Exploring Labour and Birth Experience and Relationships with Maternal Sleep and Symptoms of Postnatal Mental Distress in Aotearoa/New Zealand: A Mixed Methods Study

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ABSTRACT

Labour and birth experience (birth experience) can significantly affect a woman's wellbeing; however, there is a dearth of research on the prevalence and implications of a positive or negative experience in Aotearoa/New Zealand. Good sleep health is vital for mental health; however, whether sleep is a pathway linking labour and birth experience and postnatal mental distress is unclear.

This mixed methods study was guided by a social determinants of mental health theoretical lens. It investigated Māori and non-Māori women's birth experiences and relationships between birth experience, maternal sleep, and postnatal mental distress, using data from the *Moe Kura* study, which is informed by Kaupapa Māori epidemiological principles.

Quantitative data (Māori: n = 383, non-Māori: n = 702) were analysed using descriptive statistics and hierarchical logistic regression. Approximately one-third of women reported a negative birth experience, which was associated with anxiety symptoms at 4-6 weeks postpartum and more severe mental distress symptoms at 11-13 weeks postpartum. Māori women were over-represented in more socioeconomically deprived areas and were more likely to experience stressful life events and birth in a place different to planned. Antenatal mental distress was consistently associated with postnatal mental distress. Sleep was independently associated with postnatal mental distress at 11-13 weeks postpartum but did not attenuate associations between birth experience and postnatal mental distress.

A sub-sample of 13 Māori and 87 non-Māori women commented on their birth experience. Qualitative content analysis identified four themes: reactions 'expressing myself', appraisals 'into the unknown', aspects 'reality of experience', and impact on future labour and birth decisions and experiences 'looking ahead.' Differences in experiential patterns included negative experiences around communication and obstetric interventions described by Māori women and contrasting expectations versus reality of birth experience described by non-Māori women.

Mixed methods findings indicated that although many women report a positive birth experience, a considerable proportion have a negative experience which may increase risk of postnatal mental distress. Good sleep health is important for postnatal mental health but may not be the primary pathway linking birth experience to mental distress. Structural drivers of social and maternity service inequities must be addressed to achieve equitable maternal mental health.

Ko te whaea te takere o te waka

Mothers are like the hull of a canoe, they are the heart of the family.
Māori proverb

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TERMS AND ABBREVIATIONS

Antenatal	Before childbirth
Birth experience	Labour and birth experience
DSM-IV	The Diagnostic and Statistical Manual of Mental Disorders, fourth addition, published in 1994
DSM-IV-TR	The Diagnostic and Statistical Manual of Mental Disorders, fourth addition-text revision published in 2000
DSM-5	The Diagnostic and Statistical Manual of Mental Disorders, fifth addition, published in 2013
EPDS	Edinburgh Postnatal Depression Scale
ESS	Epworth Sleepiness Scale
Ethnicity	Social construct reflective of the social group(s) that a person identifies with
GAD	Generalised anxiety disorder
GSDS	General Sleep Disturbance Scale
LMC	Lead maternity carer
Moe Kura	Moe Kura: Mother and Child, Sleep and Wellbeing in Aotearoa/New Zealand study
N1	Stage 1 NREM sleep
N2	Stage 2 NREM sleep
N3	Stage 3 NREM sleep
NREM	Non-rapid eye movement
NZ	Aotearoa/New Zealand
NZDep2006	New Zealand Index of Deprivation 2006. A non-occupational, composite, area-level measure of relative socioeconomic deprivation. Ranges from decile 1 (10% of small areas with lowest levels of deprivation) to decile 10 (10% of small areas with highest levels of deprivation)
Perinatal	Around childbirth
Perinatal period	Period of time surrounding conception, pregnancy, childbirth and the first postpartum year
PND	Postnatal depression
Postnatal	After childbirth
Postnatal mental distress	The occurrence of depression, anxiety and/or stress in the first postnatal year

Postpartum	After childbirth
PRQ	Pregnancy Risk Questionnaire
PTSD	Post-traumatic stress disorder
REM	Rapid eye movement
SEP	Socioeconomic position
Te Tiriti o Waitangi	The Treaty of Waitangi

CHAPTER 1 INTRODUCTION

Labour and birth are significant and vulnerable times in a woman's life. Birth can be joyous and empowering; however, a negative experience can leave women suffering profound physical and emotional distress (Ayers et al., 2008; C. T. Beck, 2001; Bell & Andersson, 2016; Waldenström et al., 2004). Globally, between 7% and 21% of women report a negative birth experience (Henriksen et al., 2017; Smarandache et al., 2016; Waldenström et al., 2004) and up to a third identify some aspects of their birth as traumatic (Creedy et al., 2000; Soet et al., 2003). However, research on the prevalence of positive or negative birth experiences in NZ is limited.

