidity between childhood adversity and the negative determinants of health was echoed in a study by McDonnell and Valentino (2016a), who described their maternal population as young (M = 25 years), racially diverse, and mostly unmarried. This study also reported a high ACE prevalence, with 78.3% of women reporting one or more ACEs, with participants' total ACE scores found to be positively associated with both antenatal and postnatal depression scores (McDonnell & Valentino, 2016a).

The pattern of higher ACE scores in higher-risk populations aligns with findings from Johnson et al. (2017), whose prospective cohort study measured the maternal ACEs and MMH outcomes of women engaging with two high-risk home visiting services (Johnson et al., 2017). The first service, Early Head Start (EHS), offers intensive home visiting services to families who meet the federal poverty guidelines, and the Olmsted County Public Health Service (OCPHS) targets families with risk factors of child maltreatment and poor infant brain development (Johnson et al., 2017). The ACE prevalence in the participants of the EHS service was high at 80%, with 45% of women reporting an ACE score of four or more (Johnson et al., 2017). Similarly, in the OCPHS cohort, a high ACE prevalence of 73% was reported, with 33% of women reporting an ACE score of four or more (Johnson et al., 2017). The prevalence of antenatal depression was found to be high across these two services, with a pooled prevalence of antenatal depression in 47% of all pregnant women and 53% postnatally (Johnson et al., 2017). The average ACE score of women screening positively for antenatal depression was 4.0 (SD = 3.1) and 2.4 (SD = 2.7) for women screening negatively for antenatal depression. Similarly, the average ACE score of women who screened positively for depression was 3.0 (SD = 2.3) compared to 2.4 (SD = 2.0) for those screening negatively for PND, highlighting the significance of the associations between maternal childhood adversity and maternal depression in these population groups negatively impacted by the SDH. Similarly, a study conducted by Shin et al. (2021) reported that two-thirds of their study population (n = 745) had experienced childhood adversity, with 18% scoring four or more on the ACE-10 tool. African American participants were approximately twice as likely to experience childhood adversity than those participants who identified as white. T-tests analysed each ACE measure against scores for PND, revealing that most ACE items were individually, significantly, and positively correlated with higher rates of PND (Shin et al., 2021).

Coe et al. (2021) reported a high prevalence of childhood adversity in 88% of their high-needs study population of 295 US mothers, all receiving public assistance. A further large US study (n = 735) examined childhood adversity in a low-income population of mothers receiving targeted home visiting services (Mersky & Janczewski, 2018). Within this ethnically diverse population, childhood adversity prevalence was high (85%), with a mean ACE score for each participant of 3.4. An interesting finding in this study was that in their results reporting PND, EDPS scores did not differ by ethnicity (p = .19), contrasting with every other study sourced in this review that examined mental health outcomes by ethnic group, indicating that other variables of influence were significant in this population beyond ethnicity (Mersky & Janczewski, 2018).

Five of the studies in the scoping review examined ACEs within maternal populations receiving mental healthcare (Allen et al., 2023; Erickson et al., 2022; Kim et al., 2020a; Menke et al., 2019; Prentice et al., 2022). Kim et al. (2020) reported a high prevalence of childhood adversity (87%) in their study population of mothers receiving inpatient mental healthcare for moderate to severe mood and anxiety symptoms. Kim et al. (2020a) described that 57% of their participants reported four or more ACEs, which is markedly higher than the 15% of the study population in the original ACE research (Felitti et al., 1998). In a further study, Erickson et al. (2022) examined pregnant and postpartum women who had received at least one week of inpatient mental healthcare; a total ACE prevalence was omitted from the results. We can, however, assume a high ACE prevalence for this inpatient population as it is reported that the mean participant ACE score was 3.74 (SD = 2.82), with 50.3% reporting four or more ACEs (Erickson et al., 2022). Erickson et al. (2022) reported additional risk factors for this population, with 64% of patients endorsing moderate to high social support risk, 41% reporting food insecurity, and 42.4% describing housing insecurity. Logistic regression revealed that ACEs were associated with small but significant risks for low social support (OR = 1.23, p = .003, 95% CI [1.07, 1.40]), food insecurity (OR = 1.23, 95% CI = 1.08-1.39, p = .002), and housing insecurity (OR = 1.23, p = .003, 95% CI [1.07, 1.40]) (Erickson et al., 2022).

In a university-based perinatal psychiatric clinic in the US, 65% of women met the criteria for major depression, 23% for generalised anxiety disorder, and 4% met the criteria for PTSD (Menke et al., 2019). Despite describing the participant sample as low risk as determined by their socio-demographic characteristics, this participant group engaging with mental health services were again overburdened by experiences of childhood adversity, with 30% of participants reporting four or more ACEs (Menke et al., 2019). A retrospective cohort study of 1,270 US mothers examined ACE trajectories in a sample of mothers enrolled in a perinatal mental healthcare programme (Allen et al., 2023). As found in the studies by Erickson et al. (2022), Kim et al. (2020a), and Menke et al. (2019), the mothers receiving mental health treatment in the study were overburdened with significant histories of adversity (Allen et al., 2023). Although the total population ACE prevalence was again

omitted from the article, it can be assumed that the ACE prevalence was high in this sample, as 23.1% of women reported >3 ACEs (Allen et al., 2023). The associations between the total ACE scores of participants were also significant, with mothers who reported >3 ACEs more likely to smoke tobacco, report a body mass index of >30, and report chronic medical conditions (Allen et al., 2023). For mental health associations, those participants with ACE scores >3 were more likely to experience antenatal depression, namely 10.3% versus 4.3% (p = .008) (Allen et al., 2023). Interestingly, in this population, this trend did not extend to the postnatal period, with Allen et al. (2023) describing no significant differences in the PND rates of mothers in the high-risk ACE group versus the low-risk ACE group (aOR = 1.29, 95% CI [0.59, 2.81]). These findings contrast with a US retrospective cohort study of 132 mothers who were selected as participants based on a postpartum depression diagnosis (Prentice et al., 2022). The participants of this retrospective cohort study reported a high ACE prevalence of 80.7%, with 42% of mothers reporting an ACE score of four or more, reflecting high ACE and PND association in this study sample (Prentice et al., 2022).

A Japanese cross-sectional study of 5,960 postpartum mothers examined associations between maternal ACEs and self-harm ideation at three months postpartum as their primary outcome (Doi & Fujiwara, 2019). Doi and Fujiwara's (2019) results revealed that 9.1% of mothers reported experiencing self-harm, 12.5% reported PND with an EDPS score >9, and 30% reported a positive ACE prevalence. Doi and Fujiwara (2019) described that 20% of their study participants reported negative feelings when their pregnancy was confirmed, 10% smoked during pregnancy, and 40% of participants drank alcohol during pregnancy; each risk factor was found to be associated with maternal ACE scores. Maternal ACE associations and risk-taking behaviours were also examined within a low-resource population in South Africa, where antenatal HIV prevalence is around 30% (Brittain et al., 2022). This cohort of 353 mothers reported a high ACE prevalence of 84%, which was found to be significantly associated with suboptimal adherence to their HIV medication regime (OR = 1.25, 95% CI[1.10, 1.43]), increasing the risks to both their own health outcomes as well as for their children's health via increased risk of HIV transmission (Brittain et al., 2022).

To summarise, the second most frequently occurring association considered in this scoping review was maternal childhood adversity and MMH in higher-risk/vulnerable populations (19 of the 27 studies). The high-risk/vulnerable participants in these studies can be grouped into two populations: participants negatively impacted by the SDH and participants who were current consumers of services for mental illness. Some of the SDH measured across the studies in the review included ethnicity, income, education, housing, and food insecurity. Maternal ACEs were found to be consistently associated with the negative SDH reflected in high ACE prevalence recordings in these population groups. For the second high-risk group, current consumers of mental health services, there was a strong theme that the participants were overburdened by childhood adversity experiences reflected in

both the study's higher overall ACE prevalence and the comparatively high ACE score means, where reported.

Maternal Adverse Childhood Experiences, Maternal Mental Health, and Stress. The third most common pattern (n = 12) observed in the scoping review is the association between maternal ACEs, MMH, and stress (Chang et al., 2021; Coe et al., 2021; Do et al., 2021b; Erickson et al., 2022; Esteves et al., 2020; Johnson et al., 2017; Kim et al., 2020a; McDonald et al., 2019; Menke et al., 2019; Mersky & Janczewski, 2018a; Williams et al., 2023; Zhang et al., 2023). Even though the authors used different measurement tools at different times in the perinatal period, there was a pooled consensus across the twelve studies that maternal ACEs were positively associated with symptoms of perinatal stress. Suggesting that this association is robust despite variations in measurement. Esteves et al. (2020) applied the Prenatal Maternal Stress Index (PNMS) to examine symptoms of stress in their US study of 155 mothers. Esteves et al.'s (2020) results revealed that higher maternal ACE scores were associated with higher PNMS scores (p = .39, p < .001). Higher ACE scores (OR = 1.26, p < .01, 95% CI[1.04, 1.52]) and higher PNMS scores (OR = 2.10, $p \leq$ .001, 95% CI = 1.54, 2.86) were each associated with an increased risk of PND (Esteves et al., 2020). Chang et al. (2021) applied the Social Readjustment Rating Scale to assess stressful/traumatic life events in pregnancy. Chang et al. (2021) described that not only were maternal ACEs positively correlated with stressful events during pregnancy (r = .27, $p \leq$. 01), these stressful events were positive predictors of both antenatal and postnatal depression (r = .24 ~ .35, $p \leq$.001 ~ p = .005), and negatively correlated with offspring's fine motor, language, and social development (r = -.21 ~ -.17, p = .016 ~ .043). These findings highlight the significance of the risk of maternal stress in pregnancy by indirectly affecting offspring development for children of ACE-affected mothers in this population (Chang et al., 2021).

Stress in the scoping review was also examined by assessing psychosocial stressors. Erickson et al.'s (2022) study examined maternal ACEs and current psychosocial stressors within an inpatient MMH setting. The participants reported a high incidence of childhood adversity; psychosocial stressors were also commonly reported by 40% of patients (Erickson et al., 2022). These findings align with the high maternal stress reported within the study population whose infants were inpatients of the NICU (Williams et al., 2023). Williams et al. (2023) measured acute stress disorder by applying the revised 22-item Impact of Events Scale to their highly ACE-affected participant population (81.5% prevalence). Although an increased level of maternal stress is expected for mothers whose infants are in the NICU, Williams et al.'s (2023) analysis revealed that cumulative ACE scores directly predicted acute stress disorder in their study sample (β = 0.27, p < .05) as well as PND (β = 0.23, p < .05) demonstrating that ACEs and stress were significantly associated in this participant sample. Traumatic events in the NICU combined with NICU stressors were also found to mediate the effect of maternal ACEs on acute stress disorder diagnosis in this population (Williams et al., 2023).

Mersky and Janczewski (2018a) measured the stress of 735 US mothers by applying the ten-item Perceived Stress Scale. In this low-resourced maternal population, maternal ACEs were found to be significantly associated with perceived stress levels (β =.77, $p < .05$) (Mersky & Janczewski, 2018a). As well as the identified direct association pathway, perceived stress was determined to be the mediating factor for the association between maternal ACEs and both antenatal and postnatal depression in this cohort, reflecting the multiple pathways that maternal ACEs influenced stress outcomes in this study population (Mersky & Janczewski, 2018a). Parenting stress was measured at 12 months postpartum by Coe et al. (2021), who used the Parenting Stress Index short form to assess stress symptoms in their study. Maternal stress was found to be significantly associated with maternal ACEs (β = .18, $p < .05$), IPV (β = .20, $p < .05$), antenatal depression (β =.43, $p < .05$), and parent-child dysfunctional interactions at 12 months postpartum (β =.56, $p < .05$) (Mersky & Janczewski, 2018a). This study provides insights into the maternal factors that increase the likelihood of maternal stress at 12 months postpartum, as well as the negative parenting factors associated with maternal stress at that time.

To summarise, the third most common pattern observed in the scoping review was the association between maternal ACEs, MMH, and stress. As noted in the first pattern, only seven studies reported stress-related data. Despite the range of tools used to measure stress within the 12 studies, there is a consensus that maternal ACEs are positively associated with symptoms of stress in the perinatal period. These associations were more pronounced for participants within inpatient maternal mental health settings and the NICU.

Maternal Adverse Childhood Experiences, Maternal Mental Health, and Intergenerational Outcomes. The fourth most frequently occurring pattern explored by the articles considered in this scoping review was the links between maternal ACEs, MMH, and intergenerational outcomes, which was examined within ten of the articles (Brittain et al., 2022; Chang et al., 2021; Coe et al., 2021; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016a; Racine et al., 2018a; Racine et al., 2020; Zhang et al., 2023). In a study that analysed maternal ACEs by two categories, child maltreatment (first five ACEs) and household dysfunction (second five ACEs), maternal childhood maltreatment ACEs were found to directly predict higher levels of infant maladaptive socio-emotional symptoms at six months of age (McDonnell & Valentino, 2016a). The household dysfunction ACES were not found to be directly associated with infant socio-emotional function; however, indirect associations were observed via younger maternal age at first pregnancy and low infant birth weight (McDonnell & Valentino, 2016a). Letourneau et al. (2019) used mediator models to examine potential pathways to how maternal ACEs could be associated with child internalising (e.g. anxiety and depression) and externalising (e.g.

aggression and hyperactivity) behaviours at 24 months of age. Letourneau et al. (2019) found that a pathway exists between exposure to maternal childhood adversity, which was positively associated with maternal postnatal depression, which was positively associated with both child internalising and externalising behaviours at 24 months of age. A post hoc analysis revealed that the indirect effects of ACEs via postnatal depression was supported, 95% CI [0.003,0.065], but the pathway via prenatal anxiety was not [-0.008, 0.088], suggesting that PND uniquely contributes to the effects of maternal childhood adversity on child internalising behaviour even after accounting for the effects of prenatal anxiety (Letourneau et al., 2019). For child externalising behaviours, both antenatal anxiety and depression were each found to contribute to the associations between maternal childhood adversity and childhood externalising behaviour outcomes (Letourneau et al., 2019). Behavioural outcomes in children of ACE-affected mothers were also examined by McDonald et al. (2018). McDonald et al. (2019) found that the highest proportion of suboptimal behaviour was observed in children whose mothers had an ACE score of three or more. These children were more likely to have higher levels of hyperactivity/inattention (21.3% in the ≤3 ACE group vs. 15.3% in the ≥3 ACE group), physical aggression (17.4% vs. 11.6%), anxiety/emotional disorders (12.2 vs. 8.7%), separation anxiety (17.8% vs 22.2%), surgency/extraversion (24.4% vs. 16.4%), and negative affectivity (22.7% vs. 14.8%) (McDonald et al., 2019).

Child developmental outcomes were also examined in the prospective cohort study by Brittain et al. (2022), whose results described no significant associations between maternal ACEs and child development in the domains of communication, gross motor, fine motor, problem-solving, or personal social functioning (Brittain et al., 2022). Contrastingly, maternal ACE scores were found to be associated with maternal perceptions of delay in their child's socio-emotional development (Brittain et al., 2022). Zhang et al. (2023) also observed a similar link and reported significant associations between maternal ACEs and their child's socio-emotional problems between 12-48 months of age. Racine et al. (2018a) considered pathways for maternal ACE association on child development at 12 months postpartum. Indirect risk pathways were revealed via heightened psychosocial risk factors in pregnancy, such as limited social support, history of mental health difficulty, or current symptoms of depression, anxiety, or stress ($\beta = -.03$, $p = .004$) (Racine et al., 2018a). A second indirect risk pathway was identified for adverse child developmental outcomes via maternal pregnancy and health risk and infant health risk at birth ($\beta = -.01$, $p = .02$, 95% CI [-0.01t, -0.001]) (Racine et al., 2018a). Racine et al. (2018a) findings are significant to the intergenerational ACE literature as they provide evidence to support the theory that maternal ACEs can affect child development outcomes via both biological and psychological pathways. A further study that found no direct associations between maternal ACEs and child development outcomes but found significant associations via maternal psychological mediating pathways was the Taiwanese prospective cohort study by Chang et al. (2021). The patterns of maternal ACE associations with child developmental outcomes at six months

were observed only via antenatal mental health dysfunction pathways (Chang et al., 2021). Antenatal mental illness was associated with postnatal mental illness, which was associated with poorer gross motor skills, fine motor skills, language skills, and social skills in infants at six months postpartum (Chang et al., 2021).

The impact of maternal ACEs on maternal self-efficacy and the success of the mother-infant relationship was examined in an Australian cross-sectional study by Chau et al. (2023). In this postnatal population (n = 191), 15.3% of EDPS scores indicated postnatal depression in participants. When analysing the data by ACE category, both the physical abuse and the psychological abuse ACEs were significantly associated with less successful mother-infant bonding (Chau et al., 2023). Low perceived maternal self-efficacy was found to be significantly correlated with both postnatal depression and mother-infant bonding difficulties (Chau et al., 2023).

One study considered the impact of maternal childhood adversity on infant telomere length and child behavioural outcomes at 18 months postpartum (Esteves et al., 2020). As telomere length is an established marker of cellular stress and ageing, the researchers were interested in examining whether maternal childhood adversity was associated with measurable changes in telomere length and subsequent behaviour in children of ACE-affected mothers (Esteves et al., 2020). In this population of 155 mother-infant dyads with a high maternal ACE prevalence (76.13%), it was determined that higher maternal ACE scores were indeed associated with shorter infant telomere length across the time points measured ($\beta = 0.031$, $p < .01$, [95% CI = -0.059, -0.003]), and increased externalising behavioural problems at 18 months in their children ($p = .23$, $p = .006$), but not with internalising problems ($p = .14$, $p = .095$) (Esteves et al., 2020). Esteves et al. (2020) findings support the theory of a biological pathway of transmission for maternal ACEs to negatively impact outcomes for their children (Racine et al., 2018a).

To summarise, ten articles in the review explored the associations between maternal ACEs, MMH, and intergenerational outcomes. Child development and symptoms of mental illness were the most commonly examined intergenerational outcomes in these studies. The associations found between maternal ACEs and child development and mental health outcomes were a combination of direct associations and indirect associations through parenting behaviour and MMH as the mediators for the associations. One study found significant associations exist between maternal ACEs and less successful attachment and bonding relationships, and a further study reported shorter infant telomere length, an established marker of cellular stress and ageing, in infants whose mothers reported a positive history of ACEs.

Maternal Adverse Childhood Experiences, Maternal Mental Health, and Intimate Partner Violence. Intimate partner violence (IPV) was examined within five of the studies in this scoping review, representing the fifth most frequently occurring pattern of interest (Coe et al., 2021; Do et al., 2021b; Doi & Fujiwara, 2019; Mersky & Janczewski, 2018a; Zhang et al., 2023). Childhood adversity prevalence was generally high within these study populations, with three studies reporting a study sample ACE prevalence of 83% or higher (Coe et al., 2021; Mersky & Janczewski, 2018a; Zhang et al., 2023). Doi and Fujiwara (2019) included IPV as a variable in their cross-sectional study, with 5% of maternal participants reporting verbal abuse during pregnancy and 2% reporting physical violence (Doi & Fujiwara, 2019). Applying multivariate models for analysis, both IPV and total ACE score were each found to be significantly associated with self-harm ideation. Mersky and Janczewski (2018a) examined childhood adversity in a population of intimate partner violence (IPV) affected mothers. Through mediation analysis, Mersky and Janczewski (2018a) demonstrated that higher scores on the ACE-10 questionnaire were associated with an increased likelihood of experiencing IPV. Intimate partner violence was associated with elevated scores for antenatal depression (p <.001) and perceived stress (p = .03). Antenatal depression and perceived stress scores were then found to be positively associated with PND scores (p < .001).

IPV was assessed as an 'adult adverse experience' in the study by Zhang et al. (2023), whose results revealed that partner or spouse emotional abuse was reported by 49.5% of their US cohort of 831 postnatal mothers. Zhang et al. (2023) were interested in the intergenerational pathways influencing maternal ACEs on child socio-emotional functioning. It was determined that although there were no significant direct pathways observed between maternal ACE scores and the child's socio-emotional outcomes, the combined variables of maternal ACEs and adult adversity measures (β = 0.42, 95% CI[0 .36, 0.47]), as well as mental health dysfunction combined with adult adversity (β = 0.50, 95% CI[0.42, 0.57]), each presented statistically significant pathways for child socio-emotional problems (Zhang et al., 2023). Coe et al.'s (2021) prospective cohort study also examined the role of IPV and maternal ACEs on intergenerational outcomes. Higher rates of IPV (β = .24, p < .001) and higher total ACE scores (β = .17, p < .001) were each found to be associated with more significant depressive symptoms in pregnancy (Coe et al., 2021). These outcomes were each found to be associated with dysfunctional parenting interactions, increased parental distress, and, ultimately, less sensitive parenting practices (Coe et al., 2021).

The associations between ACEs, IPV and parenting approaches were also examined in a Vietnamese prospective cohort study of 150 women in the perinatal period, where one in two women reported at least one form of child maltreatment (CM), and one in ten women reported both CM and IPV (Do et al., 2021b). Mothers who experienced IPV or witnessed IPV in childhood were twice as likely to experience poor mental health during pregnancy. Additionally, maternal ACEs were found to be

significantly associated with positive attitudes towards the corporal punishment of their children (ARR = 1.07, 95% CI[0.99,1.15]) (Do et al., 2021a). Notably, 80% of the study's participants supported corporal punishment as a method of disciplining their children, defined by the World Health Organisation (2021) as any punishment in which physical force is used and intended to cause some degree of pain or discomfort, however light. This 'highly accepted' approach to discipline for the participants of this study represents at least one adverse childhood experience for the children of the participants (Do et al., 2021b; Felitti et al., 1998).

To summarise, the associations between Maternal ACEs, MMH, and IPV were examined within five studies in this scoping review. Childhood adversity prevalence was generally high within these study populations, with three studies reporting an ACE prevalence of 83% or higher. The studies consistently linked maternal ACEs with increased exposure to IPV and, thus, poorer perinatal mental health outcomes. There were also associations observed between mothers who experienced ACEs and IPV and dysfunctional parenting practices, including child maltreatment.

Maternal Adverse Childhood Experiences, Maternal Mental Health, and Social Support. The sixth and final pattern observed within this review was maternal ACEs, MMH, and the role of social support, with all four studies that examined this theme in this review, highlighting the protective role of social support for adversity-affected mothers (Johnson et al., 2021; Erickson et al., 2022; Ilter Bahadur et al., 2021; Racine et al., 2020). Racine et al. (2020) examined the role of maternal ACEs, MMH, and social support in the postnatal period. They determined that mothers with higher ACE scores were more likely to experience depressive symptoms in the postnatal period and that low social support was both positively associated with antenatal depression. Social support served as a predictor for PND with women who reported low social support found to be three times more likely to develop PND compared with women with high social support (Racine et al., 2020). These findings align with Ilter Bahadur et al. (2021), whose results report that in addition to the significant associations with maternal ACE scores, low social support was also associated with higher rates of PND ($p < .05$). Despite the highlighted importance of the role of social support, Ilter Bahadur et al. (2021) reported that the group of participants who scored two or more ACEs had the lowest level of perceived support from friends or a special person when compared to those participants with zero ACEs ($p < .05$).

Two studies in the review that examined social support applied support group interventions in their maternal populations (Johnson et al., 2021; Erickson et al., 2022). Erickson et al.'s (2022) study that was set in a MMH inpatient setting reported that 64% of patients endorsed moderate to high social support risk (i.e. lower access to social supports). Disappointingly for the researchers, social support risk status was not found to be significantly associated with any self-reported mental health measures

conducted/ administered pre- or post-intervention (Erickson et al., 2022). However, Johnson et al.'s (2021) longitudinal study saw some positive successes in the mental health outcomes of participants engaging with the Welcome to Parenthood Program (W2P). Maternal EDPS scores decreased significantly during W2P, with this finding most pronounced in women affected by early life adversity (Johnson et al., 2021). Women with an ACE score of three or more reported the most significant decrease in depressive symptoms across their participant sample (Johnson et al., 2021). Johnson et al. (2021) attributed the success of the reduction in PND symptoms to the social support aspect of the W2P, with the positive effects of W2P extending to the infants of maternal participants who were found to outperform the control group infants in communication, gross motor skills, fine motor skills, and personal social skills at six months of age (Johnson et al., 2021).

To summarise, four studies in the scoping review examined the role of social support in ACE-affected maternal populations. Despite an overall consensus across these studies of the importance of social support in ACE-affected maternal populations, there was evidence to suggest that social support is comparatively lower in mothers affected by childhood adversity. There were associations observed between low social support and poorer mental health outcomes across the studies. Two of the studies applied social support interventions to promote MMH and connectedness, and one showed positive results in the MMH outcomes of their participants.

Advances in knowledge

Significant advances have occurred in the literature examining adverse childhood experiences. One of the most notable advances in recent years has been the recognition and examination of ACE risk extending beyond individual outcomes to consider the intergenerational effects of maternal adversity experiences (Brittain et al., 2022; Chang et al., 2021; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016a; Racine et al., 2018a; Racine et al., 2020; Zhang et al., 2023). The research that has examined the intergenerational risks for children of ACE-affected mothers has primarily focussed on the developmental and mental health outcomes of children, described in nine of the studies in this review. Identifying intergenerational pathways for risk transmission is an evolving theme within this field. The results of the study by Racine et al. (2018b) provide evidence to support both physiological and psychological pathways for ACE-risk transmission. Esteves et al.'s (2020) study results contribute evidence to support a potential pathway for physiological transmission of risk through the shortened telomere lengths in infants of ACE-affected mothers, and Letourneau et al. (2019) and Chang et al. (2021) each provided evidence of a transmission pathway mediated through maternal psychological symptomology. This research field requires further studies to analyse the transmission of intergenerational ACE risk, with more extensive and diverse populations required to understand the pathway of ACE risk transmission between generations.

A significant limitation of the original 1998 ACEs study was the homogeneity of the study's population, with approximately 70% of the participants identifying as white and college-educated (Brittain et al., 2022; Erickson et al., 2022; Felitti et al., 1998; Kim et al., 2020a; Prentice et al., 2022). As a result, subsequent researchers have extended their examination of ACEs to include more diverse and at-risk population groups. This is reflected in 19 studies in this scoping review that describe outcomes in study populations described as high-risk/vulnerable. There is a clear pattern in this review that the prevalence and severity of adversity (represented by higher individual ACE scores) are significantly overrepresented in maternal populations who are negatively impacted by the SDH. Women who are negatively impacted by the SDH typically report higher ACE scores, which are associated with increased adverse outcomes over their lifetime. Two studies were outliers to this rule. Thus, one large Turkish study (n = 900) reported a maternal childhood adversity prevalence of only 8.8% despite this maternal population being predominantly uneducated, unemployed, and having low household income (Ilter Bahadur et al., 2021). A further study that reported an unexpectedly low maternal ACE prevalence was a retrospective cohort study set in rural Pakistan by LeMasters et al. (2021). As described within the patterns section of the scoping review, both studies suggested reporting bias as a potential explanation for these findings (Ilter Bahadur et al., 2021; LeMasters et al., 2021). Fears of shame and stigma relating to childhood adversity, as well as the likely cultural normalisation of child abuse, were discussed as potential causes for the underreporting of ACE scores and MMH indicators within these studies (Ilter Bahadur et al., 2021; LeMasters et al., 2021). Reporting bias is a consideration for all studies that include marginalised population groups, where a range of complex socio-cultural factors may result in the underreporting of sensitive early life experiences.

The second category of population who appear to be negatively and disproportionately affected by ACEs are those seeking maternal mental healthcare, regardless of the population's socio-demographic status. This was highlighted by Menke et al. (2019), who, despite describing their population as having low demographic risk, found that participants who were engaging in mental healthcare reported high levels of childhood adversity, with over 30% of participants reporting four or more ACEs.

Maternal stress as a factor of MMH is an advancing pattern in ACE research, particularly in the antenatal period, as maternal stress has been found to impact pregnancy and birth outcomes negatively (Chang et al., 2021; Coe et al., 2021). Therefore, examining the relationship between childhood adversity and later perinatal stress could provide valuable insights for risk prevention. Maternal stress was a theme examined within twelve articles in the review. However, as reflected in the patterns section, only seven articles reported stress-related findings. Despite the variety of the tools used to

assess maternal stress in the studies of this scoping review and the varying time points for assessment, collectively, maternal ACEs were reported as being significantly associated with self-reported maternal stress symptoms across the perinatal period (Chang et al., 2021; Coe et al., 2021; Erickson et al., 2022; Esteves et al., 2020; McDonald et al., 2019; Mersky & Janczewski, 2018a; Williams et al., 2023). This topic requires further examination through future studies, applying standardised assessment tools for maternal stress across a range of time points to better understand the significance of stress in ACE-affected mothers over the perinatal period.

Gaps in evidence

Within this scoping review, several gaps have been identified, which may be, in part, a reflection of the speed at which this area of research is advancing. Drawing from the patterns and advances sections of this scoping review, the first identified gap is the need to establish consensus around the associations between maternal childhood adversity and perinatal anxiety and stress. Thus, there is clear consensus in the literature that maternal ACEs are significantly and positively associated with both antenatal and postnatal depressive outcomes (Ångerud et al., 2018; Johnson et al., 2021; Erickson et al., 2022; Johnson et al., 2017; Kim et al., 2019; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016a; Racine et al., 2018a; Racine et al., 2020). However, this review has uncovered conflicting findings regarding the associations that exist in the perinatal period for ACE-affected women and anxiety symptomology (Chang et al., 2021; Erickson et al., 2022; Johnson et al., 2017; Kim et al., 2020a; Letourneau et al., 2019; McDonald et al., 2019; Menke et al., 2019). Similarly, there is a lack of clarity about the role of stress in the perinatal period of ACE-affected women (Chang et al., 2021; Coe et al., 2021; Erickson et al., 2022; Esteves et al., 2020; McDonald et al., 2019; Mersky & Janczewski, 2018a; Williams et al., 2023). This is likely to do with differing interpretations of the concept of stress. As a result, there was significant variability in the tools applied to measure stress symptoms. Eight stress assessment tools were applied out of the 12 studies examining maternal stress in the review. While two studies applied the same stress measure, they used different versions of the tool, namely a 13-domain version versus a four-domain version (Erickson et al., 2022; Kim et al., 2020), limiting the ability to compare stress-related outcomes. Another identified gap was the lack of reporting of stress-related data. Despite 12 studies including measures for stress, as described within the patterns section, stress outcomes were only reported in seven of the studies in the review (Chang et al., 2021; Coe et al., 2021; Erickson et al., 2022; Esteves et al., 2020; McDonald et al., 2019; Mersky & Janczewski, 2018a; Williams et al., 2023) reflecting a lack of recognition of the importance of maternal stress-related outcomes as a primary research measure.

A further gap identified in this review is the need to describe more clearly how maternal childhood adversity is distributed in high-needs, indigenous, and diverse population groups. Of the 27 studies in

the review, 18 were from the US and Canada, with only one study set in the southern hemisphere (Chau et al., 2023). This finding reflects a critical gap in the literature, with limited studies examining the unique experiences of mothers across a range of cultures and localities. With regards to the socio-demographic profiling of women affected by early life adversity, there was again a lack of consensus regarding the risk factors and socio-demographic comorbidities associated with childhood adversity (Brittain et al., 2022; Doi & Fujiwara, 2019; Esteves et al., 2020; Ilter Bahadur et al., 2021; Johnson et al., 2017; LeMasters et al., 2021; Menke et al., 2019).

Evidence for practice

Despite this scoping review providing comprehensive evidence to support ACE-informed clinical practice changes for MCHS, reflecting upon the gap section of this review, it is not surprising that there has been a significant delay in translating ACE research into policy and practice changes in Aotearoa. Without research that examines the significance of ACEs and later mental health outcomes in our uniquely diverse maternal population, it is unlikely that we will see any imminent change. The required data must be presented clearly, and the study instruments applied in the research must be succinct and suitable for a range of diverse population groups. The definitions of the primary study measures, particularly the measure of maternal stress, which varies widely across the literature, need to be clear with screening tools that reflect a specified definition. All relevant generated data must be reported for analysis to provide a macro view of these topics for mothers of Aotearoa for the first time. Comprehensive socio-demographic data also needs to be gathered so that trends for who is most significantly affected by the study outcomes can be observed. High-quality Aotearoa-based data needs to be generated to inform policy and practice changes that can be tailored equitably to the mothers and whānau who require them the most.

Recommendations for research

The process of analysing the scoping review using the PAGER Framework has highlighted the need for new research in this field, particularly in the examination of ACEs and MMH outcomes in indigenous, diverse, and high-risk population groups outside of the US and Canada, where the bulk of the existing knowledge-base has come from. The proposed cross-sectional study has been designed to generate comprehensive socio-demographic data relevant to the maternal population of Aotearoa. Furthermore, the proposed study features a validated, comprehensive, and reliable mental health assessment tool that simultaneously assesses for depression, anxiety, and stress in participants to allow for seamless correlation analysis to better understand any relationships that exist between the study's key variables.

Women who are affected by early life adversity should be more effectively targeted by MCHS for timely assessment of early mental health symptoms that indicate an increased risk of a mental health diagnosis in the perinatal period (World Health Organisation, 2022). ACE-affected mothers can be supported in understanding the risks to their health and well-being that are linked to their history of childhood adversity (Felitti et al., 1998). ACE-affected parents can be supported through psychoeducation, strengths-based approaches, and, as required, clinical interventions to reduce the intergenerational risks for their children through the two-generation approach to addressing ACEs recommended in international best practice guidelines (Gears & Schulman, 2022).

Chapter Summary

This chapter has presented the process and results of a scoping review study that examined the available literature on maternal ACEs and maternal depression, anxiety, and stress in the perinatal period.

The review found that associations between maternal ACEs and perinatal depressive symptoms were significant in almost every study in the review. That is, the higher the ACE score, the higher the incidence of perinatal depression. Associations between maternal ACEs and perinatal anxiety and stress were examined less frequently in the studies of the review, with associations being generally supportive of a positive association, albeit less conclusive for these MMH variables. The studies in the scoping review described ACEs and the negative social determinants of health as highly comorbid. A further population negatively impacted by ACEs in the review were women receiving maternal mental healthcare in the perinatal period. This population was found to have a high ACE prevalence when compared to maternal populations unaffected by mental illness.

Maternal ACEs were generally found to be associated with increased perinatal stress in the studies of the scoping review. However, there were apparent differences in the definitions, and thus, the assessment tools were used to measure symptoms of maternal stress. This made it difficult to compare the studies in the review that had examined maternal stress. A further pattern of interest observed in the review was studies that extended their examination of maternal ACE associations beyond the mother to consider the outcomes of their children. Thus, the children of mothers affected by maternal ACEs appear to have an increased risk of difficulties with their mental health, reduced socio-emotional functioning, and poorer academic achievement. The pathways for how maternal ACE risk is transmitted to their children were examined by some studies in the review, providing evidence for both direct pathways, where maternal ACEs and child outcomes were significantly associated, and indirect pathways, where maternal parenting behaviour, health outcomes, and mental illness were found to be mediators for the intergenerational risk (Racine et al., 2018).

Maternal ACE scores were found to be significantly associated with IPV in the studies of this review. Women experiencing IPV also reported significantly higher symptoms of perinatal mental illness. One protective factor that was described in the literature of the scoping review is social support. Even in maternal populations negatively impacted by ACEs, social support was found to be significantly associated with improved mental health outcomes. Unfortunately, two studies did report that levels of social support were found to be the lowest in populations most significantly impacted by adversity when compared with mothers with ACE scores of zero (Erickson et al., 2019; Ilter Bahadur et al., 2021).

There are several limitations to the current body of ACE research, including consistency in the associations between maternal ACEs and perinatal anxiety and stress. There is also a lack of consistency across which sociodemographic factors are present in ACE-affected mothers. Another limitation is the risk of reporting bias, discussed in two articles that reported low ACE prevalence scores despite high SDH risk factors. The underreporting of ACE and MMH data is a significant consideration for any research engaging with vulnerable population groups. The sensitivity of these themes for many cultural groups cannot be overlooked. It is critical to engage participant groups in research in a way that is culturally responsive to their unique needs to reduce the risk of harm to the participants and increase the accuracy of the study's findings. The proposed research study will endeavour to minimise the limitations identified in the existing evidence.

This scoping review observed clear advances in the ACE literature. For instance, studies assessing ACE prevalence appear to consider increasingly diverse maternal populations. However, the review also highlighted the need for more studies to be conducted outside of the US and Canada, including studies involving diverse and indigenous population groups.

The examination of the associations between adversity in childhood and later MMH outcomes is poorly understood within the context of Aotearoa. This research gap has provided the impetus for a cross-sectional study to generate current data on the significance of these issues within the maternal population of Aotearoa for the first time.

Conclusion

This chapter has mapped the breadth and scope of the available literature examining the topics of maternal ACEs and perinatal mental health outcomes. In the following chapter, I present the methodological approach for this study to address the identified objectives of measuring maternal ACE scores and MMH in the maternal population of Aotearoa for the first time, investigating associations between these variables. The chapter discusses ethical considerations and the methods, including sampling calculations, data collection, validity, and reliability testing. The next chapter also

explains the data analysis plan, outlining the statistical methods and procedures used for the data analysis.

Research Questions

The following research questions were developed for this study and were informed by the findings of the scoping review.

The research questions to be tested in the analysis of the data are:

1. Within the study population, what is the prevalence of depression, anxiety, and stress scored by the Patient Health Questionnaire-2+ (PHQ2+) and the Depression Anxiety and Stress Scale-21 (DASS-21) assessment tools?
2. Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool?
3. Are there any socio-demographic characteristics associated with depression, anxiety, and stress as measured by the DASS-21 tool?
4. Does a higher score on the ACE-10 increase the likelihood of having depression or anxiety as measured by the PHQ2+ questions?
5. Does a higher score on the ACE-10 increase the likelihood of having a higher level of depression, anxiety, and stress as measured by the DASS-21?

Chapter Four: Methods

Introduction

This chapter presents the methodological approach of this study that was developed to address the identified objectives of measuring maternal ACE scores and symptoms of maternal mental illness and investigating associations between these variables. This chapter opens with a discussion of the chosen study design, including a reflection on why this design was selected to answer these specific research questions. The systematic processes of the study's method are described, beginning with the study's measurements. The discussion of the method is supported by evidence of the validity and acceptability of the selected tools. The chapter also presents the data analysis plan, outlining the statistical methods and procedures for the data analysis, ensuring that the research is structured and transparent, strengthening the findings' reliability and credibility. The power analysis is also reported to ensure that the sample size for the present study is sufficient. The recruitment strategies are then described, providing context for the inclusion and exclusion criteria. The chapter concludes by discussing the data collection process.

Design

This examination of associations between maternal ACEs and later maternal mental illness was conducted as an observational study applying a cross-sectional design. This efficient and inexpensive approach will provide the researcher with relevant data to test the overarching research questions developed from the identified gaps and limitations of the scoping review. It is important to note that as the data is collected at a single point in time, conclusions of any causal relationship between the variables of childhood adversity and later maternal mental illness cannot be drawn (Maninder Singh, 2016). Nevertheless, the associations between these two outcomes of interest can be studied by applying cross-sectional data.

Study Population and Sampling Methods

The study population was identified as Aotearoa Mothers in their first postnatal year registered with Whānau Āwhina services. This population represents a convenience sample as the researcher is employed in an environment with access to a national population of mothers in Aotearoa (i.e., Whānau Āwhina). This allows for a greater level of promotion for the study through pre-existing organisational relationships and promotional pathways. Future advantages include existing pathways for distributing the study's findings and the potential clinical application for mothers registered with Whānau Āwhina. The study was conducted in partnership with Whānau Āwhina, the largest national provider of WCTO services in Aotearoa. Whānau Āwhina was referred 80% of new babies born in Aotearoa in 2023; approximately 51,000 new babies and their whānau registered annually (Whānau Āwhina Plunket, 2023c). All Whānau Āwhina centres nationally had the opportunity to recruit

participants for this study using convenience sampling methods. One of the risks of cross-sectional methods is the non-response of participants. The level of non-response when using large-scale survey methods is a common issue requiring various recruitment strategies to promote survey engagement (Levin, 2006). Biased participant engagement is another consideration when conducting cross-sectional methods where participants are more likely to engage in a survey that measures specific characteristics they can relate to (Levin, 2006). Response bias, a theme identified in the scoping review of the literature, presents a further risk, where participants may not disclose the truth in their survey responses based on social acceptance and stigma towards the sensitive themes of the study (Ilter Bahadur et al., 2021; Levin, 2006). The present study sought to minimise this type of response bias by recruiting a Cultural Advisory Group for the planning and cultural guidance around conducting such a study. Efforts were made to assure participants that their responses were completely anonymous and that there was no way to link their answers to them personally. The collected data was analysed on a group level, and no individual responses were studied.

Ethics

The guiding ethical principles for this research study were non-maleficence, meaning research that is non-harming or inflicting the least possible harm to reach a beneficial outcome, and manaakitanga, which refers to the researcher's cultural and social responsibility where the rights and well-being of research participants are safeguarded (Health Research Council New Zealand, 2010). Early in the planning stages of this study, recognising the need to respectfully engage a range of maternal population groups in Aotearoa, a Cultural Advisory Group was established. This was an essential step for the research process as the scoping review identified apparent gaps in investigating ACEs and MMH outcomes within Indigenous population groups. As described in the Background section, Māori, Pacific, and Asian mothers are significantly overrepresented in the mental health data of Aotearoa (Abbott & Williams, 2006; Black et al., 2017; Health Promotion Agency, 2016). Therefore, it was a priority to have cultural representation for each ethnic group to offer cultural guidance and specialist knowledge for the duration of the study. The group was recruited from the Whānau Āwhina Advisory group; the National Māori, Pacific, and Asian advisors who hold the respective cultural portfolios as organisation leaders were recruited for ongoing consultation and support.

The primary ethical risks identified for this study were focused on the rights of participants. The Cultural Advisory Group and the ethical review process guided this plan. Firstly, it was decided that no identifiable information about participants would be collected within the survey. This supported the ethical principle of non-maleficence, where the risks associated with the identifiability of the data were considered to outweigh the benefits of collecting this information. Secondly, the provision of high-quality support available to survey participants was prioritised. This was achieved by providing an 'available supports' page where participants were directed once completing the survey. On this

page, participants were encouraged to contact their regular Whānau Āwhina nurse to utilise Plunketline, which is a 24-hour-a-day nurse-led telehealth service, or access one of three free counselling sessions through Auckland University of Technology counselling services should they feel they required additional support. The National Mental Healthline contact number was also provided. This outcome reflected the ethical principle of manaakitanga as it recognises the reciprocity required from the researcher to participants who have willingly shared their health information to have the option to receive timely support as desired.

This study received ethical approval from both the Auckland University of Technology Ethics Committee (21/149) (Appendix D) and the Whānau Āwhina Research and Evaluation Process (12/08/21).

Inclusion Criteria

The inclusion criteria for participants of this study were as follows: Whānau Āwhina registered mothers over 18 years of age who have an infant less than 12 months of age and are, thus, in their first postnatal year. The infant did not have to be the first child in the family. The survey was designed to automatically exclude mothers under 18 and infants over 13 months of age. This is due to the ACE-10 assessment tool being validated to assess adversity across the first 18 years of life (Felitti et al., 1998). Including mothers younger than 18 years could, therefore, potentially underrepresent the ACE data sourced for this study population. It would also limit the comparability of the study's findings to the international studies that have measured adversity in adult populations over the age of 18 years only. The participants were required to read and type survey responses in English and have access to an internet-capable device to participate in the online survey.

Statistical Power Analysis

Adequate participant numbers were essential for the proposed study as small sample numbers would undermine the internal and external validity of the study's findings, increasing the likelihood of type II statistical error (Kang, 2021). A statistical power analysis was conducted using G*Power software (version 3.1.9.7; Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) to estimate the number of participants required for recruitment in the cross-sectional study. This analysis was used to determine the a priori sample size for the logistic regression, which aimed to test the relationship between ACEs and levels of depression, anxiety, and stress. The researcher set an alpha level of 0.05 and a desired power of 80% for the analysis. The effect size (odds ratio) used in the power calculation was based on a conservative analysis setting with the probability of H1 at 0.5 and H0 at 0.3, yielding an effect size of 2.3. The calculated priori sample size was 312 participants for the cross-sectional study to ensure sufficient statistical power to detect meaningful effects in this study.

Data Collection Procedure

The methods for data collection were explored with the study's Cultural Advisory group. These meetings informed cultural appropriateness of the promotional posters and stickers design, the script for the researcher's promotional videos for potential participants and frontline staff, and later, the online channels for study promotion most likely to result in a culturally diverse study population. The recruitment strategy for this study followed two promotional pathways. The initial path was to motivate Whānau Āwhina frontline staff nationwide to distribute advertising posters and promotional stickers with quick response (QR) codes to direct potential participants to the study's web-hosted participant information section, followed by the survey platform. Following consultation with Whānau Āwhina Regional Operations Managers, an email describing the study's objectives and the role of frontline staff in participant recruitment was emailed to the National Clinical Leaders Group for distribution to their clinical teams. The email for frontline staff included a promotional video of the researcher providing examples of conversation starters to use with potential participants and details of the supports made available for participants who choose to engage. Over this time, the researcher promoted the study with multiple regional clinical teams of Whānau Āwhina via online team meetings. Unfortunately, the timing of the approval of the Whānau Āwhina ethical review process coincided with the second national lockdown for managing the COVID-19 outbreak in Aotearoa. All face-to-face contact was suspended for Whānau Āwhina services, and the number of mothers recruited for the study was halted. In response, the researcher was required to develop a second recruitment strategy that did not require face-to-face contact.

The second recruitment strategy involved using the Whānau Āwhina Facebook page to recruit eligible participants directly engaging with that platform. With the support of the Cultural Advisors, the researcher delivered a 'Facebook chat' on MMH and well-being, which concluded with an online survey link for eligible mothers to participate in the study. In the following months, a series of promotional communications for the study were shared on the Whānau Āwhina Facebook page using the study's promotional posters and QR codes for direct access. Public Facebook and Instagram pages were then developed for the study to investigate social media platforms that would allow for a more targeted recruitment drive, engaging with existing online groups already reaching high numbers of mothers in Aotearoa. Online recruitment through social media proved to be the most successful method of participant recruitment for this study.

In September 2021, following the lifting of the national COVID restrictions, Whānau Āwhina regional centres returned to face-to-face contact with whānau, and the promotion of Whānau Āwhina frontline staff to actively recruit participants recommenced (New Zealand Government, 2021). The study was advertised in the Whānau Āwhina national newsletter, Pānui, and the national Whānau

Āwhina staff email news threads. A second all-staff email was sent, providing an update on participant numbers and encouraging Whānau Āwhina staff to continue to promote the study. In August 2022, it was apparent that the recruitment strategies had become exhausted. Very few new participants engaged in the online survey in the weeks leading up to August despite ongoing promotional methods. On the 21st of August 2022, access to the online survey was closed.

The online survey was hosted on Redcap, a secure platform where researchers can develop and host surveys and manage survey data. The Redcap platform was selected as it is mobile-capable, allowing access for participants across diverse geographic locations in Aotearoa. Redcap also offers the convenience of automated data collection, reducing the risk of transcription errors (Harris, 2019). Once prospective participants scanned the QR code used in the study's advertising material or clicked on the live links used in the social media posts, they were directed to the participant information section of the Redcap platform. This section included a video from the researcher describing the study's objectives, followed by a participant information sheet. Participants were then given the option to engage in the research and were automatically directed to the survey tool when they clicked on the option that they consented to participate. The online survey tool comprises three parts, which are described in the following section.

Measurements

This study measured childhood adversity using the Adverse Childhood Experiences-10 tool, which includes five categories of abuse and neglect and five categories of household dysfunction experienced in the first 18 years of life. Symptoms of mental illness were measured using the Patient Health Questionnaire (PHQ2+) postnatal depression and anxiety screening tool, as well as the more extensive Depression, Anxiety, and Stress Scale-21 (DASS-21), which includes seven scaled questions assessing for symptoms of depression, anxiety, and stress.

Socio-demographics

Part one of the survey comprised a collection of socio-demographic questions developed using the NZ socio-demographic protocol (Health Information Standards Organisation, 2017). This protocol was used to ensure the standardisation of the study's socio-demographic data and allow for comparing the study's findings with other Aotearoa data sets. The socio-demographic variables that followed the NZ socio-demographic protocol included ethnicity, age, relationship status, who was present in the childhood home, access to local shops/supermarkets/libraries, secondary school qualifications, post-secondary school qualifications, and total household income. Additional population-specific data of interest was collected, including the age of the youngest child in months and the number of children the mother had given birth to at the time of the survey. This additional data was collected to allow for

a more targeted analysis. The first ten socio-demographic questions were designed to gather participant data to analyse the similarities and differences between participant demographic groups. The index study focused on the postnatal period, the time following the birth of an infant and through its first postnatal year (New Zealand Guidelines Group, 2008). This time frame was selected as it reflects the engagement of mothers with the Whānau Āwhina service, and it aligns with international literature that has examined maternal ACEs in the postnatal period, allowing for the comparability of the study's findings (Coe et al., 2021).

The Adverse Childhood Experiences- ACE-10 Assessment Tool

The predictor variable of the index study is childhood adversity. Although a range of tools are available to measure childhood adversity, the Adverse Childhood Experiences-10 (ACE-10) tool was selected as the most suitable tool for this study for multiple reasons. Firstly, it is a comprehensive tool to measure adversity that has been widely validated in international studies (Kazeem, 2015; Kovács-Tóth et al., 2023; Téllez et al., 2023; Wingenfeld et al., 2011). Secondly, several studies examining the application of the ACE-10 tool within clinical settings have reported high levels of acceptability within consumer groups despite the sensitivity of the questions that are included in the ACE-10 tool (Gillespie & Folger, 2017; Glowa et al., 2016; Johnson et al., 2017; Selvaraj et al., 2019; Watson, 2019). Finally, the ACE-10 has been applied in previous Aotearoa-based studies (Reuben et al., 2016; Walsh et al., 2019a), most recently, the Growing Up in New Zealand longitudinal cohort study (Walsh et al., 2019a). Results of this study showed that 52.8% of their sample of over 5,000 children in Aotearoa reported an ACE score of one or more by four and a half years of age (Walsh et al., 2019a). The limitations of this study have raised questions for the index study to examine. Firstly, the GUiNZ study was required to apply a reduced ACE measure, only including nine out of the ten measures of childhood adversity, as sexual abuse data was not included in the original data collection. Secondly, the ACE-10 tool, originally designed to measure adversity across the first 18 years of life, was applied to the four-and-a-half-year-old cohort of the GUiNZ study. This has resulted in a limited ability to compare the GUiNZ study findings with ACE prevalence studies of adult populations internationally (Walsh et al., 2019a). Both limitations will be addressed in the index study.

Part two of the survey presents the ACE-10 assessment tool comprising ten dichotomous items: The first five assess for abuse, and the second five assess for household dysfunction (Felitti et al., 1998). The ACE-10 assessment tool measures childhood adversity by asking the following questions:
While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household often swear at you, insult you, put you down, or humiliate you? Or act in a way that made you afraid that you might be physically hurt?
2. Did a parent or other adult in the household often push, grab, slap, or throw something at you? Or ever hit you so hard that you had marks or were injured?

3. Did an adult or person at least five years older than you ever touch or fondle you or have you touch their body in a sexual way? Or try to or actually have oral, anal, or vaginal sex with you?
4. Did you often feel that no one in your family loved you or thought you were important or special? Or Your family didn't look out for each other, feel close to each other, or support each other?
5. Did you often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
6. Were your parents ever separated or divorced?
7. Was your mother or stepmother: Often pushed, grabbed, slapped, or had something thrown at her? Or sometimes or often kicked, bitten, hit with a fist, or hit with something hard? Or ever repeatedly hit over at least a few minutes or Threatened with a gun or knife?
8. Did you live with anyone who was a problem drinker or alcoholic or Who used street drugs?
9. Was a household member depressed or mentally ill, or did a household member attempt suicide?
10. Did a household member go to prison? (Felitti et al., 1998).

Participants score one ACE point for each affirmative response to the ACE-10 questions. The total ACE score is the summed ACE points ranging from 0-10 (Felitti et al., 1998).

Patient Health Questionnaire- PHQ2+ Tool

Part three of the survey assesses for symptoms of mental illness by applying two mental health assessment tools. The PHQ2 screening tool assesses for symptoms of postnatal depression by asking the following two questions; “During the past month, have you often been bothered by feeling down, depressed or hopeless? During the past month, have you often been bothered by little interest or pleasure in doing things?” (New Zealand Guidelines Group, 2008, p. 58). The PHQ2 is prescribed in the Well Child Tamariki Ora Schedule (2013) as a postnatal depression screening tool to be used by Whānau Āwhina nurses at the first and third contacts with all mothers engaging with the service. Any affirmative response results in a third question where mothers are asked if they would like help with their concerns (New Zealand Guidelines Group, 2008). The PHQ2 tool (omitting the third question) was included within the proposed study to allow for the direct comparison of the study’s mental health data against the PHQ2 data collected by Whānau Āwhina Plunket services. The PHQ2+ version of the tool adds a third screening question assessing anxiety symptoms: “During the last month, have you been worrying a lot about everyday problems?” (New Zealand Guidelines Group, 2008, p.58). This extended tool version was selected to provide additional anxiety data not assessed for in the PHQ2 version. Although in some studies, the PHQ tool is scored by summing the affirmative

responses, resulting in a total score, for this study, I decided to align the scoring method to how the New Zealand Guideline's Group directs it for clinical practice. A positive response to questions one or two results in a positive screen for symptoms of postnatal depression. A positive response to question three results in a positive screen for symptoms of postnatal anxiety (New Zealand Guidelines Group, 2008). Including the PHQ2+ tool in the data collection allows the study data to be directly comparable to current and future WCTO PHQ data sets for PND in Aotearoa mothers.

Depression, Anxiety, and Stress Scale- DASS-21 Tool

The DASS-21 is a validated assessment tool for the self-reported, negative emotional states of depression, anxiety, and stress postnatally (Miller et al., 2006). The DASS-21 tool comprises three sub-scales of seven items, 21 items in total (Lovibond, 1995). The subscale examining depression assesses symptoms of dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia.

The seven items assessing depression are:

I couldn't seem to experience any positive feelings at all (Q. 3)

I found it difficult to work up the initiative to do things (Q. 5)

I felt that I had nothing to look forward to (Q. 10)

I felt down-hearted and blue (Q. 13)

I was unable to become enthusiastic about anything (Q. 16)

I felt I wasn't worth much as a person (Q. 17)

I felt that life was meaningless (Q. 21).

The scale examining anxiety assesses for autonomic arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect.

The seven items for anxiety are:

I was aware of dryness of my mouth (Q. 2)

I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion) (Q. 4)

I experienced trembling (e.g. in the hands) (Q. 7)

I was worried about situations in which I might panic and make a fool of myself (Q. 9)

I felt I was close to panic (Q. 15)

I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat) (Q. 19)

I felt scared without any good reason (Q. 20).

The scale that examines stress assesses for levels of chronic nonspecific arousal. It includes measures for difficulty in relaxing, nervous arousal and being easily upset /agitated, irritable /over-reactive, and impatient. The seven items for stress are:
I found it hard to wind down (Q. 1)
I tended to over-react to situations (Q. 6)
I felt that I was using a lot of nervous energy (Q. 8)
I found myself getting agitated (Q. 11)
I found it difficult to relax (Q. 12)
I was intolerant of anything that kept me from getting on with what I was doing (Q. 14)
I felt that I was rather touchy (Q. 18) (Lovibond, 1995).

The answering format for each item of the three DASS subscales is a four-point scale ranging from 0 (Did not apply to me at all) to 3 (Applied to me very much or most of the time). The scores for depression, anxiety and stress are calculated by summing the item scores for each scale (Lovibond, 1995). The scores of each scale are then multiplied by two and measured against the scoring cut-offs for the tool's severity labels, one level for each scale. The labels (i.e., category levels) include normal, mild, moderate, severe, and extremely severe for depression, anxiety, and stress; see the scoring table in Table 3 below (Lovibond, 1995).

Table 3 ***Scoring Criteria for the Three Subscales of the DASS-21 cited in (Lovibond, 1995, p. section two).***

	Depression	Anxiety	Stress
Normal	0-9	0-7	0-14
Mild	10-13	8-9	15-18
Moderate	14-20	10-14	19-25
Severe	21-27	15-19	26-33
Extremely Severe	28+	20+	34+

Data Preparation and Cleaning

The study's data was exported via a CSV file from the Redcap database to the IBM Statistical Package for the Social Sciences software (SPSS) (IBM Corporation, 2021). The process of data preparation and cleaning was undertaken before any analysis commenced. This included reviewing the data set for any unusual outliers or unexpected patterns. Missing data were noted and managed according to the statistical plan. Most statistical tests in SPSS require the data to be presented numerically. Therefore, the string variable data were transformed into numerical data using the

automatic recode functions of SPSS. The data were then recoded, and numerical codes were assigned for each data category. Each code was then re-labelled to reduce confusion during the analysis process. The data was then formatted with the string variable, and the corresponding numerical data was arranged side by side to complete the compilation of the current data set.

Statistical Methods

Descriptive Statistics

Descriptive analysis was selected as an approach to provide a valuable starting point for the data analysis, where the basic features of the data were organised, simplified, and summarised (Jones, 2021). The completion statistics for the online survey were provided. The socio-demographic data were then reported, describing the characteristics of the study's participants represented using frequencies and percentages for each socio-demographic variable.

Measurements Descriptives

This section describes the descriptive analysis plan for the study's measures, including the ACE-10 assessment tool, the PHQ2+ tool, and the DASS-21 scale. These descriptives were used to explore the first research question: Within the study population, what is the prevalence of depression, anxiety, and stress scored by the Patient Health Questionnaire-2+ (PHQ2+) and the Depression Anxiety and Stress Scale-21 (DASS-21) assessment tools?

The plan reflected the online survey format in the above order. The frequencies and percentages data would represent all the participants who completed the survey up to the dependent variable section. The frequencies were presented for the ACE -10 tool to report the number of participants in the low-risk group (ACE score of 1-3) and the high-risk group (ACE score of 4-10). For the PHQ2+ tool, the frequencies and percentages for how many participants reported 'yes' or 'no' for each of the three questions were presented. Then, the summary statistics of the DASS-21 were reported, including the mean, median, standard deviation, minimum, maximum, skewness, and kurtosis. The frequency data from the DASS-21 were also presented to describe the number of participants represented for each level of the tool: Normal, mild, moderate, severe, and extremely severe for each of the depression, anxiety, and stress subscales.

Internal Consistency of the Outcome Variable

The reliability of the DASS-21 subscales of depression, anxiety, and stress were assessed for internal consistency. Internal consistency measures the degree to which each of the seven items in each subscale relates to the underlying concepts of depression, anxiety, and stress. The internal consistency

for each subscale was determined using the Cronbach's alpha.. The results were used to determine the average correlation between each of the seven items that make up each subscale, ranging from 0-1, with higher values reflecting the higher reliability of each subscale (Pallant, 2010).

Inferential Statistics

The primary objective of applying inferential statistics was to test the study's identified research questions, consider the variability of the population's data, and make generalisations for a wider population group (Tabachnick, 2013). According to Dancey and Reidy (2007), the strength of the tested associations can be described as a perfect correlation (+1 or -1), a strong correlation (+.9 - +.7) or (-.9- -.7), a moderate correlation (+.6 - +.4) or (-.6- -.4), a weak correlation (+.3- +.1) or (-.3- -.1), and zero, or no correlation (0).

Inter-correlations

Inter-correlations were tested to analyse the data further and explore the associations between the measures in the study. Specifically, inter-correlations were tested to explore the second and third research questions: Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool? And, are there any socio-demographic characteristics associated with depression, anxiety and stress as measured by the DASS-21 tool?

The socio-demographic data were correlated against the study's variables of interest using Spearman's rank-order correlation coefficient (Spearman's r). Spearman's r has been selected for the analysis as the relevant data were categorical and ordinal; in particular, the values of the outcome variable (i.e., DASS-21) were categorised into ordinal levels, making Spearman's rank correlation test the most appropriate for this analysis (Pallant, 2010). The socio-demographic variables that were used to test for any significant correlations between the ACE-10, the PHQ2+ questions, and the three subscales of the DASS-21 were maternal age, number of children given birth to, age of the youngest child in months, access to supermarkets, shops, libraries, highest secondary school qualification, highest post-secondary school qualification, and total household income. The data from these socio-demographic variables were either binomial or ordinal. The multinomial variables of ethnicity, relationship status, and childhood home living arrangement were not included in the inter-correlations. Spearman's r requires the data to be presented ordinally or as binomial variables. Pearson's Chi-square test of association was calculated to determine any associations between these sociodemographic variables and the principal variables of the study.

Missing values were managed by excluding cases pairwise, meaning that for each pair of variables for which the data was available, the correlation coefficient took that data into account. Pairwise deletion maximises all data available on an analysis-by-analysis basis, thereby increasing the power of the available data (Pallant, 2010).

Pearson's Chi-Square Test of Association

Chi-square association tests were used to explore the relationship between the multinomial/categorical variables of ethnicity, relationship status, childhood home living arrangement, the ACE categories (i.e. Low vs. High) and the DASS-21 levels (normal-extremely severe). This test provided additional socio-demographic data to answer research Question 2: Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool? Any violations of the assumptions of the Chi-Square tests resulted in alternative statistical testing.

It is essential to analyse ethnicity data in childhood adversity and maternal mental illness outcomes in Aotearoa as previous national studies have reflected an inequity of MMH outcomes when analysed by ethnicity, with Māori, Pacific, and Asian mothers reporting higher rates of maternal mental illness when compared to NZE mothers (Abbott & Williams, 2006; Health Promotion Agency, 2016; Ministry of Health, 2021; New Zealand Guidelines Group, 2008). The inclusion of ethnicity, relationship status, and childhood home living arrangement in the analysis was undertaken to provide meaningful insights into how childhood adversity and maternal mental illnesses are distributed across the diverse maternal population of Aotearoa, providing valuable insights for clinical practice for organisations that work with these population groups.

Logistic Regression

Ordinal logistic regression analysis was conducted to test the fourth and the fifth research questions: Does a higher score on the ACE-10 increase the likelihood of having depression or anxiety as measured by the PHQ2+ questions? And, Does a higher score on the ACE-10 increase the likelihood of having a higher level of depression, anxiety, and stress as measured by the DASS-21?

To test the likelihood of having depression or anxiety, as measured by the PHQ2+, a binary logistic regression was conducted (as these measures are binomial), and to test the likelihood of having depression, anxiety, or stress, as measured by the DASS-21, an ordinal logistic regression was conducted (as these three scales were categorised in ordinal levels). Ordinal logistic regression is a statistical analysis method used to model the relationships between one or more independent variables

and categorical dependent variables (Pallant, 2010). This analysis reported on the likelihood of the independent variable (ACE score) affecting the odds of moving from one category of the dependent variable to a higher or lower category. Two models were tested in each analysis. In the first model, only one independent or predictor variable (the ACE score) was entered, and in the second model, possible covariates were added as predictors. The covariate variables that were entered into the model were determined by studying the results of the inter-correlations. If any socio-demographic variables significantly correlated with the PHQ2+ questions or the three subscales of the DASS-21, they were entered as covariates. Covariates helped control the influence of other study variables. Omitting the inclusion of covariates can lead to omitted variable bias where the relationship between the study variables is less precise, and therefore, conclusions drawn from the study's findings are less accurate (Zonneveld et al., 2020).

Chapter Summary

This chapter outlined the study's methodology, which applies a cross-sectional design to explore the relationship between maternal adverse childhood experiences (ACEs) and maternal mental health (MMH) in Aotearoa. The sample included mothers in their first postnatal year registered with Whānau Āwhina Plunket. The recruitment challenges were described and included non-response and COVID-19. Recruitment strategies responded to the challenges and evolved into in-person and online strategies. The ethical approval process was described, as well as the cultural considerations for Māori, Pacific, and Asian mothers engaging with the research. The formation of a Cultural Advisory Group was prioritised for this study, promoting sensitivity to Māori, Pacific, and Asian participants. Data was collected via an online survey, which included socio-demographic questions, the ACE-10 assessment tool, and postnatal mental health assessment tools (PHQ2+ and DASS-21).

This chapter also detailed the data preparation, cleaning, and statistical methods used for this study. Data from Redcap was exported to SPSS, cleaned, transformed, and re-coded for analysis. Descriptive statistics were used to summarise the socio-demographic characteristics of the sample and the measurements, including the ACE-10, PHQ2+, and DASS-21 tools. Internal consistency of the DASS-21 subscales was evaluated using Cronbach's alpha. Inferential statistics tested associations between socio-demographic variables and ACE scores, depression, anxiety, and stress using Spearman's correlation and Pearson's Chi-square tests. Logistic regression was employed to assess the likelihood of ACE scores influencing mental health outcomes, while controlling for significant covariates.

Conclusion

This chapter presents the methodology selected to examine maternal ACEs and MMH symptoms in the postnatal period. The recruitment plan and challenges were described along with the plan for the

data analysis. The following chapter will present the research analysis results, thus answering the research questions.

Chapter Five: Results

Introduction

Chapter Four established a research methodology for investigating the adverse childhood experience (ACE) scores and mental health symptoms of Aotearoa mothers engaging with Whānau Āwhina services. The research questions were developed from the results of the scoping review. They were designed to generate data to describe how childhood adversity is distributed across maternal population groups in Aotearoa and further identify whether associations exist between maternal ACE scores and symptoms of mental illness in the postnatal period, as assessed by the Patient Health Questionnaire 2+ (PHQ2+) and the Depression, Anxiety, and Stress scale (DASS-21). This chapter presents the findings of the data analysis that aim to answer the present study's research questions. The presentation of the findings commences with the collated survey results, beginning with a summary of the descriptive statistics that reflect the study's population's socio-demographic characteristics. Data from the three principal measures are then described by reporting the descriptive results for each measure, including the internal reliability of the three subscales of the DASS-21. As part of the inferential statistics, the following results include Spearman's rank-order correlation coefficient and Pearson's Chi-square tests of independence that tested for possible associations between the socio-demographic characteristics and the ACE-10, PHQ2+, and DASS-21. Finally, the ordinal and binary logistic regression analysis results are reported. These results describe the associations between childhood adversity and symptoms of mental illness in the postnatal period, as measured by the ACE-10, PHQ2+, and DASS-21.

The online survey hosted on Redcap was available for participation between 10 August 2021 and 21 August 2022. Once the survey was closed, the data was exported from Redcap as a CSV file and imported into the IBM Statistical Package for the Social Sciences Software (SPSS) (IBM Corporation, 2021). The first four files in the data set were void of any data. This was deemed to be a result of the researcher's attempts to determine whether the survey link was performing correctly; therefore, these four files were excluded from the analysis.

Results of descriptive analysis

Socio-demographics

A total of 511 participants commenced the survey, and 429 participants completed the outcome variables, leading to a completion rate of 84%. The 429 participants who completed the principal variable (DASS-21 tool) were included in the follow-up analysis.

The following table presents the frequencies and percentages for each of the survey's socio-demographic questions, including the missing data, and the total percent for the New Zealand Maternal population.

Table Four: ***Sociodemographic characteristics of the study sample compared with the NZ maternal population.***

Ethnicity	Count	Percentage	NZ maternal population (%)
NZ European	364	77.6	44
Māori	40	8.5	26
Pacific	5	1.1	11.2
Asian	35	7.5	16
Middle Eastern, Latin American, African	5	1.1	2.8
Other	20	4.7	*NA*
Missing	1	0.2	0
Total	469	100	100

Note: Participants were able to select multiple ethnicities.
0.2% (*n* = 1) did not select any ethnicity (*n* = 46), 90.7% selected one ethnicity (*n* = 389), 8.6% selected two ethnic groups (*n* = 37), and 0.5% selected three ethnic groups (*n* = 2).

Maternal Age	Count	Percentage	NZ maternal population (%)
< 18	0	0	3.2
18 to 25	31	7.2	20
26 to 29	109	25.4	23.9
30 to 34	187	43.6	33.4
35 to 39	77	17.9	17.3
40 to 44	24	5.6	2.2
45 and older	1	0.2	*NA*
Missing	0	0	0
Total	429	100	100

Note: Participants who were selected <18 years old were automatically excluded from completing the survey.

Relationship Status	Count	Percentage	NZ maternal population (%)
Married/civil union	356	83	54
Separated	5	1.2	*

Divorced or dissolved	2	0.5	*
Widowed or surviving civil union partner	0	0	*
Never married and never in a civil union	44	10.3	*
Not elsewhere included	22	5.1	*
Missing	0	0	0
Total	429	100	100

Note- 46% 'not married or in a civil union' but not further specified.

**The 'single parents' comprised 46% and were not further categorised as separated or divorced (StatsNZ, 2018).*

Number of Children Given Birth to	Count	Percentage	NZ maternal population (%)
None	4	0.9	*NA*
One	236	55	44
Two	132	30.8	40
Three	45	10.5	12
Four	10	2.3	4
Missing	2	0.5	0
Total	429	100	100

Note: Four participants in the study population reported that they had not given birth to their children; this number may be attributed to adoption or surrogacy. As this research is focused on maternal early life adversity and later MMH outcomes and is not focused on the biological or genetic aspects of ACE transmission between generations, the data of the four identified mothers was included in the analysis of this study.

Age of Youngest Child	Count	Percentage	NZ maternal population (%)
Less than one month	30	7	*NA*
Two months	66	15.4	*NA*
Three months	52	12.1	*NA*
Four months	41	9.6	*NA*
Five months	43	10	*NA*
Six months	34	7.9	*NA*
Seven months	34	7.9	*NA*
Eight months	33	7.7	*NA*
Nine months	24	5.6	*NA*
Ten months	27	6.3	*NA*
Eleven months	41	9.6	*NA*
Twelve months	4	0.9	*NA*
Missing	0	0	

Total	429	100

Note: Participants with children older than 12 months (13 months +) were excluded from completing the survey.

Maternal Childhood Home Living Arrangement	Count	Percentage	NZ maternal population (%)
Both biological/adoptive parents in the household	324	75.5	*NA*
Only biological mother ever in the household (father never present)	40	9.3	*NA*
Biological/adoptive parents divorced or not living together	60	14	*NA*
Raised by relatives, by foster parents, or in an institution	5	1.2	*NA*
Missing	0	0	
Total	429	100	

Current Access to Facilities	Count	Percentage	Total NZ population (%)
High urban accessibility	339	79	51.2
Medium urban accessibility	58	13.5	14.1
Low urban accessibility	23	5.4	8.4
Remote	5	1.2	10
Very remote	1	0.2	16.3
Missing	3	0.7	0
Total	429	100	100

Educational Attainment	Count	Percentage	Total NZ female population (%)
None	15	3.5	25.3
NZ Certificate in one or more subjects or National Certificate level one or NCEA level 1	25	5.8	16.7
NZ Sixth Form Certificate in one or more subjects or National Certificate level 2 or NZ UE before 1986 in one or more subjects for NCEA level 2	71	16.6	17.4
NZ Higher School Certificate or NZ University Bursary/Scholarship or National Certificate level 3 or NCEA level 3 or NZ Scholarship	247	57.6	22.9

Other secondary school qualifications gained in NZ	13	3	*NA*
Other secondary school qualifications gained overseas	58	13.5	17.6
Missing	0	0	0
Total	429	100	100

Apart from secondary school qualifications, do you have another completed qualification?	Count	Percentage	NZ maternal population (%)
Yes	359	83.7	49
No	70	16.3	51
Missing	0	0	0
Total	429	100	100

Highest Completed Qualification	Count	Percentage	NZ maternal population (%)
Level one certificate (e.g., Introduction level certificate)	5	1.2	11.2%
Level two certificate (e.g., Foundation skills certificate)	7	1.6	9.9%
Level three certificate (e.g., Pre-trade certificate)	13	3	11.3%
Level four certificate (e.g., Trade certificate)	19	4.4	8.8%
Level five Diploma (e.g., Advanced trade certificate)	14	3.3	4.9%
Level six Diploma (e.g., National Certificate/Diploma)	21	4.9	5%
Bachelor's degree or level seven qualification	129	30.1	14.6%
Bachelor Hons or Postgraduate Certificate/Diploma	84	19.6	5.7%
Master's Degree	37	8.6	3.7%
PhD	16	3.7	0.84%
Other Qualification	12	2.8	5.9%
Missing	72	16.8	18.16
Total	429	100	100
Total Household Income	Count	Percentage	Total NZ population (NZ)

Loss	0	0	NA
No income	5	1.2	NA
$1-$5,000	2	0.5	NA
$5,001-$10,000	3	0.7	19.92*
$10,001-$15,000	2	0.5	
$15,001-$20,000	0	0	8.69
$20,001-$25,000	2	0.4	
$25,001-$30,000	0	0	7.25
$30,001- $35,000	1	0.2	
$35,001-$40,000	6	1.4	7.10
$40,001-$50,000	12	2.8	
$50,001-$60,000	26	6.1	10.45
$60,001-$70,000	30	7	9.72
$70,001-$100,000	77	17.9	18.8
$100,001-$150,000	140	32.6	10.53
$150,000+	103	24	5.08
Don't know	11	2.6	0
Refuse to answer	9	2.1	0
Missing	0	0	0
Total	429	100	100

**Note—The NZ national data recorded no income—$10,000* as one category, not further defined. National income data was reported in categories of 10,000, not 5,000, up to 40,000, as recorded in the index study (Stats NZ, 2018).