Labour and birth experience (birth experience) can impact a woman's sense of self, adaptation to motherhood, feelings about her baby, family relationships and future childbirth decisions (Anderson et al., 1994; Ayers & Pickering, 2005; N. Cook et al., 2018; Fenech & Thomson, 2014; Nicholls & Ayers, 2007; Pang et al., 2008; Parratt, 2002; Shorey et al., 2018). Moreover, impacts of birth experience can be enduring, with far-reaching psychological implications (Green et al., 1990; Greenfield et al., 2016).

A range of social, psychological, and cultural factors can impact birth experience (Christiaens & Bracke, 2007; McKelvin et al., 2021; Soet et al., 2003; Stevenson et al., 2016; Webb et al., 2021). Therefore, exploring women's perspectives in the unique NZ context can contribute to understanding women's lived experiences of labour and birth.

The perinatal period broadly encompasses pregnancy to one year postpartum (Garcia & Yim, 2017) and women undergo considerable physiological and psychological changes to prepare for this major life transition (L. Miller, 2016). The World Health Organization (WHO) recognises maternal mental health as a global health priority, with 13% of postpartum women experiencing a mental health disorder (World Health Organization, 2020). Postnatal symptoms of depression and anxiety are common and can have a lasting adverse impact on wellbeing. Postnatal depression affects 13%-19% of women worldwide (Gavin et al., 2005; O'Hara & McCabe, 2013). Often co-morbid with

depression, 13%-40% of postnatal women are affected by anxiety (T. Field, 2018). Furthermore, a negative birth experience can result in a woman developing some or all of the symptoms of post-traumatic stress disorder (PTSD), with the incidence of PTSD after childbirth being approximately two per cent (Ayers & Pickering, 2001; Grekin & O'Hara, 2014; Wijma et al., 1997). Notably, a woman who has experienced a negative birth without meeting PTSD diagnostic criteria can still experience significant distress (Greenfield et al., 2016)

NZ studies suggest the prevalence of postnatal depressive symptoms may be higher than those reported internationally and that inequities in perinatal mental health exist between Māori and non-Māori women (M. W. Abbott & Williams, 2006; Signal et al., 2017; Thio et al., 2006). To improve outcomes for NZ women and their families, we need to examine factors that impact postnatal mental distress for Māori and non-Māori mothers. Birth experience could influence postnatal mental distress in NZ; thus, research in this area is a priority.

Sleep disruption is common in the perinatal period; maternal postpartum sleep is highly fragmented, with women vulnerable to disturbed, shortened and reduced quality sleep (Montgomery-Downs et al., 2010; Sivertsen et al., 2015). Mental health and sleep share a close reciprocal connection, and sleep is a modifiable factor in preventing and treating depressive symptoms (Franzen & Buysse, 2008). However, the possibility that sleep health is a pathway linking birth experience and postnatal mental distress has not, to the researcher's knowledge, been explored in NZ. Understanding this potential relationship may inform sleep interventions during this period, which may benefit those with a negative birth experience.

This research investigates the relationships between birth experience, sleep, and postnatal distress symptoms. It aims to contribute to the understanding and impact of the experience for Māori and non-Māori women in NZ.

1.1 Thesis Contexts

This research examines birth experience within the unique context of NZ. It uses quantitative and qualitative data collected from participants in a broader programme of longitudinal research, the *Moe Kura: Mother and Child, Sleep and Wellbeing in Aotearoa/New Zealand (Moe Kura)* study (Signal et al., 2022). A brief overview of relevant aspects of NZ society and the methodological principles that guided the *Moe Kura* study are outlined below to contextualise this research.

1.1.1 Aotearoa/New Zealand Context

NZ's population is approximately 5.12 million, including 2.58 million people who identify as female (Statistics New Zealand, 2021). Māori are the Indigenous people of NZ and are acknowledged as Tangata Whenua (the people of the land). Māori make up 16.5% of NZ's population, alongside other major ethnic groups, including European (70.2%), Pacific (8.1%) and Asian (15.1%) peoples (Statistics New Zealand, 2018).