As reported in Table 4, the study sample was made up of predominantly NZ European mothers (77.6%), followed by Māori (8.5%) and Asian mothers (7.5%). The maternal age bracket most frequently reported was 30-34 years (43.6%), which aligns with Aotearoa maternal age birth data (Stats NZ, 2018b). Regarding relationship status, 83% of respondents reported being married or in a civil union relationship, with 12% reporting being separated, divorced/dissolved, or never married or in a civil union. The most common number of children that mothers had given birth to was one (55%), and the most frequently reported ages of their youngest child were two (15.4%) and three months (12.1%). Most respondents grew up in their family home with both parents present (75.5%), and 98% of participants reported living in urban areas, which is higher when compared to national data, which is 84% (Te Whatu Ora, 2023c).

The secondary school qualifications attained by this population were lower overall when compared nationally, despite only 3.5% of respondents reporting no secondary school qualifications and over

half (57.6%) achieving either a NZ Higher School Certificate, a NZ University Bursary/Scholarship, a National Certificate level 3, a NCEA level 3, or a NZ Scholarship. However, the study sample achieved a high level of qualification post-secondary school, with 30.1% reporting a bachelor's degree or Level 7 certificate as their highest educational attainment (n = 129), which was achieved by only 14.6% of the general population of Aotearoa. A Bachelor Honors or Postgraduate Certificate/Diploma was achieved by 19.6% (n = 84) of the study population compared with 5.7% nationally. A Master's degree was attained by 8.6% of the study population (n = 37) compared with 3.7% nationally. Finally, the highest qualification measured, the PhD, was achieved by 3.9% of the study population compared with 0.84% of all Aotearoa nationally (New Zealand Qualifications Authority, 2022). The total household income reported by the participants in our study was low compared to national household projections in Aotearoa. The median income bracket for this sample was $70,001- 80,000 NZD. Over half of the participants reported an average household income of over $100,000 annually at 56.6% (n = 243). The average annual household income in Aotearoa is $110,451. The lower income reported by the participants is likely attributed to many participants being on maternity leave, reducing their total household income across the first postnatal year (Ministry of Business Innovation and Employment, 2023).

When studying the overall distribution of the sample, it can be concluded that there is an overrepresentation of participants who identified as NZE, were married or in a civil union relationship, lived in urban areas and achieved high post-secondary school qualifications. There is an under-representation of Māori and Pacific participants, single parents, those who live rurally, and those with lower academic achievement compared to the total population of mothers in Aotearoa (Stats NZ, 2018b).

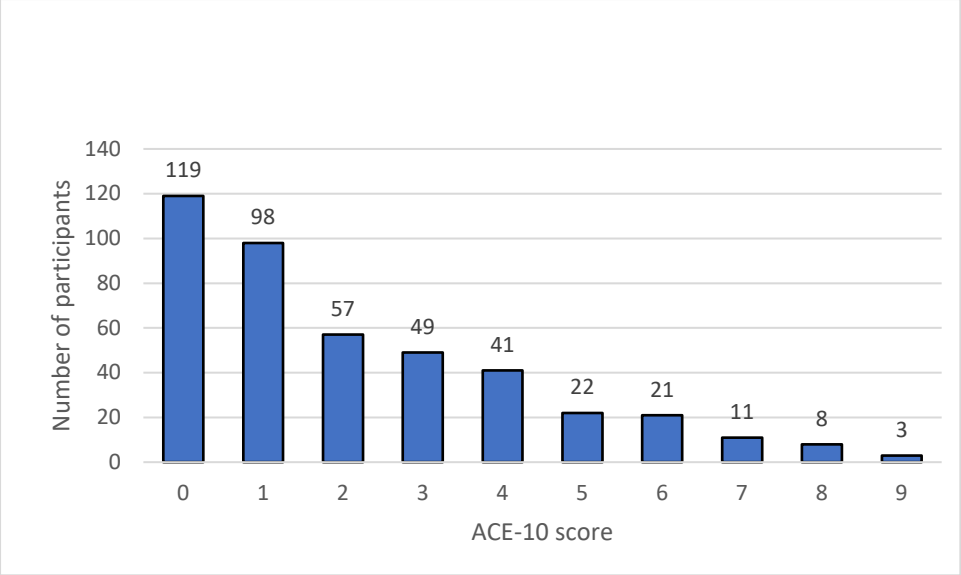
Results for Research Questions One and Two

What is the prevalence of depression, anxiety, and stress scored by the Patient Health Questionnaire-2+ (PHQ2+) and the Depression Anxiety and Stress Scale-21 (DASS-21) assessment tools? And, Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool?

Adverse Childhood Experiences-10

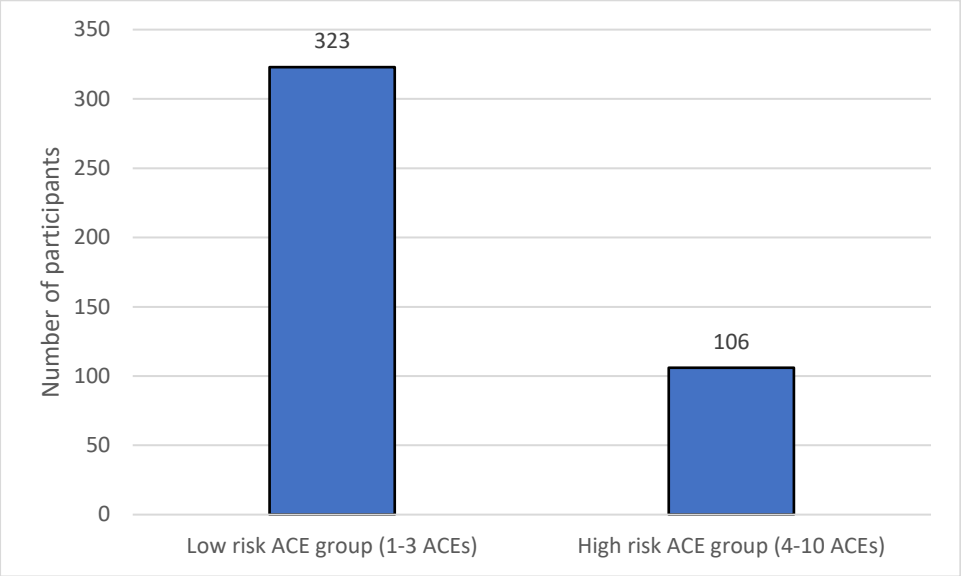
As illustrated in Figure 2 (see section below), the ACE scores of participants ranged from zero (n = 119) to nine (n = 3) out of a possible score of 10. In this study, 72.3% reported a positive ACE score (1-9) with a mean ACE score of 2.16.

Figure 2 ***Total Adverse Childhood Experiences Scores (n = 429)***



As demonstrated within several ACE studies (Alhowaymel et al., 2023; Hughes et al., 2017; McDonald et al., 2019), the participant population was split into two groups for further analysis based on participants' ACE scores. The low-risk group, who recorded ACE scores of 1-3, represented most participants at 75%, and the high-risk ACE group reported ACE scores from 4-10 at 25%.

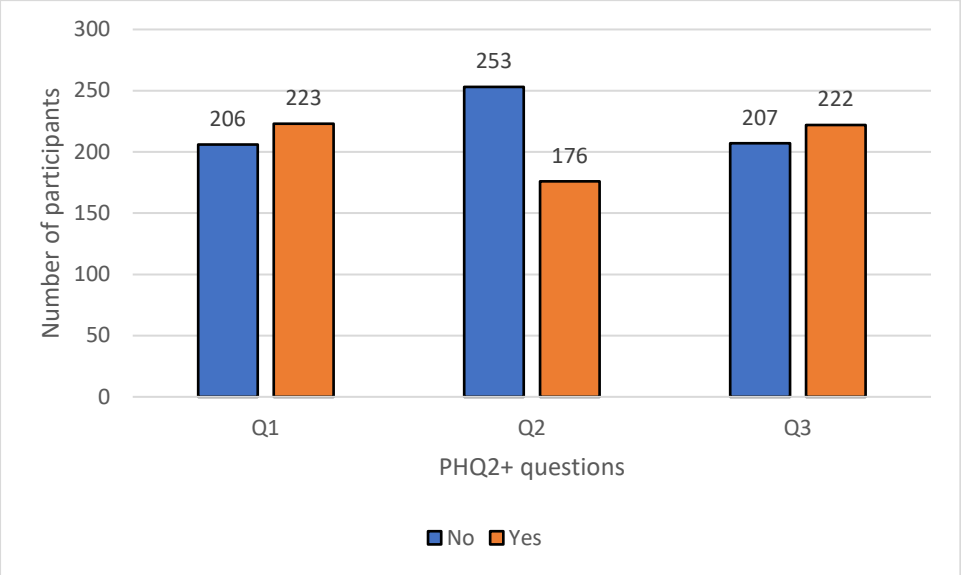
Figure 3 ***Adverse Childhood Experiences by Category (n = 429)***



Patient Health Questionnaire-2+ (PHQ2+)

As illustrated in Figure 4, the responses to the three questions of the PHQ2+ tool were relatively even, with 48% and 59% screening negatively for symptoms of depression (Q1) and anxiety (Q3). Depression Question 2 was less evenly distributed, with only 41% of respondents reporting positive depressive symptoms for this question.

Figure 4 ***Patient Health Questionnaire-2+ (n = 429)***



Note: Q.1: 'During the past month, have you been bothered by feeling down, depressed, or hopeless?' Q.2: 'During the past month, have you been bothered by little interest or pleasure in doing things?' Q.3: 'During the past month, have you been worrying a lot about everyday problems?'

Depression, Anxiety, and Stress Scale (DASS-21)

When reviewing the results of the DASS-21 scale, studying the shape of the data distribution for each subscale illustrates that the data is positively skewed. This means that most respondents scored on the lower end of the spectrum for depression, anxiety, and stress. Although stress is also positively skewed, the subscale appears to be more evenly distributed compared to depression and anxiety. This contrasts with the more evenly distributed results for depression and anxiety using the PHQ2+ measure described above. The results of the DASS-21 demonstrate that the mean score for stress (M =15.89) is also higher when compared to depression (M =10) and Anxiety (M = 7.46).

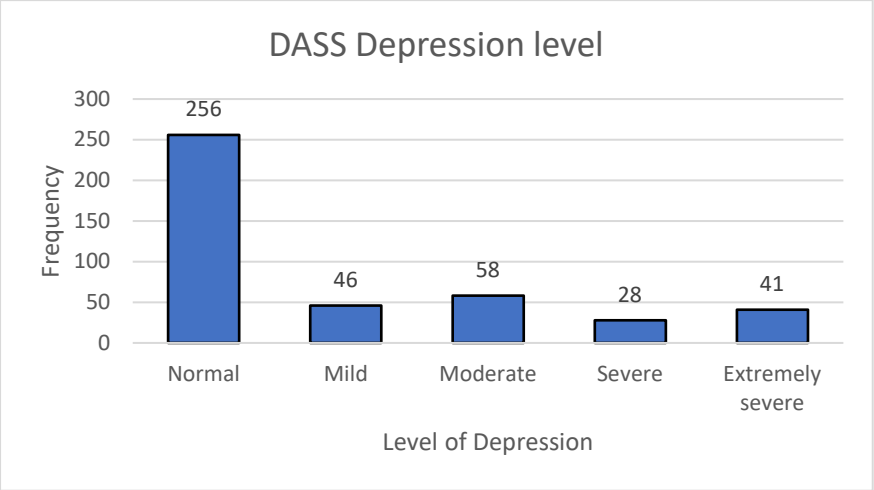
Table 4 ***Depression, Anxiety, and Stress Subscales- 21 Distribution***

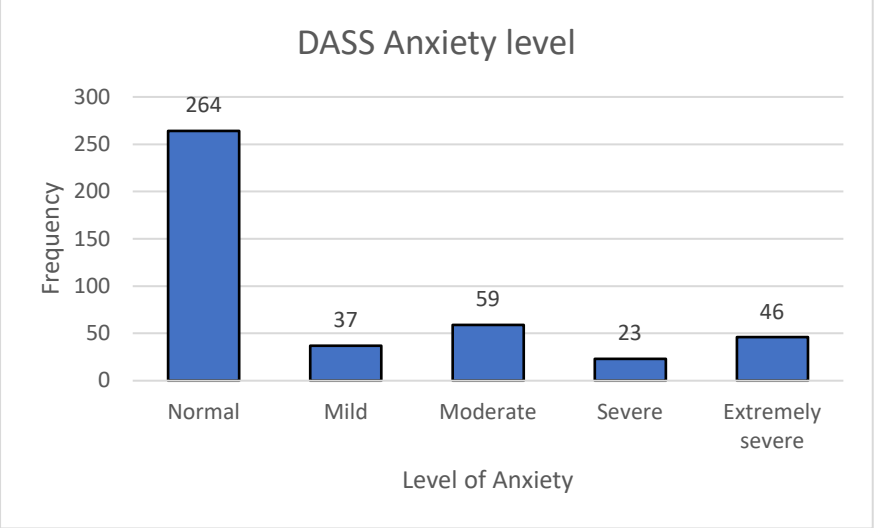
			Statistic	STD. Error
DASS Depression Subscale	Mean		10	0.50
	95% Confidence Interval for Mean	Lower Bound	9.01	
		Upper Bound	10.99	
	Median		6	
	Variance		108.56	
	Std. Deviation		10.42	
	Minimum		0	
	Maximum		42	
	Range		42	
	Interquartile Range		14	
	Skewness		1.20	0.12
	Kurtosis		0.72	0.24
DASS Anxiety Subscale	Mean		7.46	0.39
	95% Confidence Interval for Mean	Lower Bound	6.69	
		Upper Bound	8.23	
	Median		6	
	Variance		65.30	
	St. Deviation		8.08	
	Minimum		0	
	Maximum		42	
	Range		42	
	Interquartile Range		9	
	Skewness		1.54	0.12

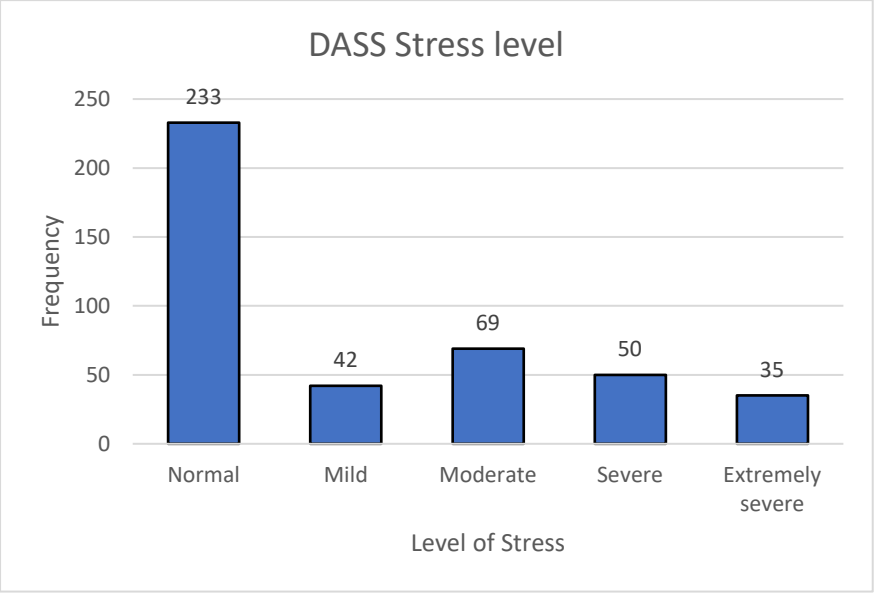
	Kurtosis		2.45	0.24
DASS Stress Subscale	Mean		15.89	0.50
	95% Confidence Interval for Mean	Lower Bound	14.90	
		Upper Bound	16.87	
	Median		14	
	Variance		107.5	
	Std. Deviation		10.38	
	Minimum		0	
	Maximum		42	
	Range		42	
	Interquartile Range		14	
	Skewness		0.60	0.12
	Kurtosis		-0.43	0.24

The scores for the depression, anxiety, and stress subscales were then categorised into levels: Normal, mild, moderate, severe, and extremely severe. As illustrated in Figure 5 below, 59.7% of participants reported a normal level of depression (n = 256), followed by 10.7% who reported moderate (n = 58) and mild (n = 46) levels. A smaller yet still substantial number of participants reported experiencing an extremely severe (9.6%, n = 41) or severe level of depression (6.5%, n = 28). As found with depression, the most common level of anxiety reported was normal by 61.5% (n = 264), followed by moderate (13.8%, n = 59), extremely severe (10.7%, n = 46), mild (9.8%, n = 42), and severe (5.4%, n = 23). Finally, the level of stress categories also led with normal for 54.3% (n = 233) of the population, followed by moderate for 16.1% (n = 69), severe for 11.7% (n = 50), mild for 9.8% (n = 42), and extremely severe for 8.2% (n = 35).

Figure 5 ***Depression, Anxiety, and Stress Frequencies in Levels***







Although the data for these three subscales is not normally distributed (as confirmed by the significance of the Shapiro-Wilk test indicating a significant difference between the present study's sample and normal distribution), the category levels of depression, anxiety, and stress are not required to be normally distributed for logistic regression analysis. Therefore, it is an appropriate test to use for this population.

Internal Consistency (i.e., reliability) of the DASS-21 Subscales

To ensure each of the seven items in the three DASS-21 subscales (i.e. depression, anxiety, and stress) measure the same underlying attributes within this study population, reliability tests were undertaken using Cronbach's coefficient alpha in SPSS (Pallant, 2010). The results show that the depression subscale consists of seven items of excellent internal consistency with the α ranging from .908 - .929. The seven-item anxiety subscale recorded good internal consistency, with the α ranging from .807 - .860. The seven-item stress subscale also reported good internal consistency with the α ranging from .873 - .889. These values reflect the acceptability of the DASS-21 subscales for reliably measuring depression, anxiety, and stress in this study population.

Further Results for Research Question Two

Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool?

To identify the presence of associations between variables of interest, two statistical tests (i.e., Spearman's rank correlation and Chi-square tests of independence) were conducted to establish the relationships between the socio-demographic variables and the ACE-10 and the DASS-21 scales in response to research questions 2 and 3 (i.e., Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool? And are there any socio-demographic characteristics associated with depression, anxiety and stress as measured by the DASS-21 tool?)

Analysis of Associations

The variables examined using Spearman's r correlations to test for associations include maternal age, the number of children mothers have given birth to, the age of the youngest child in months, access to local shops, supermarkets, and libraries (a higher number indicating an increasingly rural location), highest secondary school qualification, highest post-secondary school qualification, total household income, total ACE score out of 10, ACE category (low-risk ACE score 1-3, high-risk ACE score 4-9), the three PHQ2+ questions (if participants answered yes coded with 1, and no coded with 0), and the

DASS-21 subscales for depression, anxiety, and stress. The correlation coefficients are presented in Table 6.

Maternal Age. Results show that the age of the maternal participants was negatively and significantly, yet weakly correlated with the total ACE-10 score r (358) = -.148, p < .01 and the ACE category variables (i.e., low vs. high risk) r (358) = -.132, p < .01. A similar pattern is seen with the PHQ.3 (anxiety) r (426) = -.101, p = .05 and with all three of the subscales of the DASS-21 (i.e., depression r (426) = -.148, p < .01, anxiety r (426) = -.231, p < .001, and stress r (426) = -.159, p < .01) in that a negative significant but weak correlation can be observed. This indicates that younger maternal age was associated with higher ACE scores, being in the high-risk ACE group, screening positively for anxiety using the PHQ2+, and recording higher scores for DASS-measured depression, anxiety, and stress.

Maternal age was also significantly, positively, yet weakly associated with the number of children r (429) = .148, p < .01, highest secondary school qualification r (429) = .119, p = .05, highest qualification r (429) = .271, p < .01, and total household income r (429) = .213, p < .01. This indicates that as maternal age increases, the number of children, the highest secondary school qualification, the highest post-secondary school qualification, and the total household income variables all increased.

Number of Children. Results showed a positive, significant, but weak association between the number of children and DASS-measured stress r (429) = .104, p = .05, indicating that as the number of children increased, the stress level also increased. No associations were observed between the number of children and DASS depression or anxiety. The number of children participants had given birth to was also not associated with participants' total ACE scores, ACE categories, or the PHQ2+ depression or anxiety screening questions.

Age of Youngest Child in Months. The age of the participant's youngest child in months was positively, significantly, but weakly associated with the PHQ.2 (depression) question r (429) = .117, p = .05 and the DASS depression levels r (429) = .147, p < .01. This indicates that the younger the age of the youngest child, the greater the likelihood that the participant will score positively for depression using the PHQ.2 and record a higher depression level as measured by the DASS-21. The youngest child's age was not associated with the childhood adversity variables of the total ACE score nor the ACE category.

Access to Local Shops, Supermarkets, and Libraries. The participants' access to local shops, supermarkets, and libraries was coded into five categories, from high urban accessibility, coded

as 1, to very remote, coded as 5, with higher numbers indicating increasing rurality. The access categories were positively and significantly but weakly associated with participants' total ACE-10 score r (429) = .192, $p < .01$ and the ACE category (low vs. high) r (429) = .174, $p < .01$. This indicates that as participants' rurality increased, they were more likely to have a higher total ACE score and be in the high-risk ACE category.

A significant but weak association was observed between participant access and the PHQ.1 (depression) screening question r (426) = .105, p =.05. No associations were observed between PHQ.2 (depression) and PHQ.3 (anxiety). This indicates that being in a more rural category was associated with a positive response to the first depression screening question of the PHQ2+ tool. Depression was again positively associated (significant but weak) with participants' access when observing the DASS depression levels r (426) = .155, $p < .01$. Similarly, a positive significant weak association was observed between participants' access and the DASS stress levels r (429) = .157, p <.01. This indicates that increased rurality was associated with higher levels of depression and stress. No association was observed between participants' access and DASS anxiety levels.

A significant but weak negative association was observed between participants' access and their highest secondary school qualification r (357) = .133, p = .05, indicating that participants who lived more remotely were more likely to have achieved lower secondary school qualifications.

Highest Secondary School Qualification. The highest secondary school qualification was negatively, significantly, and moderately associated with participants' total ACE scores r (358) = -.320, $p < .01$ and their ACE category r (358) = -.262, p <.01, indicating that participants who achieved highly at secondary school were more likely to have lower total ACE-10 scores and be in the low-risk ACE category.

A negative, significant, but weak association was observed between participants' secondary school qualifications, PHQ.2 (depression) r (358) = -.110, p = .05, and PHQ.3 (anxiety question) r (358) = -.143, $p < .01$. This indicates that participants who achieved highly at secondary school were less likely to screen positive for depression and anxiety as assessed by the PHQ questions two and three. No association was observed between the highest secondary school qualification and PHQ.1 (depression). Similarly, no association was observed between the highest secondary school qualification and DASS-measured depression. However, a negative, significant, but weak association was observed with DASS-measured anxiety r (358) = -.150, p = .05 and stress r (358) = -.133, p = .05. This indicates that those participants who achieved highly at secondary school were less likely to score in higher anxiety or stress levels as measured by the DASS- 21.

Highest Post-Secondary School Qualification. Results revealed that participants' highest post-secondary school qualification was negatively, significantly, and weakly associated with the total ACE score r (345) = -.180, $p < .01$ and the ACE category (i.e., low vs. high) r (345) = -.195, $p < .01$. This indicates that participants with higher post-secondary school qualifications were less likely to score a high total ACE score or be in the high-risk ACE category. Participants' highest qualification was also negatively associated, significantly but weakly, with all three questions of the PHQ2+ tool; PHQ.1 r (345) = -.136, $p = .05$, PHQ.2 r (345) = -.124, $p = .05$, and PHQ.3 r (345) = -.180, $p < .01$, and all three subscales of the DASS-21 (depression r (345) = -.109, $p = .05$, anxiety r (345) = -.144, $p < .01$, and stress r (345) = -.149, $p < .01$). This indicates that a higher post-secondary school qualification was associated with a negative response to the PHQ2+ questions for depression or anxiety and lower levels of depression, anxiety, and stress as measured by the DASS-21.

As stated previously in the maternal age results, the highest qualification was positively, significantly, but weakly associated with maternal age r (345) = .271, $p < .01$ and moderately associated with the highest secondary school qualification r (345) = .437, $p < .01$, indicating that as maternal age and highest secondary school qualifications increased, so too did the highest post-secondary school qualification of participants. A negative, significant, but weak association was observed between the highest qualification and the number of children participants gave birth to r (345) = -.168, $p < .01$, indicating that participants with higher qualifications reported lower numbers of children.

Total Household Income. Household income was inversely and significantly, yet weakly, associated with participants' total ACE scores r (409) = -.122, $p = .05$ and the ACE categories (low vs. high) r (409) = -.113, $p = .05$. Income was also negatively associated with the three PHQ2+ questions; PHQ.1 r (409) = -.135, $p < .01$, PHQ.2 r (409) = -.141, $p < .01$, and PHQ.3 r (409) = -.164, $p < .01$, and the three subscales of the DASS-21 (i.e., depression r (409) = -.150, $p < .01$, anxiety r (409) = -.187, $p < .01$, and stress r (409) = -.134, $p < .01$). This indicates that as participant ACE scores decrease, household income increases. Depression and anxiety, as measured by the three PHQ2+ questions, and recording higher levels of depression, anxiety, and stress, as measured by DASS-21, were each associated with a lower total household income.

Positive associations, significant but weak, were observed between household income and maternal age r (341) = .213, $p < .01$, highest secondary school qualifications r (341) = .119, $p < .01$, and highest post-secondary school qualifications r (332) = -.271, $p < .01$, indicating that those participants who reported a higher total household income were more likely to be in a higher age bracket and have achieved highly at secondary and post-secondary school.

Total ACE Score Correlations. The total ACE score of participants was found to be significantly positive but weakly associated with the PHQ.1 (depression) r (429) = .246, p < .01, PHQ.2 (depression) r (429) = .270, p < .01, and PHQ.3 (anxiety) r (429) = .295, p < .01 questions. The total ACE score was also positively associated, both significantly and moderately, with all three DASS subscales: Depression r (429) = .355, p < .01, anxiety r (429) = .369, p < .01, and stress r (429) = .397, p < .01. This indicates that those participants with higher ACE scores were more likely to screen positively for the PHQ2+ (depression and anxiety) and report higher levels of DASS-measured depression, anxiety, and stress.

Participants' total ACE-10 scores were also found to be inversely associated, significantly but weakly, with maternal age r (429) = -.148, p < .01, highest secondary school qualification r (358) = -.320, p < .01, highest overall qualification r (345) = -.180, p < .01, and total household income r (409) = -.122, p = .05, and positively, significantly but weakly associated with access to local shops r (426) = .192, p < .01. This indicates that participants with higher total ACE scores were likely to be younger, report lower achievement at secondary school, achieve lower overall qualifications, and live in more remote areas.

ACE Category. Participants' ACE categories (low vs. high) were positively, significantly, but weakly associated with the three PHQ2+ questions PHQ.1 r (429) = .194, p < .01, PHQ.2 r (429) = .225, p < .01, and PHQ.3 r (429) = .196, p < .01, as well as all three DASS subscales (depression r (429) = .281, p < .01, anxiety r (429) = .298, p < .01, and stress r (429) = .299, p < .01). This indicates that participants categorised into the high-risk ACE category (ACE score of 4-10) were more likely to score positively for the PHQ2+ questions and record higher levels of DASS depression, anxiety, and stress.

A weak, negative, but statistically significant association was observed between ACE category and maternal age r (429) = -.132, p < .01, highest secondary school qualification r (345) = -.262, p < .01, highest overall qualification r (345) = -.195, p < .01, and total household income r (409) = -.113, p = .05, and positively, significantly, but weakly associated with access to local shops r (426) = .174, p < .01. This indicates that participants categorised into the high-risk ACE group were likely to be younger, report lower achievement at secondary school, have achieved lower overall qualifications, and live more rurally.

Summary of Significant Correlations

The intercorrelation analysis tests have provided data to answer Research Question 2: Are any socio-demographic characteristics measured in the present study associated with adverse childhood experiences measured by the Adverse Childhood Experiences-10 tool?

The results showed that the socio-demographic characteristics negatively associated with childhood adversity as recorded by the ACE-10 tool and the ACE categories (low vs. high) include maternal age, highest secondary school qualification, highest qualification, and total household income. There was a positive association between the participants' total ACE score, ACE category, and participants' access to local shops, supermarkets, and libraries. This indicates that as the total ACE score increases, maternal age, highest secondary school qualification, highest post-secondary school qualification, and total household income all decrease.

Table 5 ***Intercorrelations***

	Age	Number of Children	Age of Youngest Child	Access	Secondary School Qualification	Highest Qualification	Income	Total ACE Score	ACE Category	PHQ.1	PHQ.2	PHQ.3	DASS Depression	DASS Anxiety	DASS Stress
Age	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Number of Children	.15**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Age of Your Youngest Child	.09	-.02	-	-	-	-	-	-	-	-	-	-	-	-	-
Access to Local Shops	-.04	.08	-.10	-	-	-	-	-	-	-	-	-	-	-	-
Highest Secondary School Qualification	.12*	-.14*	.05	-.13*	-	-	-	-	-	-	-	-	-	-	-
Highest Qualification	.27**	-.17**	.01	-.08	.44**	-	-	-	-	-	-	-	-	-	-
Income	.21**	-.09	-.05	-.01	.25**	.18**	-	-	-	-	-	-	-	-	-
Total ACE Score	-.15**	.03	.03	.19**	-.32**	-.18**	-.12*	-	-	-	-	-	-	-	-
ACE Category	-.13**	.03	.04	.17**	-.26**	-.20**	-.11*	.76**	-	-	-	-	-	-	-
PHQ. 1 (Depression)	-.06	.04	.04	.11*	-.06	-.14*	-.14**	.25**	.19**	-	-	-	-	-	-
PHQ 2. (Depression)	-.08	-.02	.12*	.09	-.11*	-.12*	-.14**	.27**	.23**	.60**	-	-	-	-	-
PHQ. 3 (Anxiety)	-.10*	0	.08	.06	-.14**	-.18**	-.16**	.30**	.20**	.49**	.48**	-	-	-	-
DASS Depression	-.07	.03	.15**	.16**	-.09	-.11*	-.15**	.36**	.28**	.66**	.66**	.57**	-	-	-
DASS Anxiety	-.23**	-.04	.02	.09	-.15**	-.14**	-.19**	.37**	.30**	.49**	.48**	.50**	.66**	-	-
DASS Stress	-.16**	.10*	.07	.16**	-.13*	-.15**	-.13**	.38**	.30**	.52**	.53**	.57**	.75**	.690**	-

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Pearson's Chi-Square Test of Independence

Pearson's Chi-square test of independence was used to measure the strength of the associations identified by inter-correlation analysis. As the socio-demographic variables of ethnicity, relationship status, and childhood home living arrangement are recorded as multinomial/categorical variables, the associations between these three socio-demographic variables, the ACE-10 and the three subscales of the DASS-21, were tested by conducting a Pearson's Chi-square test of independence.

Ethnicity

For the Chi-square analysis, the descriptive ethnicity data was recoded into prioritised ethnicity variables as some participants had selected more than one ethnicity, and the assumptions of the Chi-square test require that the categories of the variables are mutually exclusive and that each participant fits into only one category of each of the variables. Despite the research plan describing that each ethnic group would be represented independently in this study, due to the limited number of participants who identified as Māori and Pacific, as well as limited representation in the Middle Eastern, Latin American, African (MELAA), and Other groups, the combining of the ethnic groups, was determined to be the most ethical and practical approach to analysing the available data. The researcher recognises that this approach was not the ideal plan for the ethnic group analysis; however, it was felt that the Māori and Pacific māma who had participated in the survey had the right to have their data included in the analysis. Therefore, the statistical analysis plan was adapted to allow for this. The prioritised ethnic groups (six) were collapsed into four categories to increase the number of participants in the smaller ethnic groups and strengthen the test's statistical power. The four collapsed categories are NZ European, Māori and Pacific Peoples, Asian, and the combined Middle Eastern, Latin American, African (MELAA) and Other groups.

Ethnicity and the ACE-10 Category. Using the two categories of the ACE-10 (i.e., low risk vs. high risk) and the four categories of ethnicity, a Pearson Chi-square test of independence was conducted to test for an association. The results $\chi^2(3) = 12.84$ $p = .005$, Cramer's V = .17 reflect a significant association between the ACE category and ethnic group, yet the Cramer's V result yielded a weak effect size. Pearson's Chi-square test assumes that expected counts in each cell should equal or exceed five. As the expected count of the MELAA & Other category is less than five in the ACE high-risk category, a follow-up Pearson's Chi-square test of independence was conducted, entering ethnicity with the three ethnicity categories that exceeded an expected count of five, NZ European, Māori and Pacific, and Asian.

The results $\chi^2(2) = 12.80$ $p = .002$, Cramer's V = .18 reflect a significant association between the ACE category and ethnic group, yet a weak effect size was observed (Cramer's V result). Therefore,

although a significant association exists between the ACE category and the Ethnic group variable, the magnitude of this association is small, and the practical implication of this association is limited. The distribution by ethnicity in the two ACE categories revealed a pattern of NZE and Asian groups being highly represented in the low-risk ACE group. Māori and Pacific participants were more evenly distributed between the two ACE groups, reflecting a higher number of Māori and Pacific mothers in the high-risk ACE group.

Ethnicity and Depression, Anxiety, and Stress as Measured by the Depression Anxiety Stress Scale-21. In this study, the relationship between DASS depression, anxiety, and stress levels and ethnic groups was investigated. For depression levels, a Pearson Chi-square test showed no significant association between DASS depression levels and ethnic groups ($\chi^2(12) = 18.75$ p = .095). However, when examining anxiety levels, a significant association was found, albeit with a weak effect size ($\chi^2(3) = 12.84$ p = .005, Cramer's V = .17). Due to low expected counts in specific ethnic categories for the anxiety levels, the Pearson's Chi-square test was deemed inappropriate for testing the variables. Similarly, a significant association was observed for stress levels with a weak effect size ($\chi^2(12) = 25.21$ p = .014. Cramer's V = .14). However, the test was considered inappropriate for specific ethnic categories due to low expected counts. Overall, the study found varying levels of association between DASS levels and ethnicity, with anxiety and stress levels showing a significant but weak link.

As most of the participants' responses to the DASS questions placed them into the first three levels (i.e., normal, mild, and moderate) of depression, it was decided to use the total depression, anxiety, and stress scores (0 to 42) and test whether there were any differences in the mean scores of depression, anxiety, and stress across the four ethnic groups. A one-way analysis of variance (ANOVA) was performed for each of the DASS-21 subscales, with depression, anxiety, and stress scores as the outcome variables and the four ethnic groups as the grouping variables. Although depression yielded a significant result, $F = (3, 469) = 3.70$, $p = .01$, $\eta^2 = .02$, post-hoc results of the Games-Howell revealed no significant differences between the ethnicity groups. A substantial difference in the means for anxiety across the ethnic groups was also observed, $F = (3, 428) = 6.72$, $p < .001$, $\eta^2 = .05$. Results of the Games Howell post hoc test showed that the Māori and Pacific ethnic group scored significantly higher on anxiety, ($M = 11.55$, SD = 10.52) when compared to NZE participants ($M = 7.00$, $SD = 7.25$, $p = .02$, CI [-9.30, -0.60]. No other significant differences were observed between the anxiety scores across the ethnic groups. When analysing stress, I noticed the same pattern as found for depression. The results of the Analysis of variance test showed significant differences between the ethnic groups, $F = (3, 428) = 7.46$, $p = .02$, $\eta^2 = .02$. However, no significant differences between the ethnic groups were observed when studying the Games Howell post hoc test results.

To summarise, the only significant difference between the ethnic groups on depression, anxiety, and stress was found in the combined Māori and Pacific group compared with all other ethnic groups, and their reported greater scores for anxiety comparatively.

Relationship Status

Data on five relationship status categories were collected: Married or in a civil union, separated, divorced, or dissolved, widowed, or surviving civil union partner, never married or never in a civil union, not elsewhere included. The descriptive statistics for this variable can be viewed in Table 4 above. Due to the majority of participants being represented in the 'married or a civil union' category (83%), the categories were collapsed into two categories to increase the statistical power of the test. The 'not elsewhere included' category was removed from the analysis and coded as 'systems missings', as it was unclear whether these participants were in a relationship and, thus, could not be categorised into the new collapsed groups. The two collapsed categories were transformed and re-coded as 1 (married or in a civil union) or 2 (unmarried or not in a civil union).

Relationship Status and ACE Score. The two collapsed relationship status variables (i.e., married or in a civil union and unmarried or not in a civil union) and the two ACE categories (low risk vs. high risk) were used in a Pearson Chi-square test of independence to test for any association. The results indicate no significant association between the ACE category and relationship status groups: $\chi^2(1) = 2.10$, p = .147, and Cramer's V = .072.

Despite the Chi-square results showing no associations between ACE category and relationship status, an independent samples t-test was performed to determine any significant differences between the total ACE score means in the relationship status groups. The outcome variable was the total ACE score (0-10). The independent variable was the two (binary) collapsed relationship status groups: Married/civil union and not married or in a civil union. Results showed a significant difference between the means of the two groups (t(1, 62.25) = 2.15, $p = 0.04$, $d = 2.13$), with the married/civil union group reporting significantly lower ACE score means ($M = 2.00$, $SD = 2.10$) compared with the not married or in a civil union group ($M = 2.75$, $SD = 2.33$).

Relationship Status and Depression, Anxiety, and Stress Scale-21. In this study, the relationship between DASS depression, anxiety, stress levels, and relationship status was investigated. For depression levels, a Pearson Chi-square test revealed a significant association between the relationship status variable and DASS depression levels, yet with a weak effect size as observed by the Cramer's V result $\chi^2(4) = 12.94$ p = .012, Cramer's V = .18. Therefore, a significant association

exists between relationship status and depression, the magnitude and the practical implication of this association are small.

When examining anxiety levels, the Pearson Chi-square test results $\chi^2(4) = 16.85$, $p = .002$, Cramer's V = .20 reflected a significant association between the relationship status variable and DASS anxiety levels, yet a weak effect size was observed in the low Cramer's V result. Therefore, as for depression, although a significant association exists between relationship status and anxiety, the magnitude and the practical implication of this association are small.

For DASS stress levels, the Pearson Chi-square test of independence results reflected a significant association $\chi^2(4) = 18.13$ $p = .001$, Cramer's V = .21 between the relationship status variable and DASS stress levels, yet a weak effect size was observed (Cramer's V result). As with the other two subscales, although a significant association exists between relationship status and stress, the magnitude and its practical implications are small.

Pearson's Chi-square test assumes that expected counts in each cell should equal or exceed five. As the expected count of the not married or in a civil union group was less than five in the DASS depression, anxiety, and stress levels, Pearson's Chi-square test of independence was deemed an inappropriate test to examine these variables. Overall, the study found varying levels of association between DASS levels and relationship status, with depression, anxiety, and stress levels showing a significant but weak link.

An independent samples t-test was determined to be the most appropriate test to compare the means in the total score of DASS depression, anxiety, and stress scores between the binary relationship status groups. The dependent variable was the DASS scores (0-42). The outcome variable was the two collapsed relationship status groups: Married/civil union and not married or in a civil union. For depression, there was a significant difference between the mean depression scores of the relationship status groups (t = 2.19, df = 60.25, $p = 0.12$, $d = .38$). In the married/civil union group ($n = 356$), the mean DASS depression score (0-42) was M = 9.52, SD = 10.17, compared with ($n = 51$) M = 13.45, SD 12.27 in the not married or in a civil union group. For anxiety, a significant difference was observed between the anxiety means of the relationship status groups (t = 2.86, df = 57.49, $p < .001$, $d = .55$). In the married/civil union group ($n = 356$), the mean DASS anxiety score (0-42) was 6.70 and the standard deviation was 7.48, compared with the mean DASS anxiety scores (0-42) in the not married or in a civil union group ($M = 11.06$, SD = 10.50, $n = 51$). Similarly, for stress, a significant difference between the stress means in each of the relationship status groups was observed (t = 3.30, df = 62.00, $p < .001$, $d = .50$). Participants in the married/civil union group ($n = 356$), scored

significantly less on the DASS stress score (M = 15.12, SD = 10.13), compared to the not married or a civil union group (M = 20.20, SD = 11.33).

In summary, this study revealed higher scores for DASS depression, anxiety, and stress in the not-married or a civil union group when compared with the married or in a civil union group. Those in the not-married or civil union relationship group are more likely to have higher DASS depression, anxiety, and stress scores in this study population.

Childhood Home Living Arrangement

The childhood home living arrangement data was collected over five categories: Both biological/adoptive parents in the household (75.5%), only biological mother ever present in the household (biological father never present) (9.3%), biological or adoptive parents divorced or not living together (14%) and raised by relatives, foster parents, or in an institution (1.2%). Despite an overrepresentation of the participants in the biological/adoptive parents in the household category, due to the differences in each category's description, the childhood home living arrangement categories could not be collapsed to strengthen the statistical power of the test. The small sample sizes, particularly those raised by relatives, foster parents, or an institution group, must be considered when interpreting these results.

Childhood Home Living Arrangement and Adverse Childhood Experiences. The five categories of the childhood home living arrangement (i.e., both biological/adoptive parents in the household, only biological mother ever present in the household- biological father never present, biological or adoptive parents divorced or not living together, and raised by relatives, foster parents, or in an institution), and the ACE risk categories (i.e., high risk vs. low risk), were tested for associations using a Pearson Chi-square test of independence. The results reflect a significant association between the ACE risk categories and childhood home living arrangement groups, with a moderate effect size indicated by Cramer's V result, $\chi^2(3) = 39.67$ $p < .001$, Cramer's V = .30. Pearson's Chi-Square test assumes that expected counts in each cell should equal or exceed five. As the expected count of the raised by relatives, foster parents, or in an institution group was less than five in the ACE categories, Pearson's Chi-square test of independence was deemed inappropriate to examine associations between these two variables.

A one-way analysis of variance (ANOVA) was performed to test for any differences in how ACE scores were distributed across the five childhood home living arrangement categories. The total ACE score continuous variable was added as the outcome variable (0-10). The grouping variable was the five-childhood home living arrangement groups (i.e., both biological/adoptive parents in the household, only biological mother ever present in the household- biological father never present,

biological or adoptive parents divorced or not living together, and raised by relatives, foster parents, or in an institution). A substantial difference in the ACE score means was found across the childhood home living arrangement groups, $F = (3, 428) = 6.72$, $p < .001$; $\eta^2 = .164$. Results of the Games Howell post hoc test illustrated that the only biological mother ever in the household group scored significantly higher on ACE ($M = 3.78$, SD = 1.89) when compared to both biological or adoptive parents in the household group ($M = 1.67$, $SD = 1.89$, $p < .001$, CI[-3.24, -0.97]). No other significant differences were observed between the ACE scores and the childhood home living arrangement groups.

Childhood Home Living Arrangement and Depression, Anxiety, and Stress Scale-21. Using the five DASS depression levels (i.e., normal, mild, moderate, severe, and extremely severe) and the childhood home living arrangement variables, a Pearson Chi-square test of independence was conducted to test for an association. The results $\chi^2(12) = 19.68$ $p = .073$, Cramer's V = .13, reflect a significant association between the childhood home living arrangement variables and DASS depression levels, yet a weak effect size was observed in the low Cramer's V result. Therefore, although a significant association exists between depression and childhood home living arrangements, the magnitude of this association is small, and the practical implication of this association is small.

For anxiety, the results $\chi^2(12) = 22.41$ $p = .033$, Cramer's V = .13, reflect a significant association between the childhood home living arrangement variables and DASS anxiety levels, with a weak effect size observed in the low Cramer's V result. Therefore, although a significant association exists between anxiety and childhood home living arrangements, the magnitude of this association and its practical implications are small.

For stress, the results $\chi^2(12) = 27.86$ $p = .006$, Cramer's V = .15, again reflect a significant association between the childhood home living arrangement variables and DASS stress levels. However, a weak effect size is noted in a low Cramer's V. Therefore, although a significant association exists between stress and childhood home living arrangement, the magnitude of this association is small, and the practical implication of this association is small. Again, the assumption that Pearson's Chi-square test requires counts in each cell to be equal to or more than five was not met for all childhood home living arrangement groups; therefore, Pearson's Chi-square test of independence was deemed inappropriate to examine the associations between these variables.

As most of the participant's recordings fell in the first three levels of depression, anxiety, and stress (i.e., normal, mild, and moderate), it would elicit more meaningful data to use the total depression, anxiety, and stress scores (0 to 42) and test whether there were any differences in the mean scores of depression, anxiety, and stress across the five childhood home living arrangement groups. A one-way

analysis of variance (ANOVA) was performed for each of the DASS-21 subscales, with depression, anxiety, and stress scores as the outcome variables, respectively, and the five-childhood home living arrangement groups as the grouping variable. There were no significant differences found for depression, but there were significant differences found for anxiety, $F = (3, 428) = 3.29$, $p = .02$; $\eta^2 = .02$, and for stress, $F = (3, 428) = 3.39$, $p = .02$; $\eta^2 = .02$. Although the ANOVA test results showed that there are significant differences for anxiety, studying the results of the post-hoc applying Games-Howell revealed no significant differences between the childhood home living arrangement groups. For stress, results of the Bonferroni post hoc test illustrate that the biological/adoptive parents divorced or not living together group scored significantly higher on stress ($M = 19.00$, SD = 11.32) when compared to both biological or adoptive parents in the household group ($M = 15.03$, $SD = 9.98$, $p < = .02$, CI[16.08, 21.92].

Results for Research Question Three

Are there any socio-demographic characteristics associated with depression, anxiety, and stress as measured by the DASS-21 tool?

The results presented in this chapter demonstrate that positive associations were observed with the age of the youngest child for DASS depression and access to local shops, supermarkets, and libraries. The younger the child and the more rural the dwelling location, the more likely the participants reported higher levels of DASS-measured depression. There were also negative associations between levels of DASS depression and the highest qualification and total household income variables, indicating that as the total ACE score increased, the highest qualification and total household income decreased.

For DASS-measured anxiety, inverse associations were observed with maternal age, highest secondary school qualification, highest qualification, and total household income. These findings indicate that those participants reporting higher levels of DASS-measured anxiety were more likely to be younger, have achieved lower secondary and post-secondary school qualifications, and have a lower total household income.

For DASS-measured stress, positive associations were identified with the number of children variable, indicating that the stress increased as the number of children increased. Significant inverse associations were observed with stress and maternal age, access to local shops, supermarkets, and libraries, highest secondary school qualification, highest post-secondary school qualification, and total household income. These findings indicate that those reporting high stress levels were more likely to be younger, live rurally/ remotely, have achieved lower secondary and post-secondary school qualifications, and have a lower total household income.

Results for Research Question Four

Does a higher score on the ACE-10 increase the likelihood of having depression or anxiety as measured by the PHQ2+ questions?

The binomial PHQ2+ measure was analysed using binary logistic regression. For the first analysis, the single predictor variable entered into the model was the participants' total ACE score (0-10). The outcome variable was the PHQ2+ questions. The questions of the PHQ+2 tool are as follows: 'During the past month, have you been bothered by feeling down, depressed, or hopeless?' (Question One). 'During the past month, have you been bothered by little interest or pleasure in doing things?' (Question 2). 'During the past month, have you been worrying a lot about everyday problems?' (Question 3) (New Zealand Guidelines Group, 2008). Questions one and two screen for depression, and questions three screens for anxiety (New Zealand Guidelines Group, 2008).

Table 6 ***ACE and PHQ2+ Binary Logistic Regression Model Results***

Variable	Coefficient	Standard error	Odds Ratio	95% CI Lower	95% CI Upper	p-value
Total ACE score & PHQ.1	.20	.05	1.23	1.12	1.35	<.001
Total ACE score & PHQ.2	.22	.05	1.24	1.24	1.36	<.001
Total ACE score & PHQ.3	.26	.05	1.30	1.30	1.43	<.001

Table 7 presents findings from three binary logistic regression tests examining the association between the total ACE score and PHQ.1, PHQ.2, and PHQ.3. The coefficients indicate the strength and direction of the relationships, with values of .20, .22, and .26 for PHQ.1, PHQ.2, and PHQ.3, respectively, suggesting that higher total ACE scores are associated with higher likelihood of positive depression scores (PHQ.1 and PHQ.2), and a positive score for anxiety (PHQ.3). The odds ratios (OR) for these associations are 1.23 for the PHQ.1 and 1.24 for the PHQ.2 and slightly higher at 1.30 for PHQ.3, indicating that for each unit increase in the ACE score, the odds of a positive depression scores increase by approximately 23%, and the odds of a positive anxiety score increase by approximately 24%. Additionally, the *p*-values (<.001 for PHQ.1, PHQ.2, and PHQ.3) confirm the statistical significance of these associations, indicating a strong and consistent relationship between total ACE scores and depression and between the ACE scores and anxiety across the three screening questions.

For the following analysis, the objective was to control for confounding factors that might affect the associations between the ACE score and the three screening questions of the PHQ2+. Therefore, covariates were added to the model as predictors. To aid in deciding which covariates to add to the model, I studied the results of the inter-correlations analysis presented in Table 6 to determine which

socio-demographic variables correlated with the three PHQ2+ questions. The predictor variables were entered into the model simultaneously to provide a comprehensive data analysis. For PHQ.1, the variables identified were total household income, access, and highest post-secondary school qualification. Therefore, these three variables were entered into the model as predictors with the total ACE score variable. For PHQ.2, the variables of the age of the youngest child in months, highest secondary school qualification, highest qualification, and total household income were significantly correlated. Therefore, these four variables were entered into the model as predictors and the total ACE score variable. For PHQ.3, maternal age, highest secondary school qualification, highest qualification, and total household income were significantly correlated with PHQ.3. Therefore, these four variables were entered into the model as predictors with the total ACE score variable.

Table 7 ***Addition of Predictor Variables for PHQ.1, PHQ.2, and PHQ.3 Model Results***

Variable	Coefficient	Standard error	Odds Ratio	95% CI Lower	95% CI Upper	p-value
PHQ.1						
Total ACE score	.21**	.06	1.24	1.10	1.39	<.001
Total household income	-.13**	.06	.88	.79	.99	.03
Access to local shops, supermarkets or libraries	.29	.20	1.34	.91	1.97	.14
Highest qualification	-.11	.07	.90	.79	1.02	.10
PHQ.2						
Total ACE score	.26**	.07	1.30	1.14	1.49	<.001
Total household income	-.19**	.08	.83	.71	.96	.01
Age of youngest child	.61	.04	1.07	.99	1.16	.11
Highest secondary school qualification	-.29	.23	.75	.48	1.17	.20
Highest qualification	-.01	.08	.99	.85	1.16	.92
PHQ.3						
Total ACE score	.21**	.07	1.23	1.08	1.42	.002
Total household income	-.22**	.08	.80	.68	.94	.006
Maternal age	-.11	.15	.90	.67	1.20	.48
Highest secondary school qualification	-.26	.23	.78	.50	1.21	.27
Highest qualification	-.07	.08	.94	.80	1.10	.43

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Patient Health Questionnaire 2+ Question One and Question 2 (PHQ.1)

The total ACE score is a significant predictor of depression for PHQ2+ questions 1 and 2 ($\chi^2(5) = 41.11$, $p = <.001$), with a coefficient of .21 and .26, indicating positive relationships. The odds ratios of 1.24 and 1.30 suggest that for each unit increase in the ACE score, the odds of experiencing depression increase by 24% and 30%, respectively, with these effects being statistically significant (*p*

< .001). The confidence intervals (1.10 to 1.39 and 1.14 to 1.49) do not include 1, confirming the robustness of this finding. Total household income: This variable shows a negative coefficient (-.13 and -.19), with odds ratios of 0.88 and 0.83, indicating that higher total household income is associated with lower odds of experiencing depression when measured using PHQ.1 and PHQ.2. This effect is statistically significant (p = .03 and p = .01), suggesting that as household income increases, the likelihood of depression decreases. When examining PHQ.1 and Access: With a coefficient of 0.29 and an odds ratio of 1.34, this suggests an increase in the odds of depression for each unit-increased rural dwelling. However, this relationship is not statistically significant when using PHQ.1 (p = .14). The highest qualification was examined for both PHQ.1 and PHQ.2: With negligible coefficients (-.11 and .01) and odds ratios of .90 and .99, this variable does not significantly impact the odds of depression (p = .10 and p = .92), as the confidence intervals (.79 to 1.02 and .85 to 1.06) include 1, suggesting no effect. Similarly, the highest secondary school qualification was also found to have no significant impact on the odds of depression using the PHQ.2 (p = .20).

These results confirm that ACEs significantly increase the likelihood of screening positively for depression using PHQ2+ questions 1 and 2. Household income emerges as another significant predictor, with higher income levels being protective against depression. Other factors, such as access, secondary school and post-secondary school qualifications, do not directly correlate with the depression screening questions in this model.

Patient Health Questionnaire 2+ Question Three (PHQ.3)

The Likelihood Ratio test results were: $\chi^2(5) = 35.72$, p = <.001. For the ACE score, the coefficient of 0.21 indicated a positive relationship between the total ACE score and the outcome, suggesting that higher ACE scores are associated with an increased likelihood of the outcome. The odds ratio indicates that for each unit increase in the total ACE score of participants, the odds of a participant answering yes to PHQ.3 increase by approximately 23%. This suggests that as participants' ACE scores increase, so does the likelihood of them reporting a yes to the PHQ.3 anxiety screening question. Income was negatively and significantly associated with PHQ.3. The coefficient value of -.22 suggests that higher income is associated with lower odds (0.80) of answering yes to the PHQ.3 anxiety screening question. These findings indicate that as participants' total household income increases, the likelihood of screening positively for anxiety using PHQ.3 decreases in this study population. For maternal age, the coefficient -0.11 suggests a slight decrease in the likelihood of the outcome with increasing maternal age, though the relationship is not strong. The p-value of .48 confirms the lack of statistical significance. For the highest secondary school qualification, the p-value of .26 supports the conclusion of non-significance. Similarly, there was a non-significant relationship between the highest post-secondary school qualification and the PHQ2+ anxiety screening question with a p- value of .43, confirming the lack of statistical significance.

Results for Research Question 5

Does a higher score on the ACE-10 increase the likelihood of having a higher level of depression, anxiety, and stress as measured by the DASS-21?

Depression, Anxiety, and Stress

Ordinal logistic regression was used to test Research Question 5. For the first analysis, the predictor variable entered into the model was the participants' total ACE score (0-10). The outcome variable was the DASS depression, anxiety, and stress level: Normal, mild, moderate, severe, or extremely severe.

Table 8 ***Ordinal Logistic Regression for ACE & DASS-21 Model Results***

Variable	Coefficient	Standard error	Odds Ratio	95% CI Lower	95% CI Upper	p-value
Depression & total ACE score	.27**	.05	1.31	1.20	1.43	<.001
Anxiety & total ACE score on anxiety	.26**	.07	1.30	1.19	1.41	<.001
ACE score on stress	.27**	.04	1.32	1.21	1.43	<.001

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

The Likelihood Ratio test results were: $\chi^2(1) = 46.99$, $p = <.001$. The results reveal that the ACE score is a significant and positive predictor of DASS-measured depression. For every one-unit increase in the ACE score , there is a predicted increase of .27 in the log odds of a mother being in a higher level of depression category (as opposed to a lower level). The odds ratio of 1.31, which is more than 1, suggests that for every one-point increase in ACE the probability of being in a higher level of depression as the ACE score increases by 31%

The Likelihood Ratio test results for anxiety were $\chi^2(10) = 49.37$, $p = <.001$, determining the ACE score as a significant and positive predictor of DASS-measured anxiety. For every one-unit increase in the ACE score , there is a predicted increase of .26 in the log odds of a mother being in a higher level of anxiety category (as opposed to a lower level). The odds ratio of 1.19, which is more than 1, suggests an increasing probability of being in a higher level of anxiety as the score of the ACE increases.

Similarly, the Likelihood Ratio test results for stress were: $\chi^2(11) = 75.66$, $p = <.001$. These results indicate that the total ACE score is a significant and positive predictor of DASS stress. For every one-unit increase in ACE, there is a predicted increase of .27 in the log odds of a mother being in a higher

stress category (as opposed to a lower level). The odds ratio of 1.32, again more than 1, suggests the probability of being in a higher stress level as the ACE score increases, increases by 32%. These results indicate that respondents scoring higher on ACE are more likely to have a higher level of depression, anxiety, and stress.

For the subsequent analyses, covariates were added to the model as predictors to control for confounding factors that might affect the relationship between the ACE score and the subscales of the DASS-21. To aid in deciding which covariates to add to the model, I studied the results of the inter-correlations analysis presented in Table 6 to determine which socio-demographic variables correlated with the three subscales of the DASS-21. The predictor variables were entered into the model simultaneously to provide a comprehensive data analysis. According to the results of the inter-correlations (Table 6), the socio-demographic variables of the youngest child's age, highest qualification, and income were each significantly correlated with DASS depression. Therefore, these three variables were entered into the model as predictors of the total ACE score.

The data presented in Table 6 show that maternal age, relationship status, childhood home living arrangement, highest secondary school qualification, highest post-secondary school qualification, and total household income are significantly correlated with anxiety. The four ethnicity groups were also significantly correlated with anxiety; therefore, these 11 variables were entered into the model as predictors along with the total ACE score variable.

The variables that correlated significantly with stress were maternal age, number of children, relationship status, childhood home living arrangement, highest secondary school qualification, highest post-secondary school qualification, access, and total household income. The four ethnicity groups were also significantly correlated with stress; therefore, these eleven variables were entered into the model as predictors along with the total ACE score.

Table 9 ***Addition of Predictor Variables for DASS-21 Depression, Anxiety, and Stress Model Results***

Variable	Coefficient	Standard error	Odds Ratio	95% CI Lower	95% CI Upper	p-value
Depression						
Total ACE score	.33	.06	1.40	1.24	1.55	<.001
Total household income	-.15	0.5	.86	.79	.95	<.001
Married or in a civil union, vs. unmarried or not in a civil union	-.13	.38	.88	.42	1.83	.73
Age of youngest child	.08	.04	1.09	1.01	1.17	.03
Access to local shops, supermarkets or libraries	.32	.16	1.37	1.00	1.88	.05
Highest qualification	-.01	.06	.99	.87	1.12	.86
Anxiety						
Total ACE score	.24	.07	1.27	1.10	1.46	<.001
Total household income	-.15	.06	.87	.77	.98	.02
NZE ethnicity	-1.55	.67	.21	.06	.80	.02
Māori and Pacific ethnicity	-.96	.79	.38	.08	1.82	.23
Asian ethnicity	-.05	.88	.95	.17	5.4	.96
MELAA and Other ethnicity	*-	-	-	-	-	-
Maternal age	-.35	.16	.71	.52	.96	.03
Married or in a Civil union, vs. Unmarried or not in a Civil Union	-1.12	.37	.33	.16	.67	.002
Childhood home living arrangement	-.31	.20	.74	.50	1.09	.12
Highest secondary school qualification	.03	.23	1.03	.66	1.61	.91
Highest qualification	-.04	.09	.96	.81	1.14	.63
Stress						
Total ACE score	.26	.07	1.30	1.13	1.49	<.001
Income	-.19	.06	.83	.73	.93	.002
Maternal age	-.46	.15	.63	.47	.85	.003
Married or in a civil union, vs. unmarried or not in a civil union	-.98	.36	.38	.18	.77	.007
NZE ethnicity	1.39	.64	.25	.07	.87	.03
Māori and Pacific ethnicity	-.75	.79	.47	.10	2.22	.34
Asian ethnicity	-.20	.83	.82	.16	4.17	.81
MELAA and Other ethnicity	*-	-	-	-	-	-
Childhood home living arrangement	-.02	.18	.98	.69	.39	.90
Number of children	.26	.17	1.30	.93	1.82	.13
Highest secondary school qualification	.08	.23	1.09	.70	1.69	.71
Highest qualification	-.13	.08	.88	.75	1.04	.15
Access to local shops, supermarkets or libraries	.12	.20	1.13	.76	1.68	.56

**Note.* The MELAA and Other ethnic groups did not achieve representation within each of the anxiety and stress levels. Therefore, SPSS excluded this ethnic group from the logistic regression model for analysis.

Depression. For depression, the Likelihood Ratio test results were: $\chi^2(6) = 64.67$, p = <.001. These results indicate that despite the added covariates, the participants' total ACE score remains the most significantly positively associated variable with DASS depression. For every one-unit increase in ACE, there is a predicted increase of .33 in the log odds of a mother being in a higher level of depression category (as opposed to a lower level). The odds ratio of 1.40, which is higher than 1, suggests that the probability of being in a higher level of depression increases by 40% as the total ACE score increases. This indicates that as participant ACE scores increase, so does the likelihood of them reporting a higher level of DASS depression.

Income was identified as a significant and negative predictor of DASS-measured depression. For every one-unit increase in income, there is a predicted decrease of -.15 in the log odds of a mother being in a higher level of depression category (as opposed to a lower level). The odds ratio of .86, which is less than 1, suggests a decreasing probability of being in a higher level of depression as total household income increases. Therefore, a respondent with a higher total household income is more likely to report a lower level of depression.

The age of the youngest child was also found to be a significant and negative predictor of depression. For every one-unit increase in the age of the youngest child, there is a predicted decrease of -.08 in the log odds of a mother being in a higher level of depression category (as opposed to a lower level). The odds ratio of 1.09, which is more than 1, suggests an increasing probability of being in a higher level of depression as the age of the youngest child decreases. Therefore, a respondent having a younger child or being earlier in the first postnatal year is more likely to have a higher level of depression.

Access to local shops, supermarkets and libraries was a significant positive predictor of depression. For every one-unit increase in access, there is a predicted decrease of .32 in the log odds of a mother being in a higher level of depression category (as opposed to a lower level). The odds ratio of 1.37, which is more than 1, suggests an increasing probability of being in a higher level of depression as the rurality of a participant's location increases. Therefore, a respondent living more rurally is more likely to have a higher level of depression in this study population.

The collapsed relationship status (married/civil union vs. not married or in a civil union) and the highest qualification variables were not significant predictors of levels of depression in this model.

Anxiety. The Likelihood Ratio test results in $\chi^2(10) = 49.37$, $p = <.001$ revealed that even with the inclusion of covariates in the model, the participants' total ACE score remains the most strongly, positively associated variable with DASS anxiety. For every one-unit increase in ACE, there is a predicted increase of .24 in the log odds of a mother being in a higher level of anxiety category

(as opposed to a lower level). The odds ratio of 1.27, which is higher than 1, suggests an increasing probability of being in a higher level of anxiety as the total ACE score increases. This indicates that as participant ACE scores increase, so does the likelihood of them reporting a higher level of DASS anxiety.

Income was found to be negatively significantly associated with anxiety levels. For every one-unit increase in income, there is a predicted decrease of -.15 in the log odds of a mother being in a higher level of anxiety category (as opposed to a lower level). The odds ratio of .87, which is lower than 1, suggests a decreasing probability of having a higher level of anxiety for participants who report a higher level of total household income. This indicates that participants with higher household incomes are less likely to report higher anxiety levels in this study population.

NZE ethnicity was found to be inversely and significantly associated with DASS anxiety. The odds ratio of .21, which is lower than 1, suggests a decreasing probability of having a higher level of anxiety for those participants who identify as NZE ethnicity. This indicates that NZE participants were less likely to report higher anxiety levels in this study population. The other ethnicity groups, namely Māori and Pacific as well as Asian, were not found to predict DASS anxiety in the model significantly. The MELAA and Other group were excluded from the model due to insufficient numbers represented in each level of anxiety.

Maternal age was found to be negatively significantly associated with anxiety levels. For every one-unit increase in age, there is a predicted decrease of -.35 in the log odds of a mother being in a higher level of anxiety category (as opposed to a lower level). The odds ratio of .71, which is lower than 1, suggests a decreasing probability of being in a higher level of anxiety for participants in an older age bracket. This indicates that as participants' age increases, they are less likely to report higher anxiety levels in this study population.

Being married or in a civil union was found to be negatively significantly associated with anxiety levels. The odds ratio of .33, which is lower than 1, suggests a decreasing probability of being in a higher level of anxiety for participants who were married or in a civil union. This indicates that participants who are married or in a civil union are less likely to report higher anxiety levels in this study population as compared to the not married or in a civil union group.

In the model, childhood home living arrangements, the highest secondary school qualifications, and the highest qualifications were not significant predictors of DASS anxiety.

Stress. The Likelihood Ratio test results of $\chi^2(11) = 75.66$, $p = <.001$ indicate that, as with depression and anxiety, the participants' total ACE score remains the most strongly, positively associated variable with DASS stress. For every one-unit increase in ACE, there is a predicted increase of .26 in the log odds of a mother being in a higher stress category (as opposed to a lower level). The odds ratio of 1.30, higher than 1, suggests an increasing probability of being in a higher stress level as the total ACE score increases. This indicates that as participant ACE scores increase, so does the likelihood of them reporting a higher level of DASS stress.

Total household income was found to be negatively significantly associated with stress levels. For every one-unit increase in income, there is a predicted decrease of -.19 in the log odds of a mother being in a higher level of stress category (as opposed to a lower level). The odds ratio of .83, lower than 1, suggests a decreasing probability of being in a higher stress level for participants who report a higher total household income level. This indicates that participants with higher total household incomes are less likely to report higher stress levels in this study population.

NZE ethnicity was found to be inversely significantly associated with DASS stress. The odds ratio of .25, which is lower than 1, suggests a decreasing probability of being in a higher stress level for those participants with an NZE ethnicity. This indicates that NZE participants in this study population were less likely to report higher stress levels. Identifying as Māori and Pacific or Asian were not a significant predictor of DASS stress in the model. The MELAA and Other group was excluded from the model due to insufficient numbers in each stress level.

Maternal age was found to be negatively significantly associated with stress levels. For every one-unit increase in age, there is a predicted decrease of -.46 in the log odds of a mother being in a higher level of stress category (as opposed to a lower level). The odds ratio of .63, lower than 1, suggests a decreasing probability of being in a higher stress level for participants in an older age bracket. This indicates that as participants' age increases, they are less likely to report higher stress levels in this study population.

Being married or in a civil union was found to be negatively significantly associated with stress levels. The odds ratio of .38, lower than 1, suggests a decreasing probability of being in a higher stress level for participants who are married or in a civil union. This indicates that participants who are married or in a civil union are less likely to report higher stress levels in this study population as compared to those that are not married or in a civil union

The number of children, childhood home living arrangement, highest secondary school qualification, highest qualification, and access were not significant predictors of DASS stress in the model.

Chapter Summary

This summary presents the research findings from the statistical analysis of the self-reported ACE and MMH data collected for this study. Descriptive and inferential statistics were conducted to describe the prevalence of depression, anxiety, and stress scored by the Patient Health Questionnaire-2+ (PHQ2+) and the Depression Anxiety and Stress Scale-21 (DASS-21) assessment tools (RQ1). The findings suggested that about half of the participants screened negatively for depression and anxiety while approximately 40% screened negatively for depression, yet most of the participants scored on the lower spectrum of severity for all three conditions. Results showed that most participants' data fell into the lower levels for depression, anxiety, and stress, with 'normal' to 'moderate' levels being the most common among about 70% of the sample population. It was also observed that the 'mild, 'severe', and 'extremely severe' categories accounted for about 10% of the participants.

The association between socio-demographic factors and ACE outcomes (RQ2) were examined using Spearman's rho. Results showed that participants with higher total ACE scores were likely to be younger, report lower secondary and post-secondary school qualifications, and be more rurally located. The study further explored the impact of ethnicity, relationship status, and childhood home living arrangement on ACE outcomes, using Pearson's Chi-square test of independence and other parametric tests, such as the independent t-test and the one-way analysis of variance test. Results indicated a significant association between the ACE score and ethnicity. Māori and Pacific mothers were more evenly distributed between the two ACE groups (high-risk and low-risk ACE category) compared to the other ethnicity groups (where most participants in these ethnicity groups were represented in the low-risk ACE category). Furthermore, relationship status and childhood living arrangement were also significant factors, as an independent t-test showed that participants who are married or in a civil union scored significantly lower on ACE (compared to the unmarried/not in a civil union group). Results of the one-way ANOVA revealed that participants who lived with both biological parents scored significantly lower on ACE than those raised in other settings, including those raised by only their biological mother, foster parents, relatives, or in an institution. Among these, the highest ACE scores were recorded for participants raised outside of traditional family structures.

A Cronbach's coefficient alpha was applied to evaluate the internal reliability of the DASS-21 subscales for depression, anxiety, and stress. The analysis revealed that the depression subscale recorded excellent internal consistency, while the anxiety and stress subscales demonstrated good internal consistency.

Binary logistic regression was used to explore the relationship between the ACE-10 scores and the likelihood of participants reporting depression or anxiety as measured by the PHQ2+ questions

(RQ4). The results showed that higher ACE scores were associated with an increased probability of a positive screen for PHQ2+ depression (PHQ.1 and PHQ.2). Interestingly, it seems that household income played a mitigating role in the relationship between ACE and depression. Specifically, the results from PHQ.1 and PHQ.2 indicate that as total household income increases, the likelihood of screening positively for depression decreases. This suggests that higher economic stability may offer protective buffering against the mental health risks posed by ACEs. Factors such as access and highest qualification did not significantly predict positive responses to the PHQ.1 depression screening question. Regarding anxiety, the ACE score was a significant and positive predictor of PHQ2+ measured anxiety using Question 3 of the PHQ2+ tool. Specifically, higher ACE scores increased the likelihood of a positive screen for anxiety for PHQ.3, while, similar to the previous findings, higher household income was associated with a decreased likelihood of a positive anxiety screening in the study population.

Similar patterns were observed when using the DASS-21 depression, anxiety, and stress subscales and their relationship with the ACE scores. A Spearman's rho was used to test associations between the DASS-21 subscales and selected socio-demographic factors. The DASS findings reveal a consistent pattern across its depression, anxiety, and stress subscales. Younger participants and those with lower total household income scored higher across all three DASS measures. An inverse relationship was observed between the level of qualifications and DASS-measured subscales, indicating that individuals with lower qualifications are more susceptible to higher levels of depression, anxiety, and stress. For those in rural settings, the level of depression and stress increased, while stress scores also increased with the number of children the mother had.

Finally, Ordinal Logistic Regression analysis confirmed that a higher score on the ACE-10 tool increases the likelihood of having a higher level of depression, anxiety, and stress as measured by the DASS-21 tool (RQ5). Specifically, the results showed that as the ACE score increases, so does the likelihood of experiencing higher levels of depression (odds ratio of 1.40), anxiety (odds ratio of 1.27), and stress (odds ratio of 1.30), indicating a clear positive correlation between adverse childhood experiences and increased post-natal mental health challenges.

Including various significant covariates in the analysis did not alter the primary outcome; the ACE score remained the strongest predictor of higher levels of depression, anxiety, and stress as measured by the DASS-21 tool. This persistence highlights the impact of adverse childhood experiences on depression, anxiety, and stress, indicating that the relationship between ACEs and symptoms of postnatal mental illness is robust and significant, even when accounting for other influencing factors measured in this study.

Conclusion

This chapter presents a comprehensive analysis of the study's findings, responding to each of the designed research questions. The following chapter interprets the significant results described within this chapter. The study's findings are considered in the context of the current body of literature examining maternal ACEs and MMH outcomes, considering how the findings could inform future policy and clinical practice change in Aotearoa.

Chapter Six: Discussion Chapter

Introduction

This chapter is divided into two sections. The first section critically interprets the research results against current international evidence. The second section discusses how the results may inform clinical practice change and influence future health policy. The significant results of each research question are interpreted, and the implications of these findings are discussed within the context of international evidence and literature. How the findings agree with or contradict existing evidence is explored, and the novel contributions of this research are highlighted. Based on the findings of this research study, recommendations for future research are described. The relevance and implications of the results are considered in the context of primary healthcare service delivery in Aotearoa. The chapter also suggests how the study findings could inform future health policies and clinical practice concurrently, informed by the research findings.

Research Aims

For the first time, this study aimed to measure the incidence of childhood adversity among a maternal population of Aotearoa, analyse how adversity is distributed in this population, and examine whether there are associations between childhood adversity experiences and later maternal mental health outcomes in the postnatal period. The following section discusses the main findings concerning the research aims.

Research Question One

Depression

Based on the analysis of the survey data collected from 429 mothers in Aotearoa, the mothers in my sample reported a prevalence of depressive symptoms using the PHQ2+ tool. Depressive symptoms were common, reported by 39% of the 429 mothers in the study sample. When applying the more extensive DASS-21 assessment tool, the seven-item depression subscale determined a markedly lower prevalence rate (39%, n = 167 participants) in our study population. Thus, 39% of mothers reported depression symptomology that, when scored, resulted in their allocation to one of the following DASS-21 positive depression screening levels: Mild, moderate, severe, or extremely severe. The difference between these two prevalence rates within our sample is likely due to the interpretation and self-reporting of the depression screening questions. One possible contributing factor to the variation in depressive symptomology is reflected in the design of the tools themselves. On closer examination of the tools, the PHQ2+ tool depression questions are designed to elicit a positive response for any symptoms of depression experienced. (i.e., Q.1: ‘During the past month, have you been bothered by

feeling down, depressed, or hopeless? And Q.2: During the past month, have you been bothered by little interest or pleasure in doing things?') (New Zealand Guidelines Group, 2008). In contrast, the DASS-21 tool allows for a low level of depression symptomology (i.e., a depression score from 0-9) to be categorised as a 'normal' level of depression.