In NZ, well-established standardised protocols exist for collecting and reporting ethnicity data for population and health and disability statistics (Ministry of Health, 2017). Ethnicity is defined by Statistics NZ as "the ethnic group or groups that people identify with or feel they belong to. Ethnicity is a measure of cultural affiliation, as opposed to race, ancestry, nationality, or citizenship. Ethnicity is self-perceived, and people can belong to more than one ethnic group. An ethnic group is made up of people who have some or all the following characteristics:

- a common proper name
- one or more elements of common culture which need not be specified but may include religion, customs, or language
- unique community of interests, feelings, and actions
- a shared sense of common origins or ancestry, and
- a common geographic origin." (Statistics New Zealand, 2005, p. 1)

Ethnicity is a social construct rather than a biological one and it relates to how people experience and live their lives (Ministry of Health, 2017; Robson et al., 2007; Sternberg et al., 2005). Therefore, equating 'ethnicity' with 'race' or other terms de-emphasises the socially constructed nature of ethnicity (Zagefka, 2009). Furthermore, ethnicity is not fixed; instead it reflects the social group or groups a person self-identifies as belonging to, which can change over time (Callister, 2011; P. Reid et al., 2017).

Health inequities are "differences which are unnecessary and avoidable, but in addition are considered unfair and unjust" (Whitehead, 1992, p. 431). Health inequities put disadvantaged groups at a further disadvantage and diminish opportunities to flourish. The concept of health equity focuses beyond the individual (P. Reid et al., 2019). Instead, it recognises that the inequitable distribution of social determinants of health (e.g., resources, social, political, environmental, economic factors) drive inequities; therefore, it is structural in nature. In order to achieve health equity, resources need to be distributed differently for different groups (Robson et al., 2007). This includes evaluating the processes that determine how resources are shared and the underlying values of society (Braveman & Gruskin, 2003). Therefore, political action is required to monitor and redress health inequities.

Globally, health inequities are common, including disparities based on gender, age, disability, geographic location and socioeconomic position (Robson et al., 2007). Pervasive and compelling health inequities exist between Māori and non-Māori in NZ (Ajwani et al., 2003; Ministry of Health, 2020a; Robson et al., 2007). For example, in 2017-19, life expectancy was 7.4 years lower for Māori than non-Māori European/Other females (ASMS Toi Mata Hauora, 2021). Significant ethnic inequities also exist in morbidity for chronic and infectious diseases and injuries, with Māori having higher rates than non-Māori (Health Quality & Safety Commission, 2017; Howden-Chapman & Tobias, 2000; Ministry of Health, 2019b).

Concerningly, inequities also exist in NZ in maternal mental health. Suicide is the leading cause of maternal death in NZ, with Māori women having significantly higher rates than women from other

ethnic groups (PMMRC, 2021). In addition, Māori women are disproportionally impacted by life stress and anxiety antenatally (Signal et al., 2017). Several NZ studies have found depression and anxiety symptoms are more prevalent for Māori women than for non-Māori women during the perinatal period (Signal et al., 2017; Waldie et al., 2015; Webster et al., 1994).

Such inequities in NZ are an injustice to Māori that continue and escalate. Multiple types of racism drive health inequities, including structural, interpersonal, and intrapersonal racism (Jones, 2000). Racism refers to an ideology that some 'races' are superior and racial discrimination is the expressed form of this ideology (Bhopal, 1998; Williams et al., 1997). Racial discrimination is an important modifiable determinant of health in NZ, with self-reported racial discrimination associated with reduced access to healthcare and poorer health outcomes (Talamaivao et al., 2020). In 2011/2012, 26.3% of Māori adults reported experiencing racial discrimination compared to 14.3% of non-Māori (Ministry of Health, 2019b). Harris et al. (2006) found Māori adults were ten times more likely than European to report experiencing racial discrimination, and this was significantly associated with poor health outcomes, independent of socioeconomic position.

Socioeconomic position (SEP) is an aggregate concept referring to the social and economic factors that influence the positions individuals or groups hold within the structure of society (Galobardes et al., 2006; Lynch & Kaplan, 2000). SEP incorporates both resource-based (i.e. income, wealth, educational credentials) and prestige-based (i.e. rank or status in a social hierarchy) measures (Krieger, 2001). Krieger (2001) recommends the term 'socioeconomic status' is avoided as it privileges 'status' over material resources. SEP is a significant health determinant (Lynch & Kaplan, 2000). In NZ, those living in the most deprived areas (low SEP) report poorer health outcomes and unmet health needs, independent of ethnicity, age and sex, compared with those living in the least deprived areas (high SEP)(Ministry of Health, 2020a).

In NZ the contemporary and historical impacts of colonisation have resulted in Māori being over-represented in the most socioeconomically deprived neighbourhoods (Atkinson et al., 2014). This is indicative of structural racism (P. Reid et al., 2000) and reflective of social and economic

disadvantage and discrimination experienced by Māori. Colonisation is a continuous and deliberate process, dehumanising Indigenous peoples (P. Reid & Robson, 2007). The effects of colonialism are ongoing and continue to be lived, experienced, negotiated and resisted by Māori (Simmonds, 2016). Therefore, to understand and address Māori health inequities, it is essential to understand NZ's colonial history.