One explanation for why the PHQ2+ picked up on low-level symptoms of depressive mood, that the DASS-21 did not differentiate, were participants' symptoms associated with maternity blues versus symptoms of PND. Ntaouti et al. (2020) define postpartum/maternity blues as a transient physiologic and psychological disorder with potential symptoms of depression, tearfulness, sorrow/weeping, unstable mood, insomnia, anxiety, and confusion. Although these symptoms can feel significant for mothers who experience them, they are not recognised as clinical postnatal depression symptoms. Rezaie-Keikhaie et al. (2020) examined this concept further by conducting a maternity blues meta-analysis of 26 international studies. The results revealed a prevalence of maternity blues in 39% of the pooled participant groups. Other studies have reported a prevalence of maternity blues in over 50% of mothers in the early postnatal period (Henshaw, 2003; Howard et al., 2014). For comparison, postnatal depression is characterised by persistent symptoms that include depressed mood, irritability, loss of interest in everyday activities, tiredness and fatigue, insomnia, loss of appetite, low libido, poor concentration, and feelings of guilt about the perceived inability to look after the new infant (New Zealand Guidelines Group, 2008). The critical difference that I note in the two definitions is the length of time the symptoms persist, transient for postpartum blues, and persistent in postnatal depression.

Although the exact cause of maternity blues has not been identified, studies have suggested that the symptoms likely result from the significant hormonal changes occurring over the perinatal period (Ntaouti et al., 2020; Rezaie-Keikhaie et al., 2020). Women who are more sensitive to hormonal changes are more likely to experience symptoms of maternity blues (Pop et al., 2015). It is clear from the literature that there are 'maternity blues' symptoms that have likely been picked up as depressive symptoms when applying the broader assessment questions of the PHQ2+ tool. It is also possible that low-level depressive symptoms that the DASS-21 tool would categorise as a 'normal' level of depression have resulted in a positive PHQ2+ depression screen (Lovibond, 1995). These findings may explain the variation in depression prevalence when analysing the conclusions of the two tools applied in the index study. The clinical implications of this are to consider the use of the PHQ2+ tool as a screening measure only for the symptoms of maternal depression, and if the screen is positive, to follow up with a more comprehensive, scaled assessment tool such as the DASS-21 to support clinical decision making more accurately for mothers in Aotearoa (New Zealand Guidelines Group, 2008).

Anxiety

Our research findings have confirmed a high prevalence of anxiety in the first postnatal year, particularly in the mothers who identified as Māori or Pacific in Aotearoa. The PHQ2+ anxiety screening question (i.e., Q.3 'During the past month, have you been worrying a lot about everyday problems?) elicited 59% of affirmative responses in the sample, indicating a prevalence of anxiety in the cohort in 59% of participants (n = 222). As found with depression, when the symptoms of anxiety were assessed and scaled against the DASS-21 levels of anxiety, only 38.5% of mothers (n = 170) recorded anxiety ranging from mild- to extremely severe. In 2019, a meta-analysis including 26 international studies examined the prevalence of anxiety in the perinatal period. The pooled prevalence of anxiety was 20.7% of their combined international maternal postnatal population (Fawcett et al., 2019). Interestingly, a significant variation in prevalence was reported in the individual studies, ranging from 16.7% to 25.4%. The timing of the assessment appeared crucial, with higher rates of anxiety reported in pregnancy than postnatally. Nevertheless, the 38.5% prevalence found in the current study using the DASS-21 is still markedly higher than the highest variation previously reported.

An Aotearoa-based prevalence study published in 2017 compared the prevalence of anxiety between Māori and non-Māori mothers in late pregnancy (Signal et al., 2017). Signal et al. (2017) reported that in their maternal sample of over 1,100 mothers, 25% of Māori mothers and 20% of non-Māori mothers reported symptoms of anxiety, with younger maternal age and significant life stressors each representing independent risk factors for higher anxiety scores. Similarly, the post-hoc analysis using the Games-Howell test used for the present study determined that the combined Māori and Pacific ethnic group scored significantly higher rates of anxiety (M = 11.55, SD = 10.52) when compared to NZE participants (M = 7.00, SD = 7.25, p = .02, CI[-9.30, -0.60]). The results presented in this current study align with the antenatal NZ-based findings of Signal et al. (2017), confirming that Māori mothers have an increased risk of maternal anxiety, while my study offers a postnatal perspective on increased anxiety levels for Māori and Pacific mothers compared with non-Māori/NZE mothers.

In 2022, the maternal support agency Mothers Helpers undertook a survey targeted at Aotearoa mothers who had experienced perinatal depression and anxiety between the years of 2019-2021 (Paterson, 2022). The motivation of this survey was to gain a clearer understanding of the experience of mothers affected by postnatal depression and anxiety and to develop recommendations for clinical services and support agencies to better meet the needs of this population group. Despite this survey lacking the rigour expected of scientific research (e.g. there appears to be no ethical review process), the findings remain helpful to consider in the context of the study results presented here, albeit with caution. Thus, 201 mothers participated in the Mothers Helpers survey, with their study sample presenting similar socio-demographic characteristics to the current study in terms of ethnicity,

maternal age, and number of children (Paterson, 2022). Paterson (2022) identified that although the majority of mothers first reported depressive/anxiety symptoms in pregnancy (42%) or in the first six weeks postpartum (37%), and the bulk of the remaining mothers before six months postpartum (17%), two-thirds of the mothers (68%) experienced a delay in diagnosis by two months or more after the onset of symptoms, with 17% of participants never receiving a diagnosis or support/treatment for their symptoms. As the survey did not report data on participant engagement with Well Child/Tamariki Ora services in Aotearoa, it is unclear if the participants were engaged in WCTO services. Paterson's (2022) findings demonstrate a gap for many mothers in Aotearoa in receiving timely mental health assessment and referral, despite the Well Child Tamariki Ora Schedule (2013) instructing PND at the first and third contacts with a mother (i.e. at around six weeks and three months postpartum), and the topic of MMH being prescribed for ongoing health promotion and education at each subsequent contact. This thesis builds on Paterson's (2022) findings by rigorously examining depression and anxiety, with the addition of maternal stress measurement, in a larger sample size of Aotearoa mothers. Additionally, the index study separated the anxiety data from the depression data, allowing for a more targeted analysis of each individual mental health issue for the mothers in my sample.

Stress

The inclusion of maternal stress was a priority for this study as there is increasing evidence to support the negative influence of maternal stress on perinatal outcomes in Aotearoa and internationally (Signal et al., 2017; Theunissen et al., 2022; Zaneta et al., 2019). My study determined a prevalence of DASS-measured stress beyond what was categorised as normal (i.e., mild, moderate, severe, or extremely severe) in 45.7% of the mothers in our study sample. Not only was stress the highest reported prevalence when compared with depression (40.3%) and anxiety (38.5%), but the stress scores, reported as levels, were also higher comparatively. Thus, among the 45.7% of the cohort who reported experiencing stress, 19.9% reported experiencing severe or extremely severe levels of stress. This value is higher than the combined severe and extremely severe levels of depression and anxiety, both of which were 16.1%.

Analysing the GUiNZ longitudinal research data, Waldie et al. (2015) identified a significant relationship between stressors in pregnancy and experiences of maternal depression. Although Waldie et al. (2015) measured stress by applying the Perceived Stress Scale (PSS) developed by Cohen (1983), and my study applied the DASS-21 Stress Scale (Lovibond, 1995), a validity and reliability study conducted in Greece tested and compared each of the two stress assessment tools using Cronbach's alpha reliability test (Andreou et al., 2011). Andreou et al. (2011) determined similar internal validity between the two tools, with the PSS recording a Cronbach's alpha of 0.69 and the DASS-21 Stress Scale Cronbach's alpha level of 0.64, suggesting that each tool is equally effective at measuring stress. Waldie et al. (2015) results detailed that for every one-point increase in perceived

stress in their participants, there was a 1.34 increase in the odds of having antenatal depression (p<.001) (Waldie et al., 2015).

The association between maternal stress and increased rates of depression found in the antenatal study by Waldie et al. (2015) was replicated in a postnatal population in a literature review examining maternal stress in 48 papers from eight longitudinal studies across Australia and Aotearoa (Schmied et al., 2013). Schmied et al. (2013) described stress as being a significant mediating factor for maternal mental illness in the pooled participant group of their study. They determined that the effects of acute stressful life events were significantly stronger in association with mental illness than the experience of chronic stress in the perinatal period. In addition to this, multiple stressful events during pregnancy were found to have intergenerational consequences, with the children of stressed mothers recording increased mental health morbidity and lower IQ scores in early childhood. Our study aligns with the findings of both Waldie et al. (2015) and Schmied et al. (2013) in that strong, significant associations were observed between maternal stress and maternal depression scores r (429) =.75, p < .01. Again, as the study was cross-sectional in design, no inferences about causality between the two variables can be made.

In a systematic review examining psychosocial interventions in managing postnatal maternal stress, Song et al. (2015) found that psychosocial interventions, including a strong maternal social network, stress management programmes, and, particularly in higher-risk populations, nurse-mother stress management support, were all successful strategies in reducing maternal stress. My study has highlighted the significance of maternal stress postnatally in Aotearoa, outweighing both depression and anxiety in prevalence in our maternal participant sample, particularly in mothers who identify as Māori or Pacific. The strategies described in the research by Song et al. (2015) provide examples of potential clinical interventions that could be offered through WCTO services to reduce maternal stress and its intergenerational consequences. However, maternal stress is not routinely assessed in clinical practice settings in Aotearoa. Suggestions to include a culturally responsive maternal stress assessment for new mothers in Aotearoa are explored in the recommendations section.

This research study has identified significant associations between childhood adversity and many of the socio-demographic characteristics examined in the study. Higher ACE scores were associated with younger maternal age, lower achievement in secondary and post-secondary school, lower household income, being located rurally, identifying as Māori or Pacific, being unmarried/not in a civil union, and not having both parents living together in the family home while they were growing up. Despite PND assessment being included as an assessment activity at the first and third WCTO contacts (i.e. at around six weeks and three months postpartum) and these themes being outlined as an ongoing topic for maternal health promotion in the WCTO Schedule (2013), there appears to be a gap between the

assessment of and intervention for mental health, and currently, no formal direction for the assessment of symptoms of anxiety or stress within WCTO services.

Research Question Two

Maternal Age

A wealth of literature has linked adverse childhood experiences with an increased risk of teen pregnancy (Felitti et al., 1998; Flaviano & Harville, 2021; Hillis et al., 2004; Walsh, 2021). However, in my study, where there were limited teen mothers, as participants were required to be over the age of 18 years to participate, and the majority of participants were represented in the 30-34-year age group, the association between increased adverse childhood experiences and younger maternal age remained. The index study's findings are consistent with recent evidence supporting inverse associations between ACE scores and maternal age (Hardcastle et al., 2022; Sun et al., 2017). Researchers have offered a range of explanations for this correlation, but the most common explanation in the literature suggests a link to the intergenerational transmission of ACEs. This idea recognises that children born to parents with higher ACE scores are at an increased risk of experiencing ACEs themselves. A study set in Aotearoa that compared the ACE scores of children with teen parents against those of non-teen parents found significantly higher ACE scores in children whose parents were teens (Walsh, 2021). In a further study examining the intergenerational links between parents and their children's ACEs, Schickedanz et al. (2021) reported that for parents with an ACE score of four or more, there was a 3.25- fold higher risk of their children experiencing an ACE score of four or more, compared with parents who had an ACE score of zero (n = 2,205). Two studies (Lê-Scherban et al., 2018; Racine et al., 2018b) have built on the theory that two transmission pathways exist for intergenerational ACE risk: Epigenetics through altered pathophysiology and parenting and mental health-related behaviour.

The environmental epigenetics hypothesis proposes that sustained environmental effects, such as experiences of childhood adversity, can influence the epigenetic mechanisms that control how genes are expressed (Scorza et al., 2023). In a study examining the correlation between mothers' ACE scores and DNA methylation (DNAm) in their offspring, there were measurable differences in the DNAm of infants of ACE-affected mothers, indicating a potential pathway for biological transmission of ACE risk from a mother to her infant (Scorza et al., 2023). This is significant as this study demonstrates a possible pathway for how maternal ACEs can alter the pathophysiology of their children. Although this field of research is in its infancy, there is significant potential for future research studies to explore the risk pathways from mothers to their offspring further (Scorza et al., 2019).

The examination of the parenting and mental health behaviour pathway for the transmission of ACE risk is receiving an increasing level of focus in the academic literature, with several studies considering how parenting behaviours influence a child's risk of adverse outcomes (ACEs Aware, 2020; California Surgeon General, 2020; Lomanowska et al., 2017; McDonald et al., 2019; McDonnell & Valentino, 2016). The literature suggests that maternal ACEs are associated with increased risky parental behaviours, including substance dependence, personal and interpersonal violence, depression, self-harm, and suicidality; each of these behaviours represents an ACE item for their children (ACEs Aware, 2020; Felitti et al., 1998; McDonald et al., 2019). Secondly, a growing theme within the literature examines the associations between maternal childhood adversity, insecure attachment relationships with their children, and maladaptive parenting practices (Agrati et al., 2015; Coe et al., 2021; Cooke et al., 2019; Khan & Renk, 2018; Schickedanz et al., 2021). In a US-based study involving a high-need home visiting service, Coe et al. (2021) observed that ACEs were associated with less sensitive parenting practices influenced by the experience of postpartum parenting stress. In a systematic review examining the relationships between parental ACEs, parents' emotional availability, and discipline strategies, parental ACEs significantly increased parenting risk behaviours (Rowell & Neal-Barnett, 2021). Rowell and Neal-Barnett (2021) linked parental ACEs with decreased parental emotional availability and more punitive parenting strategies. These themes were echoed in a study by Cooke et al. (2019), who identified associations between maternal early-life adversity and maternal attachment avoidance and attachment anxiety. Further research is required to definitively describe how parenting behaviours lead to increased ACE scores in children and, potentially, what parenting behaviours are deemed protective and are associated with a reduced risk of intergenerational adversity.

Education and Income

Education is strongly linked to income as a socio-economic determinant of health and well-being, and thus, these two study variables are examined together (Mackenbach et al., 2019). My study's findings highlighted the significant role that ACEs play in influencing educational outcomes and income for the mothers in the study. The sample reported slightly below the national average level of secondary school qualification but higher than the national level of post-secondary school qualifications, with 62% of participants achieving a Bachelor's degree or above (New Zealand Qualifications Authority, 2022). It could be assumed that the mother’s high levels of education would suggest that there would be a corresponding low ACE prevalence in our study population. However, this was not the case, as the prevalence of ACEs was high in the highly educated participant sample when compared to the reported ACE prevalence rates in many recent international studies (Chang et al., 2021; Ilter Bahadur et al., 2021; Meltzer-Brody et al., 2018; Racine et al., 2018b). Despite the high ACE prevalence of the study’s participants, the expected inverse association between participant ACE scores and their education level was determined to hold true. Thus, the mothers who had achieved high post-secondary

school qualifications were indeed found to have lower total ACE scores. These findings are consistent with several studies that have linked childhood adversity with lower academic achievement (Stewart-Tufescu et al., 2022; Walsh et al., 2019a; Webb et al., 2022).

In an Aotearoa retrospective cohort study that examined the relationship between ACE scores and school readiness in the GUiNZ cohort of children, Walsh et al. (2019a) described a 'dose-response' relationship between the child's ACEs and tests of cognitive performance in their study participants at 4.5 years of age (Walsh, 2019). As Stewart-Tufescu et al. (2022) demonstrated, even when controlling for socio-demographic variables, a significant relationship exists between increasing ACE scores and lower academic achievement in the teenage years. Their study also examined the engagement aspect of education, revealing that ACEs were significantly linked with chronic absenteeism and an increased likelihood of school suspension (Stewart-Tufescu et al., 2022). In a further study that considered individual ACE categories against academic achievement indicators, Webb et al. (2022) revealed that parental incarceration was the strongest predictor of all ten ACEs for decreased academic achievement in school-age children. The physical neglect ACE category was the strongest predictor of incomplete homework and apathy towards 'doing well' at school (Webb et al., 2022).

A study of almost 28,000 participants across ten US States that examined adult education, employment, and income found that participants with four or more ACEs were more likely to report non-completion of secondary school and current household poverty (Meltzer-Brody et al., 2018). Metzler-Brody et al. (2018) identified a significant association between childhood adversity, lower income levels, and higher unemployment rates. A cumulative effect was observed, where four or more ACEs significantly increased the likelihood of household poverty. The results of the current study contribute to an Aotearoa maternal population perspective, confirming household income to be significantly and inversely associated with the total ACE scores of mothers. The cumulative effect pattern was also observed in our study's sample; their total household income decreased as participant ACE scores increased. However, limitations with the total household income measure encourage caution when reviewing the total household income data. Refer to the limitations section for further discussion.

Recent Aotearoa-based research has illustrated that ACEs are socioeconomically patterned. Utilising the GUiNZ data, Walsh et al. (2019b) identified that children of families with a household income of NZD 20,000 or less experienced ACE scores three times higher than those with a household income of NZD 150,000 or more (Walsh, 2019). These findings were echoed by Lacey et al. (2022), who determined that poverty was significantly associated with every one of the individual ACE-10 items in their large population data set. Particularly significant were the associations between poverty and

the sexual abuse ACE, poverty and the maternal mental illness ACE, and poverty and the parental separation or divorce ACE measure (Lacey et al., 2022).

Access to Local Shops, Supermarkets, and Libraries

Despite lower numbers of rural mothers participating in the study, the analysis revealed significant associations. Rural dwelling was significantly associated with higher ACE scores in the current sample. This finding aligns with international research. For example, the Behavioral Risk Factor Surveillance System (BRFSS) American National Survey of Children's Health identified five ACE measures more commonly reported among children living rurally than children from urban areas (Talbot et al., 2016). The five ACEs they identified were divorce or separation of parent or guardian, living with someone with an alcohol or substance use disorder, parent or guardian who has served time in jail or prison, living with someone with a mental illness, and seeing or hearing domestic violence (Talbot et al., 2016). Follow-up ACE research would benefit from increased representation from those who live rurally in Aotearoa to increase the statistical power and allow for the generalisation of the findings for this population group.

Ethnicity

The findings presented in this thesis revealed associations between ethnicity and ACE scores in our maternal population of Aotearoa. Examining the ACE scores across the different ethnic groups revealed an important pattern. There are apparent differences in the representation of Māori and Pacific peoples in the high-risk category of ACE scores compared to the NZE and Asian groups, with the proportions of Māori and Pacific mothers in the high-risk group much higher comparatively. In a systematic review examining ACEs in Indigenous populations, Radford et al. (2022) concluded that ACE scores were consistently higher in Indigenous communities across the international studies they examined. Radford et al. (2022) described how indigenous populations, despite recording higher ACE scores and experiencing increased negative health consequences, will often also experience barriers to accessing appropriate healthcare services. In other words, they are likely exposed to the consequences of historical traumas and continue to experience ongoing cultural insensitivity and racism (Radford et al., 2022). Radford et al. (2022) uncovered that the ACE score means in indigenous participants averaged 3 out of a possible 10 ACEs, compared with an average non-indigenous ACE score of 1.36 out of 10. Significant associations between experiences of childhood adversity and psychological distress with suicidality for Indigenous participants were also revealed (2022). These findings align with the index study's results, which, for the first time in Aotearoa, exposed consistent associations between higher ACE scores and increased rates of depression, anxiety, and stress in a maternal study population. This is significant as in Aotearoa, suicide is the leading cause of maternal death in the perinatal period, with mothers who identify as Māori 3.35 times more likely to die by suicide than any

other ethnic group, with 24 deaths in every 100,000 Māori mothers each year (Maternal Care Action Group New Zealand (MCAGNZ), 2022). The research presented here contributes one novel explanation for why these rates are comparatively so high, as the data shows that Māori mothers have increased mental health risks associated with their increased exposure to childhood adversity. This study thus offers proof of an association between maternal ACEs and maternal mental illness, which could provide the impetus for MCHS to develop culturally responsive assessment tools and interventions for Māori mothers in an approach to reduce the inequity of mortality and morbidity-related outcomes for this and other minority population groups.

Relationship Status

The index research results established a pattern for how ACEs are reported by the mothers who were unmarried versus those who were married. Mothers in the unmarried group scored significantly higher ACE scores than those married. A retrospective cohort study involving 1,896 US mothers investigated the interplay between maternal ACE scores, paternal involvement, and the birth outcomes of their children (Testa & Jackson, 2021). Testa and Jackson's (2021) research findings demonstrated the significant role of marital status in mediating maternal ACEs and outcomes for their children. Firstly, their results affirmed the findings that ACE scores were higher in unmarried participants. When analysing the health outcomes of their newborns, the newborns of unmarried women who were exposed to four or more ACEs had a 3.74 times greater probability of low birth weight and a 1.74 times greater probability of preterm birth than the infants whose mothers reported no ACE exposure (Testa & Jackson, 2021). Testa and Jackson's findings support the theory of intergenerational ACE transmission from mothers to their children, discussed earlier in this chapter.

Childhood Home Living Arrangement

The study's data illustrated significant differences in mother's ACE scores based on the participants' childhood home composition. In Aotearoa, children are typically raised by caregivers other than their parents when there has been a dramatic disruption to the function of the whānau unit (Oranga Tamariki, 2017). Many types of disruption translate to measures of childhood adversity, reflecting clear pathways for the association between children not living with their biological parents and the children reporting higher ACE scores. Not surprisingly, in this study, the highest mean ACE scores were recorded in mothers who were raised by relatives, foster parents, or an institution. Plant et al. (2013) study describes how parents who were maltreated in childhood are at an increased risk of enacting those same harmful behaviours on their children. Building on these findings, a US retrospective cohort study (n = 2,205) by Schickedanz et al. (2021) identified that the factors of parental mental health, aggravation towards their children, attitudes towards parenting, and parenting conflict were the mediating factors for whether the intergenerational transmission of ACE-harm from

a parent to their child was enacted. Schickedanz et al. (2021) determined that two-parent households were positively associated with lower ACE scores in children, even in the presence of parental ACEs. In the Aotearoa-based retrospective cohort study by Walsh et al. (2019), the strength of the parent-to-parent relationship was identified as the most vital protective factor for children of ACE-affected parents out of the 37 variables for protection entered into their research model (Walsh, 2019). These studies highlight the need for more clinical strategies that support and enhance parenting relationships in an attempt to reduce and even prevent intergenerational harm for children who have an increased ACE risk.

Research Question Three

The present study revealed significant associations between the DASS-21 subscales of depression, anxiety, and stress, with several of the socio-demographic characteristics measured in the study.

Depression

Depression, as measured by the DASS, was associated with the youngest child's age, access to local shops, supermarkets, and libraries, maternal age, highest qualification, and total household income. Those with higher scores for depression typically had younger children, were more rurally located, were not married, were younger, achieved lower post-secondary school qualifications, and had lower household incomes.

Depression and Age of Youngest Child. In the present study, depression was positively associated with the age of the youngest child. This finding is in line with international evidence. For example, Stowe et al. (2005) conducted a study examining the timing of new-onset postnatal depression, determining that the symptoms of PND typically commence between birth and twelve weeks postpartum. The academic literature provides a range of reasons for the timing of this onset, including the pronounced hormonal changes in women in the early weeks of the postnatal period. Trifu et al. (2019) identified several hormonal interactions with associated psychiatric responses involved in late pregnancy, during birth, and in the early weeks of the postpartum period. Their study highlighted that many perinatal mood syndromes involve estradiol, progesterone, oxytocin, cortisol, and thyroid hormonal changes (Trifu et al., 2019). Another strong theme in the literature linking higher rates of depression to the early postnatal period and, thus, younger infant age is sleep deprivation (Fu et al., 2023; Maghami et al., 2021; Poeira & Zangão, 2022; Wang et al., 2023). In a meta-analysis examining antenatal and postnatal sleep disturbance and PND symptoms, Fu et al. (2023) described that postnatally, women who experienced poor sleep quality reported 2.71 times higher rates of depression than mothers who reported good sleep quality. These findings were even more significant when poor sleep onset commenced in pregnancy. Women who reported poor sleep

quality during the antenatal period were 3.72 times more likely to experience PND in their study population of almost 40,000 maternal participants (Fu et al., 2023). The trend observed in these studies leads to speculation that sleep may be linked with PND; this association requires testing in a maternal population of Aotearoa to provide evidence as a further focus for health promotion in reducing symptoms of mental illness in the perinatal period, particularly in ACE-affected maternal populations.

Depression and Access to Local Shops, Supermarkets and Libraries. The association observed in this study between rural dwellings and higher rates of DASS-measured depression is not a research trend commonly observed in the literature. A Canadian study of over 6,000 mothers identified higher rates of postpartum depression among mothers living in urban areas than in mothers who lived in rural, semi-rural or semi-urban areas (Vigod et al., 2013). An explanation for these findings was offered in a 2022 study that explored well-being and health in rural Aotearoa (Jaye et al., 2022). Jaye et al. (2022) reported that the high value that rural people of Aotearoa place on their community's assets and their contribution to their well-being and health may mitigate the disadvantages of distance to health services in this population. These rural population findings, when combined with this study's findings of higher rates of depression in rural mothers, lead to the suggestion that the rural maternal population of Aotearoa uniquely requires increased social connection during the postnatal period. This idea was supported in the 2015 NZ New Mothers Mental Health Survey (Health Promotion Agency, 2016). One of the key findings in the survey was the need for maternal social connection to foster good mental health and well-being postnatally. The HPA survey revealed that participants who screened positively for PND reported lower social connectedness, greater isolation, lower family/whānau well-being, and lower levels of life satisfaction (Health Promotion Agency, 2016). There are opportunities to examine the role of social connectedness within future studies, specifically focussing on the connections that promote positive mental health outcomes for rural whānau in Aotearoa.

Depression and Maternal Age. Maternal age was again found to be a significant socio-demographic characteristic in our study, this time in its association with depression. Younger maternal age was significantly associated with higher rates of DASS-measured depression. This is a consistent finding within the academic literature that cites a range of risk factors that contribute to younger mothers experiencing higher rates of depression. These include a lack of social support, increased financial stressors, increased risk of unplanned pregnancies, instability of relationships, lower levels of education and life skills, as well as experiencing increased stigma and social pressures (Abdollahi et al., 2014; Ghaedrahmati et al., 2017). In a US qualitative study examining the experience of unintended pregnancy in adolescence and early adulthood, Moseson et al. (2019) described the significant stigma experienced by younger mothers relating to pregnancy, leading to selective and

limited disclosure of the pregnancy to people in their social support networks. Moseson et al. (2019) described how societal stigma compounded the negative aspects of unintended pregnancy, where many participants described being rejected by their partners, their peer groups, and their families, leading to increased isolation. An exciting insight for future clinical application from this study was that almost every one of the 25 participants reported that having someone to talk to who had also experienced unintended pregnancy as a way to alleviate stigma, share perspectives and lessons learned would have improved their experience and their outcomes, mainly as their usual supports had fallen away (Moseson et al., 2019). Although small, this study highlights the potential for peer support services for younger mothers as a method to strengthen support systems, reduce the impact of stigmatisation and potentially reduce the risk of poorer mental health outcomes in younger mothers (Moseson et al., 2019).

Depression, Highest Qualifications, and Income. The findings presented in this study revealed significant positive associations between participants' highest qualification and total household income; the higher their post-secondary school qualifications, the more likely they were to report higher total household income levels. These results also determined that qualifications and income were each significantly inversely associated with postnatal depression. Those participants reporting higher levels of PND were more likely to have achieved lower qualifications and reported a lower total household income. Interestingly, these results contradict findings from Goyal et al. (2010). This US study followed 210 mothers over the perinatal period to assess the impact of income on symptoms of antenatal and postnatal depression. Goyal et al. (2010) reported that depressive symptoms were only correlated with socioeconomic status antenatally, not in the postnatal period, as found in my study. One explanation for the difference in findings is that limited studies have independently assessed income as a predictor of PND and have also controlled for the influence of additional socio-demographic factors. Negative socio-demographic factors are generally comorbid in low-income population groups. These comorbidities and their consequences will likely contribute to the lower mood of mothers in the postnatal period (Abel Fekadu et al., 2020; Garfield et al., 2015; Providence et al., 2023).

The associations uncovered in this research study between educational qualifications, total household income, and the levels of PND align with findings from a large longitudinal birth cohort study in Japan (Kenta et al., 2019). Kenta et al. (2019) identified that participants' education and income levels were independent risk factors for PND in their sample of over 90,000 Japanese postnatal mothers. The current study's and Kenta et al.'s (2019) findings that have linked increased symptoms of depression in mothers with lower qualifications and lower levels of income lead to a possible theory that high income may be a protective factor against postnatal depression in mothers. This theory was analysed in an international systematic review and meta-analysis involving 58 studies that examined the socio-

demographics of maternal participants reporting postnatal depression (Abel Fekadu et al., 2020). Abel Fekadu et al. (2020) determined that a pooled odds ratio of 2.05 (1.66– 2.54) $p = <.001$ increased the likelihood of experiencing PND in the mothers who reported low economic status. These results align with the current research findings that identified maternal qualifications and, thus, total household income are significantly associated with depressive outcomes postnatally. This is evidence to advocate and promote national policy to ensure adequate household income for women and whānau in the postnatal period as a protective measure to reduce the risk of PND and its far-reaching negative and intergenerational consequences in Aotearoa (World Health Organisation, 2022).

Depression and Relationship Status. The results presented in the index study revealed a significant difference between the mean depression scores of the two relationship status groups. In the married/civil union group, there was a significantly lower mean score of depression when compared with the non-married/not in a civil union group. These findings align with a large Canadian cross-sectional study that examined National Population Health Survey data to determine whether relationship status and experiences of depression were associated (Bulloch et al., 2017). Bulloch et al. (2017) reviewed the data of almost 900,000 Health Surveys spanning from 1996-2013 and determined that depression was found to be the lowest in survey participants who were married. There was also a trend that for those who were unmarried, depressive symptoms increased steadily over time, a finding that contrasts with previous research, which has demonstrated a general decline in population depressive symptoms with advancing age (Bulloch et al., 2017; Patten et al., 2016).

Anxiety

Anxiety, as measured by the DASS, was associated with maternal age, highest qualification, and total household income. Those mothers with higher scores for anxiety typically were younger, were more rurally located, achieved lower post-secondary school qualifications, and had lower household incomes.

Anxiety and Maternal Age. The findings linking younger maternal age to increased levels of anxiety in the current study are similar to those reported in an Indonesian study led by Puspasari Ayu et al. (2019). In their cross-sectional study, increasing maternal age was found to be correlated with lower levels of maternal anxiety (Puspasari Ayu et al., 2019). A further study that sought to determine whether anxiety levels were higher in a maternal population (<21 years) than in a control group of young women with no children uncovered that the ‘young mothers group’ were 2 to 4 times as likely to have an anxiety disorder, including generalised anxiety disorder, separation anxiety disorder, social phobia, and specific phobia, than the ‘non-mother’ control group (Van Lieshout et al., 2020). In contrast, the Norwegian Mother and Child Cohort Study (n = 19,000) reported higher rates of maternal distress and anxiety in the older mothers participating in their study compared with the

younger mothers (Aasheim et al., 2012). Aasheim et al. (2012) determined that women over the age of 32 years had an increased risk of parenting distress over the first 18 months postpartum when compared to mothers who were aged 25-31 years (Aasheim et al., 2012). The conflicting findings between maternal age and anxiety across these studies may result from the differences in how each study has categorised their 'younger age group' participants. The category of older mothers in the Aasheim et al. (2012) study was compared with a younger mother group aged 25-31 years. Whereas the study by Puspasari Ayu et al. (2019) identified their younger mother age group as < 20 years and Van Lieshout et al. (2020) as <21 years. The differences in the ages of the younger mother groups limit the comparability of the study's findings.

Anxiety and Highest Qualification. The index study's findings identified a significant inverse correlation between post-secondary school qualification achievement and maternal anxiety; those who recorded higher levels of anxiety were found to have achieved lower-level post-secondary school qualifications. These findings align with McCurdy et al. (2022), whose study examined the relationship between anxiety and depression and academic achievement in US children across 13 public schools in California. Anxiety was found to predict lower spelling and maths skills strongly and significantly in their eight and nine-year-old participants (McCurdy et al., 2022). In a study examining social anxiety and academic achievement over three years in university students, Brook and Willoughby (2015) determined that social anxiety had a significant and negative direct relationship with academic achievement in their population of 942 Canadian students. The studies of McCurdy et al. (2022) and Brook and Willoughby (2015) combined with the current study findings that relate higher levels of anxiety with lower qualification achievement point towards a lifelong trend for those who experience anxiety struggling to achieve academically. Further research is required to determine strategies to reduce childhood anxiety, particularly in those who have an increased risk through a positive ACE score, in an attempt to help them improve their academic achievements, allowing them to gain qualifications and subsequently earn a better income.

Anxiety and Income. My study found significant inverse associations between maternal anxiety and total household income; as anxiety scores increased, total household income was found to decrease. A UK longitudinal study offers a lifespan perspective to these study variables (Parra-Mujica et al., 2023). Parra-Mujica et al. (2023) applied a logistic regression model to examine symptoms of anxiety and depression against the variables of sex, age, ethnicity, birthplace, region, rurality, highest qualification, marital status, employment status and attrition. Firstly, as with my study findings, they confirmed the inverse relationship between the variables of income and heightened anxiety. Secondly, they determined that increases in average net equivalised household income throughout childhood and adolescence were significantly associated with reduced symptoms of anxiety and depression in their participants (Parra-Mujica et al., 2023). These findings, as found with depression, lead to the

researcher's recommendations for national policy to ensure adequate household income for women and whānau in the postnatal period as a protective measure to reduce the risk of anxiety and its' intergenerational negative consequences in Aotearoa (World Health Organisation, 2022).

Anxiety and Ethnicity. My results revealed a significant difference in the anxiety score means across the ethnic groups in this maternal study sample. Mothers who identified as Māori and Pacific scores were allocated to significantly higher levels of anxiety when compared to NZE participants. These findings contrast with an Aotearoa/Australia meta-analysis that examined mood and anxiety disorders in indigenous populations (Black et al., 2017). Black et al. (2017) found that in the seven Australian studies and 10 Aotearoa studies, Indigenous people in both countries did not have significantly higher rates of anxiety disorder. Participants who were Māori were found to have considerably lower rates of simple phobias or generalised anxiety disorders when compared to non-Māori people of Aotearoa. One reason that Black et al. (2017) results contrasted with our study findings could be the differences in inclusion criteria for the study's participant samples. Black et al. (2017) study inclusion criteria included study participants of any age or gender who had received a psychiatric diagnosis according to the criteria specified by the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (American Psychiatric Association, 2013). As the index study focussed on a maternal population of Aotearoa in their first postnatal year, the self-reported symptoms of anxiety being examined were far more focused on positive symptomology of anxiety, not necessarily resulting in a psychiatric diagnosis. My findings of increased anxiety symptoms in Māori and Pacific mothers in Aotearoa contribute unique insights into the experiences of anxiety specific to the postnatal period.

There is evidence to suggest the significant underdiagnosis of mental health conditions in Māori people of Aotearoa. A 2017 study conducted in Aotearoa found that although Māori, Pacific, and Asian people of Aotearoa were more likely to score in the 'at risk' category for risk of developing depression and anxiety, these groups reported the lowest rates for receiving an actual diagnosis of depression and anxiety over the five years measured in the study (Lee et al., 2017). When speculating as to reasons for this finding, Lee et al. (2017) surmised that the inequalities might be a reflection of ethnic group differences in access to, expectations from, and style of communication with medical professionals in Aotearoa; these ideas are validated in the culturally responsive shortcomings in service provision outlined in the 2021 Stocktake report (Ministry of Health, 2021).

Anxiety and Relationship Status. The study generated findings that highlighted differences in mothers' anxiety scores based on their relationship status. In the married/civil union group (n = 356), the mean DASS anxiety score was significantly lower when compared with the mean DASS anxiety score in the not married or in a civil union group. When surveying the international literature

on this association, the associations between these variables do not appear straightforward. That is, being married does not consistently predict lower rates of anxiety across the literature. This was illustrated in a South African study that aimed to assess the prevalence of PND and anxiety and to investigate their relationship with marital satisfaction in low-risk women (Odinka et al., 2018). Odinka et al. (2018) revealed that levels of depression and anxiety were dependent on the marital satisfaction of the participants, not the marital status. Those participants who reported the highest levels of marital dissatisfaction were determined to register the highest rates of comorbid depression and anxiety (Odinka et al., 2018). In a further study that offered marital communication skills training to promote marital satisfaction and psychological health during pregnancy, it was revealed that there were significant differences in the scores of marital satisfaction, depression, and anxiety in the intervention and control groups (Zahra et al., 2020) Women who had received the intervention not only reported increased satisfaction in their marriage, they also reported significantly lower rates of anxiety and depression. The two studies of Odinka et al. (2018) and Zahra et al. (2020), along with our study findings, highlight the importance of assessing marital status in relation to anxiety and including measures to assess for marital satisfaction. Future research that includes additional analysis of marital satisfaction would provide a clearer picture of possible protective factors against maternal anxiety in Aotearoa.

Stress

The study's findings positively correlated maternal DASS-measured stress scores with the number of children variable, revealing that the more children a mother has, the higher her reported stress level in our study participants. Negative significant associations were observed with stress and maternal age, access to supermarkets, libraries, and shops, highest secondary and post-secondary school qualifications, and total household income. Associations were also observed between stress scores, ethnicity, relationship status, and childhood home living arrangement. Higher-stress participants were typically younger, lived rurally, achieved lower secondary and post-secondary school qualifications, and reported lower total household incomes. Higher stress scores were observed in Māori and Pacific participants, those not married or in a civil union, and those who grew up without both parents in their family home. Risk factors for maternal stress are significant to uncover as the literature describes associations between maternal stress and adverse birth outcomes, including preterm birth and low birth weight (Lilliecreutz et al., 2016), developmental delays and behavioural difficulties in children (Amici et al., 2022), as well as maternal physical and mental health issues (Coussons-Read, 2013; Kim et al., 2019), which may have negative impacts on the parent-child relationship (Kim et al., 2019).

Stress and Number of Children. The study revealed that maternal stress levels increased as the number of children in the family increased. This association may result from increased caregiving

responsibilities, time and resource constraints, reduced time for self-care, limits to social support, and challenges balancing family commitments with other responsibilities and aspirations of mothers (McQuillan et al., 2019; van den Broek, 2021). The relevance of this finding was described in an international literature review, including 74 studies (Oyetunji & Chandra, 2020). Oyetunji and Chandra (2020) reported that across the literature, there were significant negative associations between maternal stress in the postnatal period and adverse consequences for infant growth, development, nutrition, sleep, and mother-infant attachment. The current study builds on these findings by offering an explanation for the increased maternal stress: The experiences of childhood adversity. If maternal ACE scores were applied as a risk factor by services who work alongside mothers in Aotearoa, services could target stress reduction strategies to ACE-affected whānau and, ultimately, improve maternal stress-related outcomes.

Stress and Maternal Age. The study's data demonstrated an association between younger maternal age and increased symptoms of stress. As with depression and anxiety, the contextual factors that influence many younger mothers remain when considering the impact on stress (Menon et al., 2020; Mersky & Janczewski, 2018). Protective factors and psychological vulnerabilities were examined in a study that modelled the trajectories of young mothers' parenting stress from their children's infancy to school age (Menon et al., 2020). Menon et al.'s (2020) study results indicated that in mothers with a high level of protective factors such as family support and access to formal support services, maternal stress levels were both initially lower and tracked lower over time when compared with mothers with low levels of support. Mothers who had identified mental health risk factors at the beginning of the study period were found to have higher parenting stress patterns over time (Menon et al., 2020).

Stress and Access to Local Shops, Supermarkets and Libraries. The finding in the study that maternal stress was associated with rurality is likely due to the theory of the increased need for social connectedness of mothers in the postnatal period that was described in the depression section. In an Australian prospective longitudinal study that examined perinatal well-being across urban and rural locations in over 800 mothers, Galbally et al. (2023) discovered that rural mothers reported lower rates of depression and anxiety and reported less stressful events when compared to women in metropolitan regions. However, women who lived in rural settings who did experience depression reported significantly higher parenting stress than urban mothers experiencing depression (Galbally et al., 2023). Galbally et al. (2023) attribute this difference to the limited ability of rural mothers to access formal and informal support when experiencing issues with their mental health. Rural dwelling being significantly associated with higher levels of depression and stress within our study highlights the need for further examination of the mental health needs of rural mothers in Aotearoa and the need

to invest in both formal mental health supports and informal parenting support groups in rural communities (Galbally et al., 2023; Health Promotion Agency, 2016).

Stress and Relationship Status. When reviewing the results for associations between stress scores across the relationship status groups, significant differences between the stress means in each relationship status group are observed. In the married/civil union group, the mean DASS stress score was significantly lower than in the non-married or civil union group. The pattern observed in the literature of the quality of the marriage being the predictor of stress that was discussed in relation to anxiety and relationship status is again observed in the international literature for the variable of maternal stress. A cross-sectional study undertaken in Thailand examined the prevalence, associated factors, and predictive factors of perceived stress in pregnant women (Thongsomboon et al., 2020). Through multiple logistic regression, Thongsomboon et al. (2020) determined that marital conflict was the second strongest predictor of maternal stress in the antenatal period of their participants, only preceded by family conflict. Symptoms of perceived stress were significantly associated with divorce and separation from their spouse (Thongsomboon et al., 2020). This theme was again acknowledged in an integrative literature review examining risk factors associated with stress symptoms during pregnancy and postpartum (Saur & dos Santos, 2021). Partner-related stress was a key theme identified across the literature, supporting the notion that marital status may be less critical than marital satisfaction in supporting the mental health status of mothers in the perinatal period (Saur & dos Santos, 2021). Further research comparing these two variables is warranted.

Stress and Childhood Home Living Arrangement. The study determined significant differences in the stress scores of the childhood home living arrangement groups. When the groups were examined independently, the only categories to reach statistical significance were 'both biological/adoptive parents in the household' compared to the 'biological or adoptive parents divorced or not living together', indicating that those participants who grew up with their biological or adoptive parents separated or divorced were more likely to report a higher DASS score for stress. Studies have demonstrated that stress levels are significantly higher in families who have divorced when compared to their non-separated peers (Lange et al., 2022; Strizzi et al., 2021; Tullius et al., 2022). When considering the stress for the children of separated/divorced parents, a Dutch cross-sectional study revealed a positive association between parental conflicts and symptoms of posttraumatic stress disorder in children (Lange et al., 2022). An interesting aspect of this study was the persistence of the stress symptoms over an extended period of time for those participants whose parents had historically separated or divorced. Similar findings were observed in a longitudinal study that measured the mental health outcomes of adolescents into adulthood (Tullius et al., 2022). Tullius et al. (2022) found that levels of emotional and behavioural problems in adolescents whose parents had divorced were significantly higher than in adolescents whose parents had not divorced. The increase of emotional

and behavioural issues in the affected adolescents was found to not only persist into adulthood but also enlarge over that time (Tullius et al., 2022). The literature findings, coupled with the findings from my study, highlight the need for services supporting whānau in Aotearoa to assess for and offer timely support in strengthening parental relationships and strategies to reduce parental conflict. It appears that the harmful impact of separation and divorce on stress-related outcomes on the children of separated parents is significant and persistent into adulthood. Strategies to strengthen the parent-to-parent relationship warrant attention within government policy, clinical practice settings, and future research in Aotearoa (Walsh et al., 2019b).

Research Questions Four and Five

Research Questions four and five each examined the relationship between childhood adversity using the ACE-10 tool and postnatal depression, anxiety, and stress as measured by the two screening tools. Question 4 is focused on the PHQ2+ (depression and anxiety), and Question 5 draws on the DASS-21 (depression, anxiety, and stress). As the two research questions were intended to examine the relationship between ACEs and maternal mental health outcomes, these questions are discussed simultaneously, even though the two questions are answered by applying different mental health measurement tools and statistical methods in their analysis.

ACES and Depression

My study findings identified that the ACE scores of the study sample mothers in their first postnatal year were a significant and positive predictor of PHQ-measured depression by applying questions one and two of the PHQ2+ tool. This association was confirmed when analysing depression using the more extensive DASS-21 tool. Results of the ordinal logistic regression test showed that ACE is a positive predictor of DASS-measured depression, indicating that as a mother's ACE score increased, so too did the level of depression in the participants of the study sample. These findings align with the international literature that has examined childhood adversity and depression in the postnatal period, highlighting this association as a critical outcome of focus for the study (Chang et al., 2021; Esteves et al., 2020; Ilter Bahadur et al., 2021; Johnson et al., 2017; Kim et al., 2020b; Letourneau et al., 2019; Li et al., 2020; Mahenge et al., 2018; McDonald et al., 2019; McDonnell & Valentino, 2016b; Meltzer-Brody et al., 2018; Menke et al., 2019; Mersky & Janczewski, 2018; Nidey et al., 2020; Racine et al., 2018b; Shin et al., 2021; Watters et al., 2021).

In Denmark in 2018, a large epidemiological, population-based, retrospective cohort study with over 85,000 participants examined the themes of childhood adversity and new-onset depression in the postnatal period (Meltzer-Brody et al., 2018). Meltzer-Brody et al. (2018) reported a significant association between experiences of early life adversity and new-onset depression postnatally. When

analysing their findings by ACE category, the most significant risks for any report of mental illness were observed in participants with a history of placement in out-of-home care and parental mental illness, excluding substance abuse. A fundamental limitation of the study by Meltzer-Brody et al. (2018) was the highly adapted ACE tool that they were required to apply due to the omission of many of the original ACE items from their original data set. Despite the significance of the correlation between childhood adversity and PND, applying this amended ACE tool comparing the data of Meltzer-Brody et al. (2018) study to the current study's findings is not a valid comparison.

Letourneau et al. (2019) presented a comparable study to mine, applying the standard ACE-10 assessment tool to a maternal population of Canadian mothers whose sample characteristics were similar in maternal age, marital status, post-secondary school qualifications, and total household income. This large-scale study, including over 900 mother-infant dyads, confirmed our findings that maternal ACEs are significantly associated with perinatal depression and anxiety. Letourneau et al. (2019) study examined the intergenerational associations between maternal ACEs and their offspring's mental health and development. Maternal total ACE scores were significantly associated with maternal depression, which was significantly correlated with child externalising behaviours (aggressive behaviour, attention problems) at two years of age (Letourneau et al., 2019). Postnatal depression was found to uniquely contribute to the effects of maternal ACEs on child mental health behaviours at two years (emotionally reactive, anxious/depressed, somatic complaints, and withdrawn) even after accounting for the effects of maternal anxiety (Letourneau et al., 2019).

ACEs and Anxiety

As found with depression, childhood adversity was significantly associated with maternal anxiety when applying both the PHQ2+ and the DASS-21 tools within this maternal study sample. In a pilot study examining the feasibility and acceptability of including a prenatal and postnatal home-based ACE assessment as part of a vulnerable mothers' home visiting service, data was gathered to assess associations between ACE scores and anxiety (Johnson et al., 2017). Johnson et al.'s (2017) study population reported a high ACE prevalence, with 80% of mothers reporting an ACE score of at least one and 45% reporting an ACE score of four or more. As such, Johnson et al.'s (2017) population have higher ACE scores when compared with the findings presented here, where 72.3% of participants reported an ACE score of one or more, and 25% reported four or more ACEs. Johnson et al.'s (2017) findings revealed that ACEs were positively associated with anxiety both prenatally and postnatally. The average ACE score for mothers screening positive for anxiety prenatally was 4.0 (SD 3.1), and negative prenatally 2.4 (SD 2.7). The average ACE score for mothers screening positive for anxiety postnatally was 3.0 (SD 2.3), and for those screening negative postnatally, 2.4 (SD 2.0). As a point of interest for applying the current study's findings to clinical practice, the Johnson et al. (2017) study also demonstrated that including a home-based ACE assessment activity as part of the home,

the visit was deemed widely acceptable by the families engaging with the service. It was considered feasible by the home visiting service providers (Johnson et al., 2017). The index study's ACE score and anxiety findings were comparable, with the average ACE score of those participants who screened positive for symptoms of anxiety (mild, moderate, severe, or extremely severe) being 2.9 compared with 1.7 in participants who scored in the 'normal' level of anxiety. The results also illustrated the graded association between maternal ACEs and postnatal anxiety described by Johnson et al. (2017). As the mothers total ACE score increased, so too did their anxiety levels.

ACEs and Stress

Stress was found to be positively and significantly associated with maternal ACE scores, and as found with both depression and anxiety, as the maternal ACE score increased, so too did the level of stress in the present study sample. This relationship between adversity and stress is foundational to ACE theory, where the reason for the harm caused by ACE to the brain and body is believed to be a consequence of a maladaptive stress response system (Centre on the Developing Child, 2016). As discussed in the background section of this thesis (see section The Mechanisms of ACE Harm), in an acute response to stress, the sympathetic nervous system stimulates the adrenal glands to release catecholamines, including adrenaline and noradrenaline. These hormones increase heart rate, blood pressure, and respiration rate, commonly called the 'fight, flight, or freeze' response. When this system functions normally, the body returns to its pre-arousal function levels 20-60 minutes after the removal of the perceived threat (The American Institute of Stress, 2023). Experiences of early life adversity that are severe, prolonged, or repetitive cause a hyperarousal of the sympathetic nervous system's 'fight, flight or freeze' response, resulting in the dysfunction of the neuro-endocrine-immune response system, allowing for prolonged cortisol activation and a chronic state of inflammation, with failure of the body to normalise these functions once the stressor has been removed (Franke, 2014). This is particularly significant in the first 18 years as the developing brain is more plastic and permeable to the potentially toxic mediators of the hyper-aroused stress response system (Danese et al., 2009).

The relationship between ACEs and maternal stress is clearly described within the academic literature (Chang et al., 2021; Meltzer-Brody et al., 2018; Mersky & Janczewski, 2018). In their longitudinal study based in Taiwan, Chang et al. (2021) determined that maternal ACEs were directly associated with higher levels of stress during pregnancy, antenatal anxiety, and depression and indirectly associated with higher levels of PND and poorer developmental outcomes in infants of affected mothers at six months of age. An additional study offering an intergenerational perspective on the topic is a US study examining the prenatal and postnatal mechanisms by which maternal adverse childhood experiences predict the early development of their offspring (Racine et al., 2018b). Racine et al. (2018) observed that maternal ACEs were found to be significantly associated with maternal

stress in pregnancy. Interestingly, antenatal maternal stress predicted poorer infant development at 12 months postpartum, whereas postnatal maternal stress did not predict poorer infant developmental outcomes. These findings may indicate that pregnancy presents a more sensitive period for maternal stress and later related risks for their children than currently assumed. Future studies examining maternal childhood adversity would benefit from both antenatal and postnatal timing for mental health assessments, with added measures to consider the intergenerational risk for children of ACE-affected mothers in Aotearoa.

Covariates

The results from the current study illustrated that childhood adversity was a significant predictor of depression, anxiety, and stress in our maternal study population. When undertaking logistic regression testing, the socio-demographic characteristics that were found to be positively associated with depression, anxiety, and stress were entered into the model as potential predictor variables.

Other Predictors of Depression, Anxiety and Stress. For depression, the covariates added to the model, along with the total ACE score, that were identified as significantly associated with depression were the total household income, the age of the youngest child, access to local shops, supermarkets and libraries, relationship status, and highest qualification. The regression results indicated that even with the addition of covariates to the model, the participants' total ACE score remained the most significantly and positively associated variable with DASS-measured depression. Total household income also remained a significant predictor after the other demographics were controlled for, meaning that the impact of income has a unique and independent relationship with depression, even after accounting for the influence of other variables (covariates) in the model. Similarly, the youngest child's age and access to local shops, supermarkets, and libraries remained significant, independent predictors of depression, even after accounting for the influence of other variables (covariates) in the model. These findings translate to higher levels of depression in participants who had younger children and were rurally located. Although determined to be initially significant in their associations with depression, the relationship status and highest qualification variables had their effects confounded or influenced by the introduced covariates into the model and thus lost their significance. Relationship status and highest qualification were determined not to be significant predictors of levels of depression in this model.

The socio-demographic variables found to be significantly associated with anxiety were ethnicity, maternal age, relationship status, income, highest secondary school, and post-secondary school qualifications. As found with depression, even with the addition of covariates to the regression model, the participants' total ACE score remained the most significantly positively associated variable with DASS anxiety. For ethnicity, the NZE variable remained inversely and significantly associated with

DASS anxiety, indicating lower levels of anxiety in this population group. Similarly, maternal age, relationship status, and total household income each remained significant, independent predictors of anxiety, even after accounting for the influence of other variables (covariates) in the model. These findings translate to higher levels of anxiety in participants who were younger, not married or in a civil union, with lower total household income. Although determined to be initially significant in their associations with anxiety, childhood home living arrangement, highest secondary school qualification, and highest qualification were not significant predictors of DASS-measured anxiety in the model.

As found with depression and anxiety, participant ACE scores remained the strongest predictor of DASS-measured stress, even with the addition of covariates. The significant socio-demographic variables associated with stress and added to the regression model were ethnicity, maternal age, relationship status, childhood home living arrangement, total household income, number of children, highest secondary school qualification, and highest qualification. For ethnicity, the NZE variable remained inversely and significantly associated with DASS-measured stress, indicating lower stress levels in this population group. Similarly, maternal age, relationship status, childhood home living arrangement, and total household income each remained significant, independent predictors of stress, even after accounting for the influence of other variables (covariates) in the model. These findings translate to higher levels of stress in mothers who were younger, unmarried, or not in a civil union, who grew up without both parents in the family home and who had lower total household income. Although determined to be initially significant in their associations with stress, the number of children, highest secondary school qualification, and highest qualification were not significant predictors of DASS stress in the model.

The logistic regression determined that, apart from participant ACE scores, income was the strongest predictor of depression, anxiety, and stress in the maternal population. A large prospective cohort study of 3009 Irish mothers analysed mental health outcomes by applying the DASS-21 across five time points during pregnancy through to 12 months postpartum (Hannon et al., 2022). Logistic regression was used to analyse which of the participant's socio-demographic factors most strongly predicted the outcomes of depression, anxiety, and stress (Hannon et al., 2022). Hannon et al. (2022) determined that maternal age less than 18 years was the strongest predictor of depression, anxiety, and stress in their study sample; this was followed by the socioeconomic status (SES) variable. Mothers who reported a low SES during pregnancy were associated with two to three times higher odds of reporting depressive symptoms, anxiety symptoms, or stress in the first postnatal year (Hannon et al., 2022). The significant role of income and depressive outcomes, both antenatally and postnatally, was examined in a further study focused on first-time mothers in the US (Goyal et al., 2010). Goyal et al. (2010) determined that low SES was associated with increased depressive symptoms in pregnancy and up to three months postnatally. Maternal participants reporting four SES risk factors (low monthly

income, less than a college education, unmarried, unemployed), compared with mothers with no SES risk factors, were 11 times more likely to have received a depression diagnosis at three months postpartum, even after controlling for the level of prenatal depressive symptoms (Goyal et al., 2010). Interestingly, not all of these socio-demographic associations align with the current study's findings. The maternal age, relationship status and highest qualifications variables were not found to be significantly associated with depression in my statistical model. Maternal age was, however, determined to be a significant predictor of anxiety and stress in the maternal population, aligning with the findings from Hannon et al. (2022) and Goyal et al. (2010). There appear to be emerging themes running through our findings and the international literature that there are socio-demographic factors that play a significant role in predicting adverse maternal mental health outcomes. Further research is required to examine a wide range of factors (covariates) that may contribute to the mental health status of mothers in Aotearoa to provide clear evidence of which socio-demographic risk factors can be strengthened to reduce maternal mental health risks.

Future Research

Although the index study answered each defined research question, the insights gained throughout the study have generated further questions that can be examined in future research.

Firstly, I strongly recommend a prospective examination of ACE and maternal mental health outcomes in Aotearoa. Such an approach would allow for the causal relationships between maternal childhood adversity and maternal mental health outcomes to be explored in detail. For example, utilising the existing longitudinal Growing Up in New Zealand (GUiNZ) data set. GUiNZ is a prospective longitudinal study with more than 6,000 nationally representative children in their sample. The prospective, long-term, and large sample of GUiNZ has generated several research insights that have been used to inform health and social policy, and clinical practice. A similar model could be used to examine maternal well-being (Walsh et al., 2019b). Walsh et al. (2019a) have argued that there is good reason to study ACEs within this birth cohort and published research that applied an individual ACE assessment tool at the 54-month wave of the study. To date, the published findings from this study have focussed on individual (child) ACEs and school readiness, protective factors against ACEs, and the ACEs of children with teen mothers (Walsh et al., 2019a, 2019b; Walsh, 2021). Although the ACE-prevalence data published by Walsh et al. (2019) is the strongest indicator we have of a current national prevalence of childhood adversity in Aotearoa, there remains limited ability to compare the prevalence of ACEs in the four-and-a-half-year-old cohort of the GUiNZ study against international adult ACE prevalence study populations. Also, this study has not examined the relationship that exists in Aotearoa between maternal ACEs and maternal depression, anxiety, and stress, as confirmed by the current research. If these variables were to be examined, there is potential

to determine whether a causal relationship exists between maternal childhood adversity and later maternal mental illness in Aotearoa.

In contrast to previous authors (Reuben et al., 2016; Walsh et al., 2019a) who have selected the retrospective inclusion of ACE assessment in their studies, this study argues that prospective measurement for future ACE research is preferable. Prospective measurement allows for the timely evaluation to predict and prevent the development of costly, difficult-to-treat diseases later in life (Reuben et al., 2016). There remains a current opportunity to retrospectively ACE screen the adult mothers of the GUiNZ birth cohort and correlate their ACE scores with their pre-existing maternal mental health data (Growing Up in New Zealand, 2023b). In addition, I recommend the prospective gathering of current ACE data through existing services of clinical practice to achieve a positive research and clinical practice dual result. Firstly, prospective maternal ACE assessment data collected at a mother's first visit with Whānau Āwhina would provide a current stream of ACE data that could be used to identify evolving trends and to evaluate ACE interventions in Aotearoa (Marie-Mitchell et al., 2019). This data would offer a robust and nationally representative method for understanding the current true prevalence of ACEs in our diverse maternal population of Aotearoa. Excitingly, this would also present a unique opportunity to examine ACEs and their associated risks intergenerationally, an approach yet to be undertaken in Aotearoa. Taking an intergenerational approach to ACE assessment and intervention is an evolving research trend in the international literature (ACEs Aware, 2018; Lê-Scherban et al., 2018; Marie-Mitchell et al., 2019; Narayan et al., 2021; Schickedanz et al., 2021; Schofield et al., 2018). Secondly, prospective ACE assessment would allow for timely intervention for clinical services working with whānau in Aotearoa to tailor health promotion strategies that reflect current ACE trends in the data. The ACEs Aware Best Practice Clinical Guidelines (2018) describe how taking a two-generation approach to ACE research and clinical practice recognises the complex and interconnected nature of ACEs, offering assessment and support for both children and their parents simultaneously, creating critical opportunities to break the intergenerational cycle of harm detailed within ACE literature (Narayan et al., 2021; Schickedanz et al., 2021; Schofield et al., 2018).

A further recommendation for future research would be to apply qualitative research methods to explore the experiences of those affected by childhood adversity in Aotearoa. One approach that would support the Kaupapa Māori principles described by Stevenson (2018) could be to engage in interviews to capture data on the protective factors identified by Aotearoa whānau, with interview questions focussed on gaining insights into whānau resilience. Protective factors are significant for children exposed to adversity, as described by Crouch et al. (2019); certain protective factors build resilience in children that can moderate the long-term impact of ACEs across the lifespan. Walsh et al.'s (2019b) study approached the concept of protective factors quantitatively by applying a

predictive risk model for ACEs to the GUiNZ birth cohort. Children deemed most at risk of ACEs who recorded an ACE score of zero were categorised as 'beating the odds'. This 'beating the odds' group data was then analysed using a univariate logistic regression model of 749 variables to assess for factors deemed protective against ACEs for the four-and-a-half-year-olds in the participant sample (Walsh et al., 2019b). Once the protective factors had been categorised, it was determined that the most vital protective factor against ACEs for children in Aotearoa was the strength of the parent-to-parent relationship. This was followed by parental health and wellness, parent-child relationships, family finances, and community and neighbourhood factors (Walsh et al., 2019b).

Walsh et al.'s. (2019b) study has provided Aotearoa-specific data on protective factors against childhood adversity, providing insights into how ACEs can be addressed in Aotearoa. There are opportunities to build on this study to holistically examine the mother and partner relationship to understand better how this protective factor builds resilience for whānau. This would require researchers to work together with whānau to identify their strengths and protective factors, applying those insights together to develop models of care that strengthen these factors and enhance positive outcomes for children and their whānau in Aotearoa. These insights would build on the findings of the current and Walsh et al.'s (2019b) studies to inform services that support whānau on strategies that are specific to the Aotearoa population in effectively reducing the risks associated with ACEs, tailoring resources and evidence-based pathways of care for those who are ACE affected (ACEs Aware, 2020). The ACEs Aware Best Practice Clinical Guidelines (2018) emphasise that services that promote resilience alongside the assessment of ACEs can balance the narrative of childhood adversity, focusing the energy of whānau on preventing ACEs for their children while healing from parental ACEs and strengthening their protective factors. The objective is to heal from adversity, build resilience, and break the intergenerational cycles of harm in Aotearoa.

Recommendations for Policy and Practice: Parts One and Two

Clinical Recommendations: Part One- Assess

My primary clinical recommendation is to offer universal maternal ACE assessment to all mothers engaging with WCTO services and to extend the current PND assessment to include the assessment of maternal anxiety and stress symptoms postnatally.

There has been a notable delay in translating ACE research into any meaningful clinical practice change in Aotearoa. However, evidence of increasing interest in the topic of adverse childhood experiences has been noted in recent Te Whatu Ora reports (formerly the Ministry of Health) (Te Whatu Ora, 2023a, 2023b; Thorn et al., 2019), one such publication being the Brief Evidence

Reviews for the Well Child Tamariki Ora Programme (Thorn et al., 2019). Te Whatu Ora is reviewing the WCTO Framework and Schedule to ensure that WCTO services reflect the evolving needs of children and their whānau in Aotearoa (Thorn et al., 2019). In preparation for this review, Te Whatu Ora commissioned evaluations of the recent literature and emerging research trends on 11 key issues currently facing children and their whānau in Aotearoa. ACEs were one of the critical issues examined (Thorn et al., 2019). Research and practice leaders in the maternal and infant mental health arena were commissioned to evaluate the local and international ACE literature.

My assessment of the recommendations that followed the WCTO review is that they reflect a risk-averse attitude towards universal ACE assessment. This is based upon the reviewer's analysis stating that in Aotearoa, we currently lack a skilled workforce to undertake ACE screening and that there is limited literacy on childhood adversity and its consequences in Aotearoa. This is reflected in the lack of ACE research being translated to healthcare policy, as well as a healthcare system that lacks clear pathways of care for children and their whānau who are affected by ACEs (Thorn et al., 2019). The significant associations between maternal ACEs and maternal mental health outcomes, generated through the international literature, were not mentioned in the report (Thorn et al., 2019). Following the conservative recommendations not yet to offer universal ACE assessment in clinical settings, the directive for clinical practice was to continue current screening for perinatal mental illness. This is prioritised due to the significant bearing that maternal mental illness has on adverse outcomes for both mothers and their children (Thorn et al., 2019). While my literature review findings agree that the burden of maternal mental illness is significant for mothers and their children, our research findings that link maternal childhood adversity with increasing symptoms of depression, anxiety, and stress in the postnatal period offer a unique opportunity for the early identification of women most at risk of postnatal mental illness by the early identification of risk through timely maternal ACE assessment.

Maternal ACE assessment within clinical practice settings is widely accepted internationally as a valid approach to the two-generation pathway for addressing ACEs (Chang et al., 2021; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016b; Racine et al., 2018b; Shih et al., 2021). Rariden et al. (2021) undertook a systematic review of the literature to examine the acceptability, feasibility, and implementation of ACE assessment from the perspectives of both clinicians and patients. Across 13 international studies that included diverse populations of participants in various clinical settings, parental ACE assessment was determined to be widely acceptable by those being assessed. In fact, the review findings highlighted that patients and clinicians reported that parental ACE assessment improved the patient-client relationship. Clinicians reported that ACE screening was feasible in home visiting services, primary healthcare settings, and tertiary healthcare environments (Rariden et al., 2021).

A further US study of over 2,200 families engaging with primary healthcare services also examined the feasibility and acceptability of universal parental ACE assessment as a component of their Well Child visits (Gillespie & Folger, 2017). Gillespie and Folger's (2017) study offered additional insights by conducting a mixed methods study to capture the experiences of families being screened and the reflections of the clinicians undertaking the ACE assessments. Their qualitative findings were compelling and positively supported universal ACE assessment within US Well Child services. Several clinicians reported surprise at how willingly parents explored their own adverse childhood experiences, how grateful they were about being asked about their experiences, and how many parents expressed their relief to no longer carry the burden of their childhood adversity alone (Gillespie & Folger, 2017). The timeframe of the average ACE conversation was analysed and was reported to last between three and five minutes. Clinicians reported that the most compelling question for engaging families in a conversation about ACEs was, 'How do you think these experiences affect your parenting today?' (Gillespie & Folger, 2017). When analysing their parental screening data, there were significantly higher ACE response rates in the cohort that was provided with an aggregated ACE assessment tool, that is, a version of the tool that collects only the total number of ACEs, as opposed to the generic ACE assessment tool that, along with a total ACE score, discloses the specific measures of adversity experienced (Gillespie & Folger, 2017). This finding reflects an apparent increased level of comfort in ACE assessment when the individual ACE measures are not required to be disclosed.

Ethical and Cultural Considerations for Screening

The researcher acknowledges that ACE assessments developed in the US cannot be directly applied to clinical practice in Aotearoa due to significant ethical, cultural, and healthcare system differences between the two countries. In particular, the bicultural model of health, which is fundamental to Aotearoa's healthcare, necessitates careful adaptation and testing to ensure that universal maternal ACE screening is suitable and effective. Ensuring the accuracy and acceptability of the ACE tool and its potential to generate valuable data that address health inequities is crucial, especially for Māori mothers. This process will require guidance from cultural leaders and thorough ethical oversight to minimise harm to Māori mothers and Aotearoa's diverse population of non-Māori mothers. Although a comprehensive examination of these issues lies beyond the current research project's scope, the researcher recognises that a thorough and culturally informed review is essential before implementing ACE screening practices in Aotearoa. The following section applies a US model for ACE integration that can provide a potential ACE assessment foundation for the future. This framework does not override the need for the complex preparation work that has been described. Rather, it offers insights into how an international framework for maternal ACE assessment could be translated here in Aotearoa.

One advantage of the delayed integration of ACE assessment into clinical settings in Aotearoa is that we can now reflect upon the wealth of international knowledge, best practice guidelines, and insights from the extensive evaluations from services undertaking ACE screening clinically for decades. Gears and Schulman (2022) from the US-based Centre for Health Care Strategies conducted a qualitative study on the service providers' perspectives on administering ACE assessment in clinical settings. For their study, they interviewed 14 Medi-Cal providers from 12 clinics across California in the United States. The objective of the interviews was to understand the approaches that healthcare providers use in offering child and adult ACE assessments within their clinical settings, gaining insights into trauma-informed clinical practices. The results of the CHCS interviews were grouped into seven themes, creating the steps for a clinical pathway that healthcare services can follow when implementing ACE assessment into their model of care. The seven steps are as follows: 1. Selecting the screening tool and approach for your population. 2. Building staff and organisational capacity. 3. Promoting cultural humility. 4. Supporting staff wellness. 5. Developing trust with patients and families. 6. Determining how data will be tracked. 7. Establishing a referral network and process (Gears & Schulman, 2022). The following section applies the seven-step headings to present my brief recommendations for policy and practice, drawing on the guidance from the CHCS paper for the 'Implementation of ACE Screening into Clinical Practice Settings' (Gears & Schulman, 2022).

1. Selecting the Screening Tool and Approach for Your Population. Whānau Āwhina nurses will be supported to routinely offer and administer the ACE-10 at their first point of contact with mothers in Aotearoa. A range of ACE assessment tools have been developed since the original ACE-10 in 1998 (Felitti et al., 1998). As there is no research available currently in Aotearoa to provide guidance on which tools are more acceptable to our diverse maternal population, based on findings from international studies, coupled with the high survey completion rate of this study, implying a level of comfort in most participants having their ACEs assessed using the ACE-10, I would recommend applying the original ACE-10 questionnaire for adults, currently available in 17 languages, and free of charge to access through the ACEs Aware website (Gears & Schulman, 2022). Whānau Āwhina nurses currently undertake their documentation on electronic devices. Therefore, the digital version of the ACE-10 tool could be offered to mothers to be completed at the time of the first visit or emailed to the mother to be completed and returned at her convenience. The ACE assessment is recommended to be an optional activity, with mothers allowed to decline as desired (Gears & Schulman, 2022).

In alignment with international literature reviews that have highlighted the benefits of applying an aggregate or de-identified ACE tool, my recommendation is to offer a de-identified version of the ACE-10 tool where mothers will be asked to read the ACE questions and collate their total ACE score to share with their WCTO nurse but not be asked to reveal their individual experiences of childhood

adversity (Gillespie & Folger, 2017; Rariden et al., 2021). In this setting, mothers would be encouraged that they are welcome to share the details of these experiences with their WCTO nurse if they desire to, as directed by the CHCS guide (Gears & Schulman, 2022).

Alongside implementing maternal ACE screening and extending MMH assessment to include measures for anxiety and stress, I would recommend initiating an additional research project in the first 12 months following ACE screening integration to examine the acceptability and feasibility of implementing ACE assessment into WCTO practice. This research project should focus on the experience of Māori, Pacific, and Asian mothers being screened for ACEs and assessed for symptoms of mental illness. This project would include reviewing the available ACE and MMH assessment tools and collecting qualitative insights from Aotearoa mothers. As a part of a bi-cultural healthcare system in Aotearoa, WCTO providers must ensure that ACE screening is equitable across all maternal populations of Aotearoa, particularly for tangata whenua Māori. The insights from this evaluation project will inform how ACE screening will be conducted in the future and help determine which version of the ACE and MMH tools are deemed the most appropriate for the mothers of Aotearoa, particularly whānau Māori.

2. Building Staff and Organisational Capacity. The findings from the CHSC interviews underscore the importance of building staff and organisational capacity to screen for ACEs before rolling out ACE assessments in clinical practice (Gears & Schulman, 2022). The first recommendation at this stage of the process would be to educate staff on the topics of ACEs, toxic stress, and resilience. This recommendation has already been implemented at Whānau Āwhina following the researcher's development of an online learning module, a mandatory requirement for all frontline staff to complete. The Adverse Childhood Experiences online module introduces the topic of ACEs, showcasing Nadine Burke Harris's TED talk: How childhood trauma affects health across a lifetime (Burke Harris, 2014). The module further features a summary of ACE research evidence and a discussion on child neurodevelopment. The following section in the e-learning module applies ACE theory to the WCTO practice setting, encouraging nurses and health workers to consider the intergenerational implications of ACEs and how we can take a two-generation approach to addressing childhood adversity in Aotearoa. There is learning on advancing resilience research with links to various resources to support the healing and prevention of adversity for frontline staff to share with whānau. Completing this module is currently a mandatory requirement for all frontline staff of Whānau Āwhina and is also available to WCTO nurses outside the organisation as a professional development activity. Drawing on the CHCS review insights, I recommend extending the direction for completion of the ACEs module to all non-clinical Whānau Āwhina staff and volunteers to increase organisational capacity on this important clinical topic. This would allow all staff an introduction to the principles of trauma-informed care (Gears & Schulman, 2022).

3. Promoting Cultural Humility. Gears and Schulman's (2022) CHCS interviews determined that screening for childhood adversity can be harmful if not conducted with cultural humility. They describe cultural humility as practices that reflect an understanding of the impact of racial trauma on health and well-being. This is significant in Aotearoa, where the effects of colonisation on tangata whenua Māori continue to be reflected in the longstanding, preventable inequities in health and other essential domains of life experienced today (Moewaka Barnes & McCreanor, 2019).

In recent years, Whānau Āwhina has taken several significant steps towards becoming a bicultural health partner in line with Te Tiriti o Waitangi (The Treaty of Waitangi), the founding document of Aotearoa, through the redesign of culturally safe clinical services for the promotion of equitable outcomes for whānau Māori in Aotearoa (Whānau Āwhina Plunket, 2020). Gears and Schulman (2022) identified that one of the critical drivers of organisational cultural humility is the education of all staff on the historical trauma of colonisation for Indigenous populations, with considerations for the role of Western healthcare services in perpetuating harm. In 2021, Whānau Āwhina commenced an organisation-wide professional development training titled 'Be a Better Treaty Partner'. The course provides education on the history of Aotearoa, including the lead-up to and signing of the Treaty of Waitangi, detailing the land wars of the 1800s. The mechanisms of colonisation and racism within health settings are explored, as well as the concepts of equity, equality, political correctness, and privilege. The evolution required for clinical services to take a bicultural approach to address inequity is also covered (Vicki Culling Associates, 2021).