Te Tiriti o Waitangi (The Treaty of Waitangi) was signed in 1840 by 500 rangatira (chiefs) and a British Crown representative (Orange, 2015). It formalised the initial relationship between Māori and the Crown and is often described as NZ's founding document (Kingi, 2007; Orange, 2015). However, there were significant discrepancies between the Māori and English versions, which has led to different understandings of te Tiriti/the Treaty's meaning (Kingi, 2007). The Treaty of Waitangi Act 1975 reinstated the legal authority of te Tiriti/the Treaty, establishing the Waitangi Tribunal (Hudson & Russell, 2009). The Tribunal recently ruled that rangatira, who signed te Tiriti, agreed to share power and authority; they did not cede their sovereignty to the British Crown (Waitangi Tribunal, 2014).

Māori have repeatedly claimed their rights guaranteed by te Tiriti/the Treaty have been breached. These claims include the misappropriation of resources and land and the lack of preservation of language and intellectual property rights (Hudson & Russell, 2009). Moreover, the effects of the ensuing post-Tiriti/Treaty British rule and colonisation, including land confiscations and the social and political marginalisation of Māori, are evident in the unequal power relationships between Māori and non-Māori that are entrenched in NZ society today (Robson et al., 2007).

Colonial settler values of individualism were at odds with the philosophy of collectivism of Māori (Mikaere, 1994). The social structures of Māori were undermined, and the destruction of the whānau (family) was a damaging impact of colonisation on Māori women (Mikaere, 1994). Previously birth and maternity practices for Māori women were understood through lived experience, ceremonies, storytelling, observation, and spirituality (Simmonds, 2016). However, colonialism has dismantled these practices and dramatically transformed them (Simmonds, 2016).

Traditional birthing has shifted to a more western, medicalised model of childbirth (Simmonds, 2016). Responses to oppression and a legacy of historical trauma have manifested as physical and psychological suffering experienced by generations of Māori (Pihama et al., 2014; J. Reid et al., 2014).

A permanent commission of inquiry, the Waitangi Tribunal makes recommendations on claims by Māori relating to Crown actions which breach te Tiriti (Waitangi Tribunal, 2014). The Waitangi Tribunal and Ministry of Health emphasise the Crown's role and obligations in upholding and protecting Māori rights (P. Reid et al., 2017). This partnership is intended to ensure the wellbeing of all people in NZ, both individually and collectively (Levy & Waitoki, 2016).

Several principles underpin the Treaty of Waitangi. The recent 2019 Hauora report recommends the following principles as a framework for the health and disability system:

- Tino rangatiratanga: providing for Māori self-determination in design, delivery and monitoring;
- Equity: The Crown to commit to achieving equitable health outcomes for Māori;
- Active protection: requires the Crown to act to achieve equitable outcomes for Māori, ensuring all agencies are well-informed on the extent and nature of both Māori health outcomes and efforts to achieve equity;
- Options: services are provided in a culturally appropriate way that recognises and supports the expression of Māori models of care and properly resourced Kaupapa Māori health services;
- Partnership: the Crown and Māori to work in partnership in the governance, plan, provision and monitoring, and Māori must be co-designers of the health system for Māori (Ministry of Health, 2020c; Waitangi Tribunal, 2019).

The history of colonisation and its effects on present-day inequities and the resulting marginalised social position of Māori must be understood when conducting research that is responsive to Māori

(P. Reid et al., 2017). It is essential to explore health inequities as a component of Māori health. However, it is not sufficient to identify where health inequities exist as we need to understand the mechanisms that lead to these unfair and unnecessary health differences. Systematic change and responsiveness are required to improve inequities, and processes must reflect Māori health needs and priorities (P. Reid & Robson, 2007). Therefore, social determinants of health must be considered when examining relationships between birth experience, sleep, and postnatal distress.

1.1.2 Maternity Care in New Zealand

In 2019, 59,818 women gave birth in NZ; 25.1% were Māori (Ministry of Health, 2020b; Statistics New Zealand, 2019). The median age of birth for women in NZ was 30.7 years; the median age was 27.1 for Māori (Statistics New Zealand, 2019).