Despite the positive first steps towards cultural humility taken by Whānau Āwhina, implementing the ACE assessment through a bicultural lens will require ongoing education and cultural support for frontline staff. This could include opportunities for frontline staff to reflect upon screening whānau Māori through existing peer supervision practices and the development of relevant learning resources alongside opportunities for role play and scenario-based learning by the Whānau Āwhina Māori National Education Group.

4. Supporting Staff Wellness. Gears and Schulman (2022) emphasised the requirement of organisations implementing ACE screening to support staff wellness for two key reasons. Firstly, there is research evidence to suggest that a high proportion of those working in helper professions are personally ACE-affected. An example of this was reflected in a large US study on the ACE prevalence of Registered social workers across 13 States, which recorded that over 70% of their 5,500 participants reported a positive ACE score, with over 23% reporting exposure to four or more ACEs (Steen et al., 2021). One explanation offered for this correlation is that individuals who experience

early life adversity are often drawn to vocations where they have the opportunity to reduce harm's impact on other children and families (Steen et al., 2021). This is significant for Whānau Āwhina staff, where there is potential that the disclosure of a mother's childhood adversity could re-traumatise staff who have unresolved trauma histories of their own. Secondly, even for those staff who have not experienced their own childhood adversity, screening mothers for ACEs can result in an increased risk of experiencing vicarious trauma. Vicarious trauma is the secondary emotional duress that occurs from hearing repeated stories of others' trauma (Isobel & Thomas, 2021). The CHCS recommends strategies to reduce the risk of both re-traumatisation and vicarious trauma through the offering of spaces for staff healing and opportunities for staff to engage in reflection on their individual experiences of ACE screening. Peer supervision is an existing model currently in place in Whānau Āwhina where frontline staff can share the experiences of their clinical practice with peers and work through a structured reflective process to reach an outcome or solution that the staff member is satisfied with (Pallikkuth et al., 2023). Complex case review is another formal process currently available at Whānau Āwhina. Frontline staff working with multi-stressed whānau or those experiencing crisis can present their complex case to their Preceptor or Clinical Leader for reflection and clinical guidance around best practice processes. All Whānau Āwhina staff can also access the Employee Assistance Program (EAP) for funded professional supervision at their discretion. When planning for the rollout of ACE screening integration, I recommend highlighting to staff the above existing processes for support and providing examples of how staff might work through ACE-related scenarios using organisational supervision models.

Mindfulness-based interventions refer to exercises that focus on being fully aware of the present moment and being non-judgmental towards oneself (Kabat-Zinn, 2005). Mindful practice has evidence-based benefits for all users. However, there are added advantages for those who have experienced early life adversity. A 2022 systematic review examining targeted mindfulness-based interventions found improvements in mental health and cognition in participants with a history of ACEs (Moyes et al., 2022). I recommend that all frontline staff undertaking ACE assessment complete the existing online Whānau Āwhina ‘Mindfulness and Self-Care’ module, culminating in a self-care plan to promote their own well-being. The self-care plan can include self-identified strategies to support wellness, early warning signs for staff to identify when they are becoming stressed or overwhelmed by their practice, a list of support people, and suggestions for a range of interventions to utilise to refocus on well-being when they are becoming dysregulated.

5. Developing Trust with Patients and Families. Whānau Āwhina nurses are uniquely positioned in a generally trusted relationship with the whānau they work with. From the first WCTO visit, nurses are welcomed into whānau homes with ongoing contact over the first five years of a child's life. Whānau Āwhina nurses are well trained in whanāungatanga, the establishing and fostering

of therapeutic relationships (Tipa, 2021). Whānau Āwhina nurses are also trained in navigating sensitive clinical conversations, including the assessment of mental health and screening for family violence (Ministry of Health, 2013). I believe Whānau Āwhina nurses are well equipped to offer maternal ACE assessment, drawing on their current model of clinical trust. There will inevitably be nurse-whānau relationships that are less successful than others, for various reasons, and it is essential that whānau feel comfortable asking for a different nurse as desired (Tipa, 2021). I recommend that ACE assessment be offered to all whānau, with a transparent opportunity to decline at each screening time. This would allow whānau autonomy in navigating the complex clinical topic of ACEs, which was considered to be of great significance by those clinicians and families interviewed by the CHCS (Gears & Schulman, 2022).

6. Determining how Data will be Tracked. The CHCS recommended embedding the ACE screener into electronic health records. For those mothers who choose to have the ACE tool emailed to them to complete in their own time, the returned completed tool can then be attached to the individual's electronic record. This would allow for the secure storage of personal information that utilises pre-existing systems within Whānau Āwhina. All personal health data is stored for ten years following the last contact with the Whānau Āwhina service (Whānau Āwhina Plunket, 2023a). It would be necessary to determine with ACEs Aware whether Whānau Āwhina would be allowed to use the selected ACE assessment tool from ACEs Aware and store it within the Whānau Āwhina electronic health records.

7 Establishing a Referral Network and Process. As with any Whānau Āwhina stored health information, ACE scores would not be shared with external support agencies without whānau permission (Whānau Āwhina Plunket, 2023a). Consent for sharing ACE information, where it is relevant to the required intervention, would be sought. Despite the current absence of formal clinical care pathways for the healing and prevention of ACEs in Aotearoa, there remain a variety of informal supports available that ACE-affected whānau can utilise. At Whānau Āwhina, we are developing a resource page on the Whānau Āwhina website that draws on resources from PACEs Connection in the US (Nazakawa & PACEs Connection, 2023). Donna Jackson Nazakawa has collated a page of evidence-based resources developed for parents healing from ACEs with PACEs Connection. The resource includes the promotion of meditation, hypnosis, guided therapy, nutrition and exercise, safety and self-care, understanding ACEs, EMDR therapy, neurofeedback, somatic processing, talk/cognitive therapy, drawing and writing to heal, and strengthening support relationships and community connections (Nazakawa & PACEs Connection, 2023). These headings could provide the template for education and support on the Whānau Āwhina website; some of these suggestions would require support from external specialists that can also be listed on the Whānau Āwhina website. The second handout features Nazakawa and PACEs Connection's evidence-based ‘Prevent and Heal

ACEs' parenting guide. Again, the headings of this resource could be used as the framework for sharing this information and links to available supports on the Whānau Āwhina website. The headings include nurturing and protecting your kids as much as possible, moving and playing, making eye contact, saying sorry, giving 20-second hugs, slowing down or stopping, hunting for the good, being there for kids, helping kids to express mad, sad, and hard feelings, and to keep learning (Nazakawa & PACEs Connection, 2023). These resources draw on the two-generation approach to addressing ACEs, highlighting that many of the evidenced-based interventions for the healing and prevention of ACEs are relatively simple tools that Whānau Āwhina can promote with ACE-affected whānau, with minimal impact on existing models of care.

Following the implementation of the seven steps outlined in the 'Integrating Adverse Childhood Experiences Screening into Clinical Practice: Insights from California Providers' report (Gears & Schulman, 2022), continuous measurement would be required to gauge the success of this intervention. The recommendations should be evaluated every 12 months to identify research trends that could inform the evolving clinical needs of both Whānau Āwhina clinical staff and the whānau of Aotearoa, which they serve.

Clinical Recommendations Part Two – Interventions

The second phase of the clinical practice recommendations has been informed by the World Health Organization's (WHO) 'Guide for the Integration of Perinatal Mental Health in Maternal and Child Health Services' (2022). This guide was developed to support MCHS in integrating a perinatal mental health perspective into their care. The guide is intended to develop and sustain high-quality, integrated mental health assessments and interventions to support women and their families in the perinatal period.

Stepped-Care Approach. The World Health Organisation (2022) recommended a step-care approach for providing perinatal mental healthcare within MCHS, such as Whānau Āwhina. The stepped-care approach recognises that maternal mental health exists on a continuum. This may range from good mental health, where a woman may face challenges but feels she can manage them, and temporary mental health challenges, which may affect a woman's ability to function for a period of less than two weeks, to mental health conditions with mild symptoms that somewhat affect a woman's ability to function for two weeks or more; and moderate to severe mental health conditions that significantly affect a woman's ability to function (World Health Organisation, 2022). This approach to mental health assessment has been described as the most efficient use of resources for targeted mental healthcare, allowing for an equitable distribution of time and resources of clinical services to those with the highest mental health needs. The objectives of care at each of the steps in the stepped-care approach reflect the graded mental health needs of mothers in each group. In the following section, I

apply the headings of the WHO stepped-care approach to guide part two of the clinical recommendations for Whānau Āwhina in strengthening its current provision of maternal mental health assessment and care (Ministry of Health, 2013).

Step One: Promotion of Good Mental Health.

The WHO 'Guide for Integration of Perinatal Mental Health in Maternal and Child Health Services' (2022) described the objectives of the first step in the stepped-care approach as providing respectful, non-stigmatising care and promoting mental health interventions for all women. WCTO nurses are currently trained in the identification of symptoms and risk factors for common perinatal mental health issues; they are educated in undertaking universal MMH assessments and are trained to screen for postnatal depression (PND), as directed in the current WCTO Schedule (2013). WCTO nurses are supported in developing therapeutic listening and conversation skills to use with parents regarding their mental health and well-being. Although PND is commonly screened for in a respectful and non-stigmatising manner, some barriers exist between identifying women with a mental health need and offering mental health intervention as directed by WHO (2022). These barriers are clearly described in the 2021 Stocktake report. The key findings of the report reflect an overburdened maternal mental healthcare system, with a large majority of women who are seeking mental health services unable to access them and very few services reflecting the population they are designed for. Only half of the maternal mental health services in Aotearoa offer Kaupapa Māori (by Māori, for Māori) centred care, with very few DHBs reporting culturally responsive services to support Pacific or Asian mothers, despite higher rates of mental illness recorded in these population groups (Abbott & Williams, 2006; Ministry of Health, 2021). The 2021 Stocktake report also recognises a higher mental healthcare burden required in tertiary-level maternal mental healthcare due to a lack of primary and community mental health services available in Aotearoa (Ministry of Health, 2021).

Within the first step of the stepped-care approach, WHO (2022) recommends that MCHS identify women experiencing early mental health symptoms along with those women at a greater risk of developing mental health conditions. This direction validates the recommendations for timely, universal maternal ACE assessment as a method of early identification of those mothers most at risk of mental illness in the postnatal period presented above. To reiterate, the present study identified consistent and significant associations between maternal ACEs and depression, anxiety, and stress in the postnatal period, even when factoring in a range of other significant socio-demographic associations (e.g. income, education, relationship status, etc.), maternal childhood adversity remained the strongest predictor of depression, anxiety, and stress in the analysis. Offering maternal ACE assessment at the first point of contact with mothers would, therefore, provide WCTO nurses with a systematic method of early maternal mental health risk assessment that, when coupled with current

PND assessment (Ministry of Health, 2013), would determine the level of ongoing mental health assessment and intervention required for each mother and her whānau going forward.

Step Two: Preventive Interventions for Vulnerable Women. Following the identification of those women who are experiencing mental health symptoms or those who present an increased mental health risk (for example, those mothers who have experienced ACEs) but do not meet the threshold for a mild mental health diagnosis, step two of the WHO stepped-care approach advises MCHS to provide brief, evidence-based interventions (World Health Organization, 2022). These interventions include psychoeducation, information on reducing stress and strengthening social support, and encouragement to participate in daily activities to support their mental well-being. In my assessment, this step requires strengthening within WCTO services. As described in the 2021 Stocktake report, primary mental health education and support are drastically lacking in Aotearoa (Ministry of Health, 2021). There is an opportunity to strengthen the therapeutic skills of WCTO nurses to fulfil the WHO recommendations for this step more effectively. Psychoeducation involves the MCH nurse sharing information about mental health conditions and exploring holistic strategies to support mental well-being (Park et al., 2020). Psychoeducation empowers women and whānau to recognise early symptoms of mental illness, providing resources to independently seek help as required (World Health Organisation, 2022). WCTO nurses would be required to increase their knowledge of both formal and informal resources available in their communities of practice. Some examples of activities to strengthen mental well-being and social connectedness offered by WHO (2022) include promoting maternal connection with trusted friends, spending time in nature, meditation or prayer, and peer support through parenting playgroups. The development and promotion of community groups as a source of social support is a strength of the Whānau Āwhina services; however, there are additional opportunities to strengthen maternal mental well-being by utilising these groups to offer evidence-based psychoeducation and promote maternal self-care practices. An additional benefit of maternal social connection is shared storytelling and peer support. In a 2020 systematic review that included ten randomised control trials examining the role of peer support in depression levels, Huang et al. (2020) determined that peer support interventions significantly reduced standardised mean depressive scores (−0.37, 95% CI −0.66 to −0.08) and reduced risk ratio (0.69, 95% CI 0.49– 0.96) of depression. By formalising the intention of the Whānau Āwhina parenting groups to allow space to facilitate peer support practices, there is a possibility that low-level mental health needs may be addressed (Huang et al., 2020; Park et al., 2020; World Health Organisation, 2022).

Step Three: Treatment of Mental Health Conditions with Mild Symptoms. Step three in the WHO (2022) stepped-care approach to perinatal mental health is similar to step two in that MCHS are encouraged to provide brief, evidence-based psychosocial interventions for those women

identified as having mild symptoms of mentally ill health. The pre-primary level interventions of psychoeducation, strategies to reduce stress and strengthen social support, and encouragement to take part in daily activities that are used to support their mental well-being may be effective in reducing mental health symptoms; however, when this is not the case and symptoms persist, WHO (2022) recommend a referral for women and their whānau to specialist mental healthcare services. In Aotearoa, the primary referral pathway for maternal mental illness is to the whānau General Practitioner (GP). This allows for a more comprehensive and holistic assessment of a mother's mental health, referrals for counselling, prescribing mental health medications, and referral to tertiary mental health services as required (Huang et al., 2020; Ministry of Health, 2021). Significant delays are common in accessing MMH specialist services in Aotearoa (Ministry of Health, 2021). Therefore, WCTO nurses must continue to monitor the well-being of affected mothers in their care and promote the pre-primary prevention strategies described in step two. Advocacy is also a key role in supporting whānau affected by mental illness, which may involve the re-referral of women with persisting unmet mental health needs or urgent communication with the GP or other involved services when mental health risk increases (Ministry of Health, 2021).

Step Four: Treatment of Mental Health Conditions with Moderate to Severe Symptoms. Step four of the WHO (2022) stepped-care approach to perinatal mental health pertains to women identified as experiencing many long-term symptoms of mentally ill health that significantly affect the woman's ability to function. As with step three, these women require urgent referral and advocacy to specialty mental health services. Depending on the level of risk determined, this may include the involvement of a crisis mental health team or, through the support of the GP, referral to tertiary inpatient mental health care (Ministry of Health, 2021; World Health Organization, 2022). Despite the level of intervention required for these whānau exceeding the skill set of WCTO nurses, nurses can continue regular contact with whānau for the continuity of care and to offer complimentary support to the whānau during their increased time of need.

Strengths and Limitations

The strength of this research study's results must be considered in the context of its limitations. The following section describes the methodological limitations common when applying cross-sectional study methods and the limits and strengths surrounding the homogeneity of the study's participant sample. The study's limitations mark areas of interest for future research opportunities. This chapter concludes with policy and clinical practice recommendations informed by the international best practice guidelines for adverse childhood experiences and maternal mental health, as well as this study's compelling findings.

The first limitation relevant to every cross-sectional study is the inability to generate a cause-and-effect relationships between the study's key variables. Causal inferences are the determination that changes in the effect arise due to changes in the cause (Gianicolo et al., 2020). Despite the novel insights that significant associations exist between the experiences of maternal childhood adversity and increased levels of postnatal depression, anxiety, and stress in the present sample, as the data were collected at a single point in time, causal inferences (i.e. the adverse childhood experiences caused the symptoms of maternal mental illness) cannot be confirmed (Gianicolo et al., 2020; Levin, 2006). In addition, as the study did not collect data on any pre-existing mental health conditions of the participants, it is impossible to differentiate new-onset mental health symptomology from symptoms of pre-existing mental health disorders, although this omission is not uncommon in cross-sectional studies examining ACEs and maternal mental illness (Ilter Bahadur et al., 2021; Johnson et al., 2017; Mahenge et al., 2018; Menke et al., 2019). Convenience sampling methods also limit the generalisability of the research findings beyond maternal populations with similar socio-demographic characteristics (Tabachnick, 2013). Future research that involves larger participant numbers and applies random sampling methods would add merit to the generalisability of the research findings in Aotearoa.

A further limitation of the study is the homogeneity of the participant sample. Despite significant efforts to recruit a diverse and nationally representative sample of mothers in Aotearoa, analysis of the socio-demographic characteristics revealed a clear underrepresentation of some demographic groups. For ethnicity, the percentage of Māori (n = 40, 8.5%) and Pacific (n = 5, 1.1%) mothers were under-represented when compared to NZE (n = 364, 77.6%), Asian (n = 35, 7.5%), and Middle Eastern, Latin American, and African (n = 5, 1.1%) ethnic groups according to national ethnicity datasets for Aotearoa (Stats NZ, 2018a). Reflection with the Māori Cultural Advisor highlighted that the reason for the underrepresentation of Māori may be the possible discomfort with engaging in sensitive research through an online medium. Future research could adopt some of the recommendations of Stevenson (2018), who encourages the application of Kaupapa Māori (by Māori for Māori) principles for approaching sensitive research with Māori participants. Stevenson (2018) describes five requirements of Kaupapa Māori methodology to support Māori participant engagement, including whānau (family), wāhi haumaru (providing a safe space), whakapapa (engaging in Māori philosophies), kaitiaki (being empathetic), and honouring whanaungatanga (building and maintaining relationships). Despite the best of intentions, these values have proved more challenging to adhere to when applying online survey methods, which may be reflected in the lower participation of Māori and Pacific mothers in our study. This is significant because it limits the ability to generalise this study's findings to the NZ general maternal population. The differences in the characteristics of this study's sample are significant when compared with the sociodemographic characteristics of the wider maternal population of NZ, as illustrated in Table Four.

There was also an underrepresentation of unmarried mothers in this research study and fewer mothers who lived rurally compared with those who lived in urban dwellings compared to the national trends of Aotearoa (Minister of Health, 2023). This may be due to the increased burden of parenting responsibilities placed on these population groups with less time for online research participation. A phenomenological study examining the experiences of unmarried mothers determined that the daily challenges of raising children alone while simultaneously preparing for their independence were exhausting (Kim et al., 2022). Similarly, an Aotearoa report evaluating the role of social connectedness for rural mothers described their significant roles and responsibilities, noting that they often must balance the mothering role with their ongoing duties on their farming properties (Ministry of Primary Industries, 2021). This study's underrepresentation of these demographic groups highlights the need for more inclusive research methods to accommodate the time constraints and unique circumstances of single-parent and rural populations. However, it is worth noting that the significant associations observed in this study provide an evidence-based foundation for future research examining maternal ACEs and MMH associations.

The homogeneity of the study's population presents strengths to be acknowledged alongside the limitations. The majority of the participant sample was determined to be similar in many of the socio-demographic characteristics measured. This can be an advantage where there are fewer confounding or extraneous variables to reduce the internal validity of the study's findings. This, in turn, strengthens the significant associations that were observed between maternal ACEs and maternal mental illness in the postnatal period for this population group, thereby increasing a narrower but more precise generalisability of the study's findings for mothers with similar characteristics to the broader maternal population of Aotearoa (Jager et al., 2017).

Another limitation of the current study surrounds the survey question examining annual total household income. The question did not break down the total household income variable to measure whether earnings represented the time before, during, or after maternity leave. This has resulted in less clear data on household socioeconomic status. This omission limits the validity of the total household income data results. The participants in the study reported household incomes below the Aotearoa median income level with a median self-reported household income bracket of $70,001-NZD 80,000. The Aotearoa average household income is $110,451. Based on the sample's high post-secondary school qualifications, when compared nationally, it can be assumed that many participants' total household income levels are usually higher than reported in the study, meaning that the indicated income bracket likely reflects participants' reduced income over the first postnatal year (Stats NZ, 2022).

Conclusion

There is a significant opportunity to address the study's limitations through a prospective longitudinal study that examines maternal ACE assessment and MMH in an Aotearoa setting. The goal of applying these two clinical recommendation documents for policy and clinical practice is to utilise this study's unique insights to improve mental health pathways for mothers and their whānau in Aotearoa. This can be achieved through universal maternal ACE assessment, ongoing and more extensive mental health assessment, and strengthening WCTO nurse skills to scaffold mental health education and interventions for those who require them the most. The next chapter will conclude the thesis by emphasising the new knowledge generated through this study and consider the next steps in translating this compelling data into meaningful policy and clinical practice change that ultimately improves the intergenerational outcomes of whānau in Aotearoa.

Chapter Seven: Conclusion

For the first time, this research aimed to measure the prevalence of adverse childhood experiences in a maternal population of women in Aotearoa. The study achieved a significant sample size, enhancing the study's internal and external validity. What was not achieved was the sample representativeness that would allow for the study's significant findings to be generalised across the NZ postnatal population. Maternal mental health assessment data was gathered at a single point in time across the first postnatal year. Through correlation analysis, the study demonstrated significant positive associations exist between maternal ACEs and depression, anxiety, and stress in the first postnatal year for this study sample. Not only were the associations significant, but the data provided evidence of a step-wise relationship between experiences of childhood adversity and increasing symptoms of postnatal mental illness. That is, as the ACE scores of mothers increased, so too did the reported postnatal symptoms (scores and levels) of depression, anxiety, and stress in our analysis. These findings can potentially inform meaningful, evidenced-based policy and clinical practice changes in Aotearoa and future research directives at a population level.

Novel contributions of this study have offered a unique Aotearoa maternal perspective to the literature and a foundation of new knowledge for future researchers to build upon. Simultaneously, the significant findings of this study can inform a new pathway for clinical practice to reduce the impact of childhood adversity on the mental health outcomes of mothers and allow for targeted prevention and psychoeducation to reduce the intergenerational risks so clearly described for the children of ACE-affected mothers within the international literature. Informed by the significant new knowledge gained from this research study, my primary research recommendation is to include an early universal maternal ACE assessment offering as a two-generation approach to addressing childhood adversity through systematic and evidenced-based methods.

The study applied cross-sectional methods to measure maternal ACE and MMH data at a single time point in the first postnatal year. Although cross-sectional methods limit the argument of causation that maternal ACEs cause depression, anxiety, and stress in the postnatal period, correlation analysis has revealed the significant relationships that exist between these variables in this sample. The analysis offers some insight into the significance of the issue of maternal ACEs in Aotearoa. It identifies the socio-demographic characteristics more highly associated with childhood adversity in this sample. This, coupled with the significant correlations between maternal childhood adversity and depression, anxiety, and stress observed in the international literature of the scoping review, provides some direction in how strategies for early assessment, intervention, and second-generation prevention could be developed for this population.

This study has clearly illustrated that the women who experienced adversity in childhood (as measured by the ACE-10) had increased rates of depression, anxiety, and stress in their first postnatal year in the study population. There is potential for these findings to inform a clinical practice change for services to better support women and their whānau in Aotearoa. Early maternal ACE assessment within MCHS could be used to identify those mothers who are at an increased risk of postnatal mental illness. Tailored intervention pathways that address ACEs using a two-generation approach are widely accepted internationally as best practice (Gears & Schulman, 2022). The two-generation approach recognises the dual benefit of maternal ACE assessment that simultaneously addresses a mother's ACE-related outcomes while identifying children who are at an increased risk of adverse outcomes in their health, learning, and development as a result of their mother's ACEs (Gears & Schulman, 2022; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016a).

This study has achieved my personal motivation to provide quantifiable evidence that describes what I have observed in clinical practice over the last two decades. The results of my study provide Aotearoa-based evidence to support the theory that the experiences of early life for mothers can significantly influence their mental health outcomes over the first postnatal year. This is important because up until this research was conducted, maternal and child health nurses such as Whānau Āwhina nurses had no national evidence to support their exploration of ACEs with mothers and consider, in partnership, what they might mean for their postnatal mental health. We now have evidence to support maternal ACE assessment as an evidence-based risk factor for postnatal depression, anxiety, and stress.

The World Health Organization's (2022) 'Stepped Care Model for Maternal Mental Health' focuses on targeting mental health resources in a timely way to those who require them the most. The stepped-care approach supports the strategy of early maternal ACE assessment and intervention, targeting preventative strategies for women at an increased risk of mental illness, including those affected by early life adversity (World Health Organization, 2022). Although it is evident that primary and secondary maternal mental health services in Aotearoa are in drastic need of transformation to meet the increasingly complex mental health needs of mothers and their whānau and better align with the cultural needs of women who require them the most, there is the possibility that improved screening could reduce the burden on this under-resourced system (Ministry of Health, 2021). The strength of this approach is in the timing of the assessment so that women whose ACEs put them at an increased risk of depression, anxiety, and stress are identified early. The symptoms of mental illness can be addressed and supports put in place before their symptoms develop into a diagnosable mental illness. WHO (2022) states that the earlier maternal mental health intervention occurs, the more successful the outcomes are for mothers and their infants. The ultimate goal is for women to be effectively supported prior to requiring tertiary mental health support, ultimately allowing for specialist mental health

services to be reserved for only the most complex of mental health needs (World Health Organisation, 2022).

There is a growing body of literature that recognises the increased risks of maternal mental illness in mothers who experienced childhood adversity. The novel contributions of the present research add to this body of knowledge, offering a uniquely diverse perspective from a maternal population in Aotearoa. Another contribution is the wealth of socio-demographic data correlated against ACE and MMH outcomes. This has provided critical insights into who is most at risk in the maternal populations of Aotearoa, as well as potential pathways for policymakers to reduce the burden on those most at risk. A key example uncovered in the research was the significant role that total household income played in the mental health outcomes of mothers in our sample. Depression, anxiety, and stress in the first postnatal year were significantly and inversely associated with total household income, with those with lower incomes experiencing higher rates of mental illness symptoms. Policymakers are required to strengthen the strategies that support and supplement maternal household income in the first postnatal year, particularly for those mothers whose ACEs already put them at an increased risk of mental illness. The reason this is important is that death by suicide is the leading cause of mortality among women in the perinatal period, with maternal suicide rates in Aotearoa reported to be five times higher per capita than in the United Kingdom (Health Quality & Safety Commission, 2022). The consequences of poor maternal mental health can be significant for the mother and can extend to impact her children and whānau negatively. Women who experience maternal mental illness are at a higher risk of obstetric complications and are less likely to engage with antenatal health and support services (Adane et al., 2021; Black et al., 2017; World Health Organisation, 2008). Untreated maternal mental illness can lead to an increased risk of poor birth outcomes and increased maternal physical illness, as well as social and mental health difficulties in the children of affected mothers (Field et al., 2010; Lasater et al., 2017). Our study has uncovered one pathway for reducing the impact of maternal mental illness for women, children, and their whānau in Aotearoa through timely, universal maternal ACE assessment offered through WCTO services.

Building on the solid foundation of longitudinal studies examining perinatal mental illness, childhood adversity, and significant sociodemographic factors that are associated with the outcomes of mothers and children in Aotearoa (Danese et al., 2009; Morton, 2019; Neumann et al., 2019; Reuben et al., 2016; Waldie et al., 2015; Wallander et al., 2021; Walsh et al., 2019a, 2019b; Walsh, 2021), the current study offers a uniquely maternal ACE perspective for future research to build upon. Thus, I recommend the prospective gathering of current ACE data as a complimentary addition to clinical practice to achieve dual positive research and clinical practice outcomes. Firstly, prospective maternal ACE assessment data collected at a mother's first visit with Whānau Āwhina would provide a current stream of Aotearoa ACE data that could be used to identify evolving trends and to target and evaluate

ACE interventions (Marie-Mitchell et al., 2019). This data would offer a robust and nationally representative method for understanding the evolving true prevalence of ACEs in our diverse maternal population of Aotearoa. Excitingly, this would also present data for future studies to examine ACEs and their associated risks intergenerationally, an approach that warrants future research focus in Aotearoa.

The findings from this study offer a turning point for maternal and child health services in Aotearoa. More than twenty years after the original ACEs study was published (Felitti et al., 1998), the translation of ACE research can positively inform a universal, national clinical practice change and new population health research foundation in Aotearoa.

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Glossary

Terms	Definition
Adverse Childhood Experiences (ACEs)	Refers to some of the most intensive and frequently occurring sources of stress that children may suffer early in life. Such experiences can include multiple types of abuse; neglect; violence between parents or caregivers; other kinds of serious household dysfunction such as alcohol and substance abuse; and peer, community, and collective violence.
Antenatal	Before birth, during, or relating to pregnancy.
Analysis of variance (ANOVA)	A test used to determine differences between three or more unrelated samples or groups on the outcome/dependent variable.
Anxiety	An emotion characterised by feelings of tension, worried thoughts, and physical changes like increased blood pressure.
Aotearoa	Māori (indigenous) name for Aotearoa.
Chi-square	A statistical test is used to compare observed results with expected results. The purpose of this test is to determine if a difference between observed data and expected data is due to chance or if it is due to a relationship between the variables you are studying. The test is also conducted to determine whether a relationship exists between two categorical variables.
Culturally responsive	The ability to understand and consider the different cultural backgrounds of the people you engage with.
Depression	A mood disorder that causes a persistent feeling of sadness and loss of interest.
Depression, anxiety, and stress scale-21 (DASS-21)	The short form of the DASS-42 is a self-report scale designed to measure the negative emotional states of depression, anxiety, and stress.
Externalising behaviours	Refers to behaviours such as impulsivity, aggressiveness, and disruptiveness.
Internalising behaviours	It is characterised by anxiety, withdrawal, and dysphoria.
Kaiawhina	The overarching term describes non-regulated roles in the health and disability sector that

	work under the direction and delegation of Registered nurses. Kaiawhina who work for Whānau Āwhina are health workers who identify as Māori.
Karitane	A type of community worker in Aotearoa advising on parenting issues. Karitane who work for Whānau Āwhina are health workers who identify as non-Māori
Kaupapa Māori	Māori approach, Māori topic, Māori customary practice, Māori institution, Māori agenda, Māori principles, Māori ideology. A philosophical doctrine that incorporates the knowledge, skills, attitudes, and values of Māori society.
Māori	The term refers to the indigenous people of New Zealand/Aotearoa. A new use of the word was born from contact with Pākehā to distinguish between people of Māori descent and the colonisers.
Maternal adverse childhood experiences (maternal ACEs)	The ACEs of women in their first 18 years of life who have since become mothers.
Maternal mental health (MMH)	A state of well-being is one in which a mother realises her strength and ability, e.g., that she can cope with the everyday stresses of life, work productively and fruitfully, and contribute to her community.
Patient Health Questionnaire (PHQ2, PHQ2+, PHQ9)	It is a multiple-choice self-report inventory that is used to screen for depression.
Perinatal	The period when you become pregnant and up to a year after giving birth.
Postnatal	Relating to or denoting the period after childbirth.
Postnatal depression (PND)	Depression that occurs after childbirth.
Post-traumatic stress disorder (PTSD)	A mental health condition triggered by a terrifying event, causing flashbacks, nightmares, and severe anxiety.
Social determinants of health (SDH)	The non-medical factors that influence health outcomes. They are the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life (World Health Organisation, 2024).
Stress	Defined as a state of worry or mental tension caused by a difficult situation

Tangata Whenua	Used to describe either the Māori people of a particular locality or Māori people as a whole as the original inhabitants of Aotearoa.
Te Tiriti o Waitangi (in English The Treaty of Waitangi)	Aotearoa's founding document, signed in 1840, was meant to be a partnership between Māori and the British Crown. Although it was intended to create unity, different understandings of the treaty and breaches of it have caused conflict.
Te Whatu Ora (formerly The Ministry of Health)	A public health agency established by the Aotearoa Government to replace the country's 20 district health boards on 1 July 2022.
Well Child Tamariki Ora Programme (WCTO)	A universal programme, designed on the principle of providing services for all, with additional services available according to need (the principle of 'proportionate universalism') (Ministry of Health 2010c, 2010d). Additional contacts (which may begin antenatally) are provided on the basis of assessed need. WCTO services are free and include clinical assessment, health promotion, family/whānau support and advice, and interventions or referrals as appropriate.
Well Child Tamariki Ora Schedule	The current WCTO schedule involves 13 'core' contacts from birth to five years: Four contacts during the postnatal period provided by lead maternity carers (LMCs), a six-week check by general practice, and eight contacts from four to six weeks through to five years provided by WCTO providers.
Whānau	Māori word for the basic extended family group.
Whānau Āwhina Plunket	Aotearoa, New Zealand's largest support service for child health and well-being, provides the WCTO programme to tamariki under five and their whānau.