Maternity services in NZ are free to all eligible women. Services are uniquely based on women-centred community care, integrating with specialist care and hospital services when required. Pregnant women are encouraged to choose a lead maternity carer (LMC) early to coordinate their maternity care (Ministry of Health, 2021). An LMC can be a midwife, general medical practitioner with a diploma in obstetrics or an obstetrician. Responsible for care throughout pregnancy, labour and birth, an LMC provides information to assist with decisions during this time (Ministry of Health, 2021).

In 2018, 92.9% of women registered with an LMC during pregnancy, of which 94.5% registered with a midwife (Ministry of Health, 2020b). Despite the universal provision of maternity services, inequities exist in access to and provision of care. Women living in areas of high socioeconomic deprivation are less likely to register early with an LMC and are at increased risk of stillborn and neonatal death (PMMRC, 2021). A qualitative study of women in socioeconomically deprived areas identified financial barriers and lack of information as barriers to early engagement with LMCs (Priday et al., 2021). Rural women are also more likely than urban-dwelling women to have difficulty with access and choice in registering with maternity services (Gibbons et al., 2016; A. Robertson, 2008). In addition, persistent inequities exist between Māori and non-Māori in

experiences of and access to maternity care (Dawson et al., 2019; Robson et al., 2007; Stevenson et al., 2016).

1.2 Research Context

Kaupapa Māori epidemiology research principles informed the wider *Moe Kura* study design (Paine et al., 2013). Informed by its Indigenous underpinnings, Kaupapa Māori theory is defined and controlled by Māori and was developed in response to Māori aspirations, cultural practices, and wellbeing preferences (Pihama et al., 2015; Smith, 2012). Kaupapa Māori epidemiological research principles brought Māori women to the centre of this research. It informed recruitment and retention strategies to ensure sufficiently large numbers of Māori women participated; prioritised equal explanatory power for Māori and non-Māori participants; and ensured equal focus on Māori perspectives (Paine et al., 2013). Researching this way aims to contribute to an ongoing process of monitoring the Crown regarding its Treaty obligations and positively impacting the inequities that exist in NZ (P. Reid et al., 2017).

1.3 Researcher's Identity and Position

I am a mother of three children; with my first child, I experienced a negative birth, and I found the transition to motherhood difficult. I place great value on representation and social justice, bringing women's concerns and issues to the centre. My approach focuses on the importance of empowering all women to have their voices heard about their lived experiences.

My ethnicity is NZ European/ Pākehā. My husband's iwi is Ngāti Kahu, and I am grateful to have been embraced by and belong to his whānau. I do not profess, however, to understand the experience of being Māori. I acknowledge that I have a Pākehā perspective and position when conducting research. As a non-Māori researcher, I recognise I cannot conduct Kaupapa Māori research; therefore, this research is not undertaken or presented from a Kaupapa Māori perspective. I have actively collaborated with co-principal investigators and guardians of the *Moe Kura* study, Professor Leigh Signal and Dr Sarah-Jane Paine (Tūhoe), throughout all stages of the

research process. I am committed to honouring the Kaupapa Māori research principles that were a part of the *Moe Kura* study, including respect for all participants. It is a privilege to have had the opportunity to use the *Moe Kura* dataset.

1.4 Scope of the Thesis

This research is restricted to participants in the *Moe Kura* study cohort. It utilises a mixed methods study design, using a combination of quantitative and qualitative birth experience, postnatal mental distress, sleep health and demographic *Moe Kura* questionnaire data.

1.5 Thesis Structure

Following this introductory chapter, Chapter 2 provides background information from published literature relevant to the thesis including information on birth experience, postnatal mental distress, sleep, and associations with wellbeing. It highlights the knowledge gaps this research aims to address and the thesis's quantitative, qualitative, and mixed methods research questions. Chapter 3 describes the mixed methods research methodology and quantitative and qualitative study methods employed, including study design and analysis methods. The quantitative and qualitative study results and discussion are presented in Chapters 4 and 5. The final chapter, Chapter 6, summarises results from the quantitative and qualitative studies and synthesises the findings to address the overarching aim of the thesis. The implications of findings are then discussed, strengths and limitations, recommendations for future research, and this research's overall conclusion.

CHAPTER 2 BACKGROUND

This chapter provides an overview of current literature on birth experience, sleep and postnatal mental distress, and their relationships and importance. It concludes with a summary of knowledge gaps in these areas and the research questions this thesis aims to address.

2.1 Birth Experience

2.1.1 Defining Birth Experience

Before the 1980s literature on negative birth experiences and medical 'birth trauma' focused almost exclusively on the mode of birth involving physical trauma (Greenfield et al., 2016; Michaels, 2018). This is reflected in contemporary understandings of birth, with considerable research focused on obstetric complications and medical outcomes for the baby (Meyer et al., 2000; Ryding et al., 