Appendices

Appendix A *Scoping Review Source Information*

Title		Country	Population	Sample size	Sample characteristics	Design	Primary findings	MMH tool	ACE tool	Ace prevalence of sample population (1-10)	Period examined	Depression associated with aces	Anxiety associated with aces	Stress associated with aces	Child outcomes
The association between adverse childhood experiences and perinatal depression symptom trajectories	(Allen et al., 2023)	USA	Mothers	1,270	Mothers referred to community mental health services	Retrospective cohort study	294 (23.1%) reported a high adverse childhood experience score. Those with a high adverse childhood experience score were more likely to experience a worsened antenatal depression trajectory than those with a low adverse childhood experience score. There was no significant difference in the postpartum depression trajectories between those with a high and those with a low adverse childhood experience score.	PHQ-9	ACE-10	ACE prevalence not reported, 23.1% ACE score 3+	Antenatal and postnatal	Yes antenatally No postnatally	na	na	na
Adverse childhood experiences and depressive symptomatology among pregnant women	(Ångerud et al., 2018)	Sweeden	Mothers	3,389	Mothers in an antenatal clinic, average age 30	Longitudinal	ACE predicts reporting of DS both ante- and post-natally.	EPDS	ACE-10	58.80%	Antenatal and postnatal	Yes antenatally Yes postnatally	na	na	na

Welcome to parenthood is associated with a reduction of postnatal depressive symptoms during the transition from pregnancy to 6 months postpartum in a community sample: A longitudinal evaluation	(Benzies et al., 2021)	Canada	Mothers & infants	454	Educated, employed, married, high income	Longitudinal	The number of women with high depressive symptoms decreased by almost half. Women with higher ACE had the most significant decrease in depressive symptoms. Infants in W2P had significantly better development than infants in reference samples.	EPDS	ACE-10	54.60%	Antenatal and postnatal	Yes antenatally Yes postnatally	na	na	na
Association between adverse childhood experiences and perinatal depressive symptoms: A cross-sectional analysis of 16,831 women in Iceland	(Bränn et al., 2023)	Iceland	Mothers	16,831	Age 27 years, moderate education, income, married	Cross-sectional study	The positive association between the accumulative number of ACEs and PND symptoms in a dose–response manner. All 13 studied types of ACEs were positively associated with PND.	EPDS	ACE-IQ, 39 items	77.50%	Postnatal	Yes postnatally	na	na	na
Impact of adverse childhood experiences on women's psychosocial and HIV-related outcomes and early child developme	(Brittain et al., 2022)	South Africa	Mothers & infants	353	Low socioeconomic community is characterised by high levels of poverty and HIV, with an antenatal HIV prevalence	Cohort study	Increased report of ACEs was strongly associated with depressive symptoms, hazardous alcohol use, intimate partner violence, and self-reported suboptimal adherence to antiretroviral therapy. Among 255 women who	EPDS	ACE-IQ, 39 items	84%	Postnatal	Yes postnatally	na	na	Poorer socioemotional development at 36-60 months

nt in their offspring					of around 30%		reported on their child's development, maternal ACEs were associated with poorer socioemotional development.								
The impacts of maternal childhood adversity, stress, and mental health on child developme nt at 6 months in Taiwan: A follow-up study.	(Chang et al., 2021)	Taiwan	Mothers & infants	130	Mothers over 18 years, mostly married, mainly employed, highly educated cohort	Prospective cohort	Maternal ACEs were associated with maternal stressful events during pregnancy and prenatal mental health. Maternal stressful events during pregnancy were associated with prenatal mental health and postnatal mental health. Maternal prenatal mental health was associated with postnatal mental health, which was associated with child development at six months.	EPDS-Chines e version	ACE-14 items	26.90%	Antenatal and postnatal	Yes antenatally No postnatally	Yes, antenatally, Yes, postnatally	Yes antenatally	ACEs indirectly influenced offspring's development via maternal stressful events during pregnancy and pre-and postnatal mental health problem.
Examining the relationship between maternal childhood abuse history and mother-infant bonding: The mediating roles of postpartum depression and maternal self-efficacy	(Chau et al., 2023)	Australia	Mothers & infants	191	Mostly white, university educated, mean age 32 years	Cross-sectional study	Postnatal depression symptomatology and maternal self-efficacy were found to fully mediate the relationship between psychological child abuse experience and mother-infant bonding disturbances.	EPDS	ACE-Q	74.9% Phys. abuse, 21.5% sexual abuse, 94.8% psychologic al abuse	Postnatal	Yes postnatally	na	na	Negative impact observed for psychological childhood abuse experience on the quality of the mother-infant bond during the postpartum period

Cascades of risk linking intimate partner violence and adverse childhood experiences to less sensitive caregiving during infancy	(Coe et al., 2021)	USA	Mothers & infants	295	Mothers 18 years + mean age 25.6 years, ethnically diverse, 65% unemployed, all families received public assistance, low education.	Prospective cohort study	Mothers with higher IPV endorsed more significant prenatal depressive symptoms, which were, in turn, associated with postpartum parenting stress and, ultimately, less sensitive parenting behaviour. Moderation analyses revealed that these indirect effects varied as a function of maternal ACEs, with the link between IPV and depressive symptoms only present for mothers who reported high ACEs.	PHQ-9	ACE-10	88%	Antenatal and postnatal	Yes, prenatally, not measured postnatally		Yes postnatally	Parent-child dysfunctional interaction and sensitive parenting
Intergenerational effects of violence on women's perinatal well-being and infant health outcomes: Evidence from a birth cohort study in central Vietnam	(Do et al., 2021)	Vietnam	Mothers & infants	150	Most women (71.62%) were employed (blue-collar or white-collar labour), the mean age was 29.86 years (range 19–47 years)	Prospective cohort study	Women who experienced CM were much more likely than non-exposed women also to be exposed to p-IPV. The difference in risk was estimated at 18 percentage points. Women exposed to p-IPV in the previous six months had more mental health problems during pregnancy (higher by 40 percentage points).	PHQ-9	ACE-IQ, 39 items	55.03%	Antenatal and postnatal	Yes, prenatally, not measured postnatally	na	Yes, prenatally, not measured postnatally	The infants had a two-fold higher risk of adverse birth outcomes (LBW, PTB, admission in neonatal intensive care) if their mothers experienced any form of p-IPV. The risk was substantially higher if the mothers were exposed to both CM and p-IPV.
Combined effect of adverse childhood experiences and Young	(Doi & Fujiwara, 2019)	Japan	Mothers & infants	5,960	Over 35% of the participants were 30–34 years old, half were	Cross-sectional study	Maternal ACEs, young maternal age, pluripara, and lower household income were associated with self-harm ideation	EPDS	ACE-10	28.50%	Postnatal	Yes postnatally	na	na	Negative feelings towards pregnancy

Age on self-harm ideation among postpartum women in Japan					first-time mothers, one-fourth had an educational level of high school or less, and one-fourth had a low household income.		among postpartum women. Moreover, the combined effect of maternal ACEs and young age on self-harm ideation was consistent with our hypothesis. These results indicate that perinatal women who have multiple risk factors, especially young age and ACEs, may have a high suicide risk during pregnancy.							
Adverse childhood experiences and current psychosocial stressors: Exploring effects on mental health and parenting outcomes from a mother-baby partial hospital program	(Erickson et al., 2019)	USA	Mothers	159	The Mother-Baby Day Hospital at Hennepin County Medical Center providing trauma-informed, multi-generation treatment for perinatal women.	Prospective cohort study	High proportions of patients reported 4+ ACEs and current psychosocial stressors. Effect sizes for associations between ACEs, psychosocial stressors, and self-report symptoms were small to moderate. Individuals with food or housing insecurity entered treatment with higher anxiety.	EPDS & GAD-7	ACE-10	? More than 63.5, 50.3% reported 4+	Antenatal and postnatal	Yes antenatally Yes postnatally	Yes antenatally Yes postnatally	Yes postnatally	na
Adverse childhood experiences: Implications for offspring telomere length and psychopathology	(Esteves et al., 2020)	USA	Mothers & infants	155	Mothers 18+. Mean age 28.49 years. 52.3% Black, lower-income population	Prospective cohort study	Higher maternal ACEs were associated with shorter infant TL across infancy and higher infant externalising behavioural problems at 18 months. Greater telomere attrition predicted higher externalising	PNMS &EDPS	ACE-10	76.13%	Postnatal	Yes postnatally	na	Yes postnatally	Higher maternal ACEs were associated with shorter infant TL across infancy and higher infant externalising behavioural problems at 18 months. No associations were found with

							problems, even when accounting for maternal postnatal depression and prenatal stress.								internalising behavioural problems.
The role of adverse childhood experience and social support type in postpartum depression in Turkey	(Ilter Bahadur et al., 2021)	Turkey	Mothers	900	The mean age of participants was 26.94. 37.1% were uneducated, while only 3.8% were university graduates. The majority were unemployed, and 94.9% had low family income.	Prospective cohort study	Family support was perceived as beneficial in both women with no history or ≥2 instances of ACE. However, perceived support from friends and a special person was lowest in the ≥2 ACE group. In logistic regression, unwanted pregnancy, emotional abuse and neglect, incarceration of a household member, and poor special person support were factors significantly associated with developing PPD.	EPDS	ACE-10 Q	8.80%	Postnatal	Yes postnatally	na	na	na
Parents' adverse childhood experiences and mental health screening using home visiting programs: A pilot study	(Johnson et al., 2017)	USA	Mothers	110	Sample one: The population met federal poverty guidelines and was ethnically diverse. Sample two: Population deemed at risk of child maltreatment, less ethnically diverse	Prospective cohort study	A trend toward the association of positive prenatal maternal depression screen with ACE score was identified.	EPDS, PHQ-9, GAD-7	ACE-10	77%	Antenatal and postnatal	Yes antenatally Yes postnatally	Yes antenatally Yes postnatally	Yes antenatally Yes postnatally	na
Exposure to racism and other	(Kim et al., 2020)	USA	Mothers	133	Diverse populations are at a	Prospective cohort study	Early life adversity was exceedingly common among	EPDS & GAD-7	ACE-10 + 6 environ	87%	Antenatal and postnatal	Yes antenatally	Yes antenatally	Yes antenatally	na

adverse childhood experiences among perinatal women with moderate to severe mental illness					high risk for disparities based on race, ethnicity and income.		pregnant and postpartum women with moderate to severe mental illness. Childhood exposure to racism and environmental trauma are important risk categories for perinatal mental illness.		mental q's			Yes postnatally	Yes postnatally	Yes postnatally	
Adverse childhood experiences and depression among women in rural Pakistan	(LeMasters et al., 2021)	Pakistan	Mothers	889	Low maternal education, high rates of family mental illness	Retrospective cohort study	The majority (58%) of women experienced at least one ACE domain, most commonly home violence (38.3%), followed by neglect (20.1%). Women experiencing four or more ACEs had the most pronounced elevation of symptom severity. Findings suggest that ACEs are substantively distinct and have unique relationships to depression.	PHQ-9	ACE-IQ 12 item	58%	Antenatal and postnatal	Yes, perinatally-not further specified	Not reported	na	na
Intergenerational transmission of adverse childhood experiences via maternal depression and anxiety and moderation by child sex	(Letourneau et al., 2019)	Canada	Mothers & infants	907	The mean age of mothers was 32.2 years. Most were married, had some post-secondary education, and had a family income ⩾ of $70,000.	Prospective cohort	Overall, maternal ACEs were associated with symptoms of anxiety and depression during the perinatal period and externalising problems in children. Furthermore, we observed indirect associations between maternal ACEs and children's internalising and externalising	EPDS, 10-item anxiety subscale	ACE-10	54.90%	Antenatal and postnatal	Yes antenatally Yes postnatally	Yes antenatally Yes postnatally	na	Positive relationship between the number of maternal ACEs and both children's externalising and internalising behavioural problems

							problems via maternal anxiety and depression. Sex differences were observed, with boys demonstrating greater vulnerability to the indirect effects of maternal ACEs via both anxiety and depression.							
Maternal adverse childhood experiences, mental health, and child behaviour at age 3: The all our families community cohort study	(McDonald et al., 2019)	Canada	Mothers	1,994	The sample is representative of the pregnant population in an urban Canadian Centre.	Longitudinal	The presence of 3 or more ACEs was associated with postpartum smoking, binge drinking, depressive and anxiety symptoms, lower optimism and higher neuroticism, and lower reported parenting morale. In children, three or more maternal ACEs were associated with higher levels of internalising (e.g., anxiety) and externalising difficulties (aggression and hyperactivity), as well as temperament (surgency and negative affectivity).	EPDS	ACE-11	62%	Antenatal and postnatal	Yes antenatally Yes postnatally	Yes antenatally Yes postnatally	na	For all but one child outcome, the highest proportion of sub-optimal behaviour was seen in children whose mothers reported three or more ACEs. Children in families where mothers experienced three or more ACEs were more likely to have higher levels of hyperactivity/inattention, physical aggression, anxiety/emotional disorders, separation anxiety, surgency/extraversion, and negative affectivity.
Intergenerational effects of childhood trauma	(McDonnell & Valentino, 2016)	USA	Mothers	398	Ages ranged between 15 and 46 years at	Prospective cohort	Both childhood household dysfunction and maltreatment were significantly	Beck Depression Inventory	ACE-10	78.30%	Antenatal and postnatal	Yes antenatally Yes postnatally	na	na	Maternal experiences of childhood household dysfunction

					prenatal assessment. The majority of the sample was never married and was racially diverse.		correlated with prenatal depressive symptoms, whereas only childhood maltreatment remained significantly correlated with maternal postnatal depressive symptoms at the 6month time point. In contrast, childhood maltreatment, but not household dysfunction, was significantly correlated with infant socioemotional functioning at six months.	(BDI-II)							were indirectly associated with higher levels of infant maladaptive socioemotional symptoms through maternal age at first pregnancy and infant birth weight.
Childhood adversity and sleep are associated with symptom severity in perinatal women presenting for psychiatric care.	(Menke et al., 2019)	USA	Mothers	578	English-speaking; 18 years of age or older; and pregnant or less than 12-months postpartum	Prospective cohort	Regression analyses revealed differential associations between ACEs and sleep quality and perinatal mood symptoms; ACEs were significantly associated with pregnancy and postpartum PTSD, whereas sleep quality was associated with perinatal depression and generalised anxiety.	EPDS & GAD-7	ACE-10	? 30% had multiple ACEs	Antenatal and postnatal	Yes antenatally No postnatally	No antenatally, No postnatally	No antenatally. Yes postnatally	na
Adverse childhood experiences and postpartum depression in home visiting programs:	(Mersky & Janczewski, 2018)	USA	Mothers	735	30.1% non-Hispanic white, 28.4% non-Hispanic black, 25.3% Hispanic, 7.7%	Retrospective cohort study	PPD was significantly associated with increased exposure to ACEs. ACEs were partially mediated by three antenatal conditions: Intimate partner	EPDS	ACE-10	85%	Postnatal	Yes postnatally	Yes postnatally	Yes postnatally	na

Prevalence, association, and mediating mechanisms					American Indian. Participating women averaged 23.7 years of age and were low-income		violence (IPV), perceived stress, and antenatal depression.								
The association between adverse childhood experiences and postpartum depression	(Prentice et al., 2022)	USA	Mothers	132	PPD population. Respondents had a mean age of 32 ± 5.7 years (range 21–48 years) and were primarily Caucasian (87.9%)	Retrospective cohort study	Women with PPD are more likely to have high-risk ACE scores than the general female population.	EPDS	ACE-10	80.70%	Postnatal	Yes postnatally	na	na	na
Maternal adverse childhood experiences and infant development	(Racine et al., 2018)	Canada	Mothers & infants	1,944	Mothers 18+. Mean age 31 years. 81.8% Caucasian, 79.1% University educated and above, 69.9% household income over $80,000	Prospective cohort	The association between maternal ACEs and infant development outcomes at 12 months operated through 2 indirect pathways: Biological health risk (pregnancy health risk and infant health risk at birth) and psychosocial risk (maternal psychosocial risk in pregnancy and maternal hostile behaviour in infancy).	EPDS	Adapted ACE, no neglect measure	63.50%	Antenatal and postnatal	Yes antenatally Yes postnatally	Not reported	na	na
Perinatal depression: The role of maternal adverse childhood experiences	(Racine et al., 2020)	Canada	Mothers	1,944	Mothers 18+. Mean age 31 years. 81.8% Caucasian, 79.1%	Longitudinal	Logistic regression demonstrated that after accounting for sociodemographic factors and social support, ACEs predicted depressive	EPDS	Expanded ACE	63.50%	Antenatal and postnatal	Yes antenatally Yes postnatally	Not reported	na	na

and social support					University educated and above, 69.9% household income over $80,000		symptoms in pregnancy, the postpartum period, and across the perinatal period. Social support did not moderate the association between maternal ACEs and depression at any time point.							
Maternal adverse childhood experiences and postpartum depressive symptoms in young, low-income women	(Shin et al., 2021)	USA	Mothers	746	Over half of the sample was African American, two-thirds reported a high school education or less, over half were married or cohabiting, about two-thirds reported an annual family income of $25,000 or less, and the average age was 27.3 years.	Prospective cohort	The majority of the participants (61%) reported experiencing at least one type of ACEs prior to age 18. ACEs were positively associated with PPD symptoms, even after controlling for maternal race/ethnicity, age, educational attainment, marital status, household income, and infant gender and birth order.	Pregnancy Risk Assessment Monitoring System (PRAMS)	ACE-10	61%	Postnatal	Yes postnatally	na	na	na
Peripartum traumas and mental health outcomes in a low-income sample of NICU mothers: A call for family-centered,	(Williams et al., 2023).	USA	Mothers & infants	119	Participants were 48.7% Black, 39.5% White, 7.6% Hispanic/Latinx, and 2.5% Asian: 5% who did not complete high	Prospective cohort	Participants' cumulative ACEs and peripartum trauma scores were significantly correlated with ASD, PPA, and PPD. When examining associations between the various types of peripartum trauma exposure and	Impact of events Scale, GAD-2, PHQ2	ACE-10	81.50%	Postnatal	Yes postnatally	Yes postnatally	Yes postnatally	na

trauma-informed care					school, and 37.8% with a high school degree. The majority of infants (71.8%) had Medicaid insurance.		mental health outcomes, only birth trauma was significantly correlated with ASD, PPA, and PPD.								
Intergenerational pathways linking mothers' adverse childhood experiences and children's social-emotional problems	(Zhang et al., 2023)	USA	Mothers & infants	831	19–49 years old, 47.5% white, low income	Prospective cohort	The association between maternal ACEs and children's social-emotional problems was fully mediated, with postpartum mental health acting as a primary mechanism. Mental health was an indirect conduit through which the effects of adult adversity and perceived father involvement were expressed.	PHQ-9, GAD-7	ACE-10	83%	Postnatal	Yes postnatally	Yes postnatally	Yes postnatally	Mothers' mental health problems, experiences of adult adversity, and perceptions of father involvement fully mediated the relationship between mothers' ACEs and children's social-emotional problems

Appendix B *Patterning Chart*

Patterns	Citations
Maternal ACEs associated with maternal stressful events in the perinatal period	Chang et al., 2021; Erickson et al., 2019; Esteves et al., 2020; Mersky & Janczewski, 2018; Williams et al., 2023; Coe et al., 2021; McDonald et al., 2019.
Maternal ACEs associated with antenatal mental illness	Allen et al., 2023; Ångerud et al., 2018; Benzies et al., 2021; Bränn et al., 2023; Chang et al., 2021; Coe et al., 2021; Do et al., 2021; Johnson et al., 2017; Kim et al., 2020; Letourneau et al., 2019; McDonnell & Valentino, 2016; McDonald et al., 2019; Menke et al., 2019; Mersky & Janczewski, 2018; Racine et al., 2018; Racine et al., 2020.
Maternal ACEs associated with postnatal mental illness	Ångerud et al., 2018; Benzies et al., 2021; Bränn et al., 2023; Brittain et al., 2022; Chang et al., 2021; Doi & Fujiwara, 2019; Erickson et al., 2019; Esteves et al., 2020; Ilter Bahadur et al., 2021; Johnson et al., 2017; Kim et al., 2020; LeMasters et al., 2021; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016; Menke et al., 2019; Mersky & Janczewski, 2018; Prentice et al., 2022; Racine et al., 2018; Racine et al., 2020; Shin et al., 2021; Williams et al., 2023; Zhang et al., 2023.
ACE association with depression outweighs any other variable	Ångerud et al., 2018; Brittain et al., 2022; Shin et al., 2021; Racine et al., 2020.
Maternal ACEs NOT associated with PPD.	Allen et al., 2023.
Prenatal depression associated with maternal perceptions of dysfunctional parent-child interaction and less sensitive parenting	Coe et al., 2021.
Maternal mental illness extends beyond the perinatal period, with ACE prevalence.	Bränn et al., 2023
Mothers ACEs associated with their offspring's poor developmental outcomes	Chang et al., 2021; Racine et al., 2018.
Maternal ACEs impact pregnancy outcomes.	McDonnell & Valentino, 2016; Racine et al., 2020.
Mothers with ACEs and IPV had a high risk of adverse birth outcomes	Do et al., 2021.
Maternal ACEs predict shorter infant telomere length.	Esteves et al., 2020.

Maternal PND is significantly associated with symptoms of child mental illness.	Brittain et al., 2022; Esteves et al., 2020; Letourneau et al., 2019; McDonald et al., 2019; McDonnell & Valentino, 2016; Zhang et al., 2023.
Women who experience ACEs and IPV have higher rates of depressive symptoms in the perinatal period (cumulative effect)	Coe et al., 2021; Doi & Fujiwara, 2019.
Low social support associated with maternal ACE	Erickson et al., 2019; Ilter Bahadur et al., 2021.
Low social support increased the prevalence of mental illness.	Ilter Bahadur et al., 2021; Racine et al., 2018.
Social support/ intervention decreased MMH outcomes for ACE mothers.	Benzies et al., 2021; Erickson et al., 2019.
Women who have ACEs are more likely to experience IPV.	Coe et al., 2021; Do et al., 2021; Mersky & Janczewski, 2018; Zhang et al., 2023.
Higher ACE prevalence in higher risk population	Allen et al., 2023; Brittain et al., 2022; Coe et al., 2021; Erickson et al., 2019; Johnson et al., 2017; McDonnell & Valentino, 2016; Mersky & Janczewski, 2018; Shin et al., 2021; Williams et al., 2023.
Maternal ACEs NOT associated with race.	Esteves et al., 2020.
Maternal ACEs associated with risk-taking behaviours	Allen et al., 2023; Bränn et al., 2023; Brittain et al., 2022; Do et al., 2021; Doi & Fujiwara, 2019; Ångerud et al., 2018; McDonald et al., 2019.
Maternal ACEs NOT associated with risk-taking behaviours (substance abuse)	Johnson et al., 2017.
High maternal ACE population impacted by determinants of health	Brittain et al., 2022; Doi & Fujiwara, 2019; Erickson et al., 2019; Esteves et al., 2020; Ilter Bahadur et al., 2021; Johnson et al., 2017; Kim et al., 2020; McDonald et al., 2019; Mersky & Janczewski, 2018; Shin et al., 2021; Williams et al., 2023; Zhang et al., 2023.
Higher ACE scores in younger mothers	Allen et al., 2023; Doi & Fujiwara, 2019; McDonnell & Valentino, 2016; Mersky & Janczewski, 2018.
Maternal mental illness associated with lower maternal self-efficacy	Chau et al., 2023; McDonald et al., 2019.
ACEs negatively impact attachment and bonding.	Chau et al., 2023.

Assumed underreporting of ACEs due to culture/stigma	Ilter Bahadur et al., 2021; LeMasters et al., 2021.

Key for themes	Total articles	
Maternal ACEs and MMH	27	
Maternal ACEs, MMH, and intergenerational outcomes	10	
Maternal ACEs, MMH, and parenting stress	12	(7 reported)
Maternal ACEs and MMH in high-risk/vulnerable populations	19	
Maternal ACEs, MMH, and intimate partner violence	5	
Maternal ACEs, MMH, and the impact of social support	4	

Appendix C *Newcastle Ottawa Scale Results*

				Selection				**Comparability**	**Outcome**			
Title	Citation	Design	Method	1. Representativeness of the exposed cohort	2. Selection of the non-exposed cohort	3. Ascertainment of Exposure	4. Demonstration of the outcome of interest was not present at the start of the study	1. Comparability of cohorts on the basis of the design or analysis	1. Assessment of outcome	2. Was follow-up long enough for outcomes to occur	3. Adequacy of follow-up of cohorts	Total stars
The association between adverse childhood experiences and perinatal depression symptom trajectories	(Allen et al., 2023)	Cohort	Retrospective cohort study	*	*	* Clinical records	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	5
Adverse childhood experiences and depressive symptomatology among pregnant women	(Ångerud et al., 2018)	Cohort	Longitudinal study	*	*	0 Self-report	*	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	5
Association between adverse childhood experiences and perinatal depressive symptoms: A cross-sectional analysis of 16,831 women in Iceland	(Benzies et al., 2021)	Cohort	Longitudinal study	*	*	* Combination of clinical assessment and self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	0	0	3
Impact of adverse childhood experiences on	(Bittain et al., 2022)	Cohort	Prospective cohort study	*	*	0 Self-report	0	0 Study does not appear to control (assess) for	0	*	*	4

women's psychosocial and HIV-related outcomes and early child development in their offspring								lifetime mental illness				
Examining the relationship between maternal childhood abuse history and mother-infant bonding: The mediating roles of postpartum depression and maternal self-efficacy	(Chang et al., 2021)	Cohort	Prospective cohort study	*	*	0 Self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	4
Cascades of risk linking intimate partner violence and adverse childhood experiences to less sensitive caregiving during infancy	(Coe et al., 2021)	Cohort	Prospective cohort study	*	*	* Combination of clinical observations and self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	5
Combined effect of adverse childhood experiences and young age on self-harm ideation among postpartum	(Do et al., 2021)	Cohort	Prospective cohort study	*	*	0 Self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	0	3

women in Japan												
Adverse childhood experiences and current psychosocial stressors: Exploring effects on mental health and parenting outcomes from a mother-baby partial hospital program	(Erickson et al., 2019)	Cohort	Prospective cohort study	*	*	0 Self-report	* Investigated	* Previous mental health examined in the analysis	0	*	*	6
Adverse childhood experiences: Implications for offspring telomere length and psychopathology	(Esteves et al., 2020)	Cohort	Prospective cohort study	*	*	* Combined secure medical records, structured interviews and self-reports	*	0 Study does not appear to control (assess) for lifetime mental illness	*	*	*	7
Parents' adverse childhood experiences and mental health screening using home visiting programs: A pilot study	(Johnson et al., 2017)	Cohort	Prospective cohort study	*	*	*	* Although one of the intake streams was from a service that refers families at risk of child maltreatment, which includes ACEs	0 Study does not appear to control (assess) for lifetime mental illness	0	0	0	4
Exposure to racism and other adverse childhood experiences among perinatal women with	(Kim et al., 2020)	Cohort	Prospective cohort study	*	*	0	*	* Previous mental health examined in the analysis	0	*	*	6

moderate to severe mental illness												
Adverse childhood experiences and depression among women in rural Pakistan	(LeMasters et al., 2021)	Cohort	Retrospective cohort study	*	*	* Combination of clinical assessment and self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	5
Intergenerational transmission of adverse childhood experiences via maternal depression and anxiety and moderation by child sex	(Letourneau et al., 2019)	Cohort	Prospective cohort study	0-Limited generalisability beyond middle/upper-class families	*	0 Self-report	*	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	5
Maternal adverse childhood experiences, mental health, and child behaviour at age 3: The all our families community cohort study	(McDonald et al., 2019)	Cohort	Longitudinal study	* Over-representation of low-needs families in a wider cohort	*	* Combined questionnaires and stakeholder-assessed tools	*	0 Study does not appear to control (assess) for lifetime mental illness	0	*	0	5
Intergenerational effects of childhood trauma	(McDonnell & Valentino, 2016)	Cohort	Prospective cohort study	*	*	0 Self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	* Record linkage for birth data; gestation at delivery, birth weight	0	0	3
Childhood adversity and sleep are associated with symptom severity in	(Menke et al., 2019)	Cohort	Prospective cohort study	* Random to a population of women seeking MH assessment	*	* Combination of clinical assessment and self-report	0	* Previous MH history included in the assessment	*A psychiatrist conducts all assessments during their intake interview for	*	*	7

perinatal women presenting for psychiatric care				as an outpatient					services. Findings discussed and confirmed by three further psychiatrists that same day			
Adverse childhood experiences and postpartum depression in home visiting programs: Prevalence, association, and mediating mechanisms	(Mersky & Janczewski, 2018)	Cohort	Retrospective cohort study	*	*	0 Self-report	*	0 Study does not appear to control (assess) for lifetime mental illness	0	0 Unclear when all of the data collection occurred. MH assessment at only three months is stated	* Secondary analysis, so only reported data included	4
The association between adverse childhood experiences and postpartum depression	(Prentice et al., 2022)	Cohort	Retrospective cohort study	*Random to a population with a PPD diagnosis	*	* Combination of clinical assessment and self-report	* All diagnosed with PPD	* Previous mental health examined in the analysis	* Record linkages in analysis	*	*	8
Maternal adverse childhood experiences and infant development	(Racine et al., 2018)	Cohort	Prospective cohort study	*	*	0- Self-report	*	0 Study does not appear to control (assess) for lifetime mental illness	0	*	0	4
Perinatal depression: The role of maternal adverse childhood experiences and social support	(Racine et al., 2020)	Cohort	Longitudinal study	*	*	0- Self-report	*	0 Study does not appear to control (assess) for lifetime mental illness	0	*	0	4
Maternal adverse childhood	(Shin et al., 2021)	Cohort	Prospective	*	* Described characteri	0 Self-report	*	0 Study does not appear to control (assess) for	0	0 Appears to be one baseline data collection	0	3

experiences and postpartum depressive symptoms in young, low-income women			cohort study		stics as being similar			lifetime mental illness		point and one survey 7 days postnatally		
Intergenerational pathways linking mothers' adverse childhood experiences and children's social-emotional problems	(Zhang et al., 2023)	Cohort	Prospective cohort study	*Representative of a high-needs population	*	0 Self-report	0	0 Study does not appear to control (assess) for lifetime mental illness	0	*	*	4

Cross-sectional studies								Comparability	Outcome			
				1. Representativeness of the sample	2. Sample size	3. Non-respondents	4. Ascertainment of the exposure (risk factor)	1. The subjects in different outcome groups are comparable based on study design or analysis. Confounding factors are controlled.	1. Assessment of the outcome	2. Statistical test		
Welcome to Parenthood is associated with reduction of postnatal depressive symptoms during the transition from pregnancy to 6 months postpartum in a community sample: A	(Bränn et al., 2023)	Cross-sectional		* Representative of the broader population	*16,831	*	*Previous mental health history included in the analysis	**Confounders described and controlled for	*	*		8

longitudinal evaluation.										
The impacts of maternal childhood adversity, stress, and mental health on child development at 6 months in Taiwan: A follow-up study.	(Chau et al., 2023)	Cross-sectional	0-Underrepresented by higher-risk groups	0 -191 mothers	*	0 Study does not appear to control (assess) for lifetime mental illness	Under-representation of higher-risk participants	*	*	3
Intergenerational effects of violence on women's perinatal well-being and infant health outcomes: Evidence from a birth cohort study in Central Vietnam	(Doi & Fujiwara, 2019)	Cross-sectional	*	*5,960	*	0 Study does not appear to control (assess) for lifetime mental illness	**Confounders described and controlled for	*	*	7
The role of adverse childhood experience and social support type in postpartum depression in Turkey	(Ilter Bahadur et al., 2021)	Cross-sectional	*Somewhat random sampling; however, refugees were excluded due to language barriers	*	0	0 Study does not appear to control (assess) for lifetime mental illness	**Confounders described and controlled for	*	*	6
Peripartum traumas and mental health outcomes in a low-income sample of	(Williams et al., 2023)	Cross-sectional	*	0-119 mothers with infants in NICU	*	*Previous mental health history (stress) included in the analysis	**Confounders described and controlled for	*	*	7

NICU mothers: A call for family-centered, trauma-informed care

Appendix D: *Ethical Approval Letter*

Auckland University of Technology Ethics Committee (AUTEC)

Auckland University of Technology
D-88, Private Bag 92006, Auckland 1142, NZ
T: +64 9 921 9999 ext. 8316
E: ethics@aut.ac.nz
www.aut.ac.nz/researchethics

16 June 2021
Margaret Sandham
Faculty of Health and Environmental Sciences

Dear Margaret

Re Ethics Application: **21/149 Determining the prevalence of maternal adverse childhood experiences (ACEs) and their associations with depressive symptoms in the first year postpartum**

Thank you for providing evidence as requested, which satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC).

Your ethics application has been approved for three years until 16 June 2024.

Standard Conditions of Approval

1. The research is to be undertaken in accordance with the Auckland University of Technology Code of Conduct for Research and as approved by AUTEC in this application.
2. A progress report is due annually on the anniversary of the approval date, using the EA2 form.
3. A final report is due at the expiration of the approval period, or, upon completion of project, using the EA3 form.
4. Any amendments to the project must be approved by AUTEC prior to being implemented. Amendments can be requested using the EA2 form.
5. Any serious or unexpected adverse events must be reported to AUTEC Secretariat as a matter of priority.
6. Any unforeseen events that might affect continued ethical acceptability of the project should also be reported to the AUTEC Secretariat as a matter of priority.
7. It is your responsibility to ensure that the spelling and grammar of documents being provided to participants or external organisations is of a high standard and that all the dates on the documents are updated.

AUTEC grants ethical approval only. You are responsible for obtaining management approval for access for your research from any institution or organisation at which your research is being conducted and you need to meet all ethical, legal, public health, and locality obligations or requirements for the jurisdictions in which the research is being undertaken.

Please quote the application number and title on all future correspondence related to this project.

For any enquiries please contact ethics@aut.ac.nz. The forms mentioned above are available online through http://www.aut.ac.nz/research/researchethics

(This is a computer-generated letter for which no signature is required)
The AUTEC Secretariat
Auckland University of Technology Ethics Committee
Cc: Katrina.a.k.coleman@gmail.com; annette.dickinson@aut.ac.nz; Melanie Moylan

Appendix E: ***Study Survey***

Sociodemographic questions

Participant ID	_____
Which ethnic group(s) do you belong to?	☐ New Zealand European ☐ Māori ☐ Samoan ☐ Cook Islands Māori ☐ Tongan ☐ Niuean ☐ Chinese ☐ Indian ☐ Other (Click the box or boxes which apply to you.)
Please state other ethnic groups:	_____
What is your age?	○ 18-25 ○ 25-29 ○ 30-34 ○ 35-39 ○ 40-44 ○ 45+
What is your relationship status?	○ Married (not separated) ○ Separated ○ Divorced or dissolved ○ Widowed or surviving civil union partner ○ Never married and never in a civil union ○ Not elsewhere included
Number of Children born	○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6+
Your Family Structure Before Age 18	☐ Both biological/adoptive parents in the household ☐ Only biological mother ever in the household (father never present) ☐ Biological/adoptive parents divorced or not living together ☐ Raised by relatives, by foster parents, or in an institution (Click the box or boxes which apply to you.)
Which town do you live closest to?	_____

Urban accessibility based on drive time	○ High urban accessibility, 0-15 minutes from major urban areas ○ Medium urban accessibility, 15-25 minutes from major urban areas, 0-25 minutes from large urban areas, or 0-15 minutes from medium urban areas ○ Low urban accessibility, 25-60 minute from major urban areas, 25-60 minutes from large urban areas, or 15-60 minutes from medium urban areas ○ Remote, 60-120 minutes from major, large, or medium urban areas ○ Very remote, More than 120 minutes from major, large, or medium urban areas
What is your highest gained secondary school qualification?	○ None ○ NZ Certificate in one or more subjects or National Certificate level one or NCEA level 1 ○ NZ Sixth Form Certificate in one or more subjects or National Certificate level 2 or NZ UE before 1986 in one or more subjects for NCEA level 2 ○ NZ Higher School Certificate or NZ University Bursary/Scholarship or National Certificate level 3 or NCEA level 3 or NZ Scholarship ○ Other secondary school qualification gained in NZ ○ Other secondary school qualification gained overseas
Apart from secondary school qualifications, do you have another completed qualification?	○ Yes ○ No
What is your highest completed qualification?	○ Level one certificate (e.g. Introduction level certificate) ○ Level two certificate (e.g. Foundation skills certificate) ○ Level three certificate (e.g. Pre trade certificate) ○ Level four certificate (e.g. Trade certificate) ○ Level five Diploma (e.g. Advanced trade certificate) ○ Level six Diploma (e.g. National Certificate/Diploma) ○ Bachelor degree or level seven qualification ○ Bachelor Hons or Post graduate Certificate/Diploma ○ Masters Degree ○ PhD ○ Other Qualification
Please state your highest qualification?	_____

In the last year, what was your total household income?	◯ Loss ◯ No income ◯ $1-$5,000 ◯ $5,001-$10,000 ◯ $10,001-$15,000 ◯ $15,001-$20,000 ◯ $20,001-$25,000 ◯ $25,001-$30,000 ◯ $30,001- $35,000 ◯ $35,001-$40,000 ◯ $40,001-$50,000 ◯ $50,001-$60,000 ◯ $60,001-$70,000 ◯ $70,001-$100,000 ◯ $100,001-$150,000+ ◯ Don't know ◯ Refuse to answer
Which country were you born in?	◯ NZ ◯ Australia ◯ England ◯ China (People's Republic of) ◯ India ◯ South Africa ◯ Samoa ◯ Cook Islands ◯ Other
Please state 'other' country of birth	_____

Adverse childhood Experience Questionnaire- ACE 10

Participant ID	_____
While you were growing up, during your first 18 years of life:	
Did a parent or other adult in the household often Swear at you, insult you, put you down, or humiliate you? or Act in a way that made you afraid that you might be physically hurt?	○ Yes ○ No
Did a parent or other adult in the household often Push, grab, slap, or throw something at you? or Ever hit you so hard that you had marks or were injured?	○ Yes ○ No
Did an adult or person at least 5 years older than you ever Touch or fondle you or have you touch their body in a sexual way? or Try to or actually have oral, anal, or vaginal sex with you?	○ Yes ○ No
Did you often feel that No one in your family loved you or thought you were important or special? or Your family didn't look out for each other, feel close to each other, or support each other?	○ Yes ○ No
Did you often feel that You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? or Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?	○ Yes ○ No
Were your parents ever separated or divorced?	○ Yes ○ No
Was your mother or stepmother: Often pushed, grabbed, slapped, or had something thrown at her? or Sometimes or often kicked, bitten, hit with a fist, or hit with something hard? or Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?	○ Yes ○ No

Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?	◯ Yes ◯ No
Was a household member depressed or mentally ill or did a household member attempt suicide?	◯ Yes ◯ No
Did a household member go to prison?	◯ Yes ◯ No

Patient Health Questionnaire (PHQ2)

Participant ID	_____
During the past month, have you been bothered by feeling down, depressed or hopeless?	◯ Yes ◯ No
During the past month, have you been bothered by little interest or pleasure in doing things?	◯ Yes ◯ No
During the past month have you been worrying a lot about everyday problems?	◯ Yes ◯ No

Depression, Anxiety and Stress Scale (DASS 21)

Please read each statement and click a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 Did not apply to me at all
1 Applied to me to some degree, or some of the time
2 Applied to me to a considerable degree, or a good part of time
3 Applied to me very much, or most of the time

	0: Did not apply to me at all	1: Applied to me to some degree or some of the time	2: Applied to me a considerable degree or a good part of the time	3: Applied to me very much, or most of the time
I found it hard to wind down	◯	◯	◯	◯
I was aware of dryness of my mouth	◯	◯	◯	◯
I couldn't seem to experience any positive feeling at all	◯	◯	◯	◯
I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)	◯	◯	◯	◯
I found it difficult to work up the initiative to do things	◯	◯	◯	◯
I tended to over-react to situations	◯	◯	◯	◯
I experienced trembling (e.g. in the hands)	◯	◯	◯	◯

I felt that I was using a lot of nervous energy	○	○	○	○
I was worried about situations in which I might panic and make a fool of myself	○	○	○	○
I felt that I had nothing to look forward to	○	○	○	○
I found myself getting agitated	○	○	○	○
I found it difficult to relax	○	○	○	○
I felt down-hearted and blue	○	○	○	○
I was intolerant of anything that kept me from getting on with what I was doing	○	○	○	○

	0: Did not apply to me at all	1: Applied to me to some degree or some of the time	2: Applied to me a considerable degree or a good part of the time	3: Applied to me very much, or most of the time
I felt I was close to panic	○	○	○	○
I was unable to become enthusiastic about anything	○	○	○	○
I felt I wasn't worth much as a person	○	○	○	○
I felt that I was rather touchy	○	○	○	○
I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)	○	○	○	○
I felt scared without any good reason	○	○	○	○
I felt that life was meaningless	○	○	○	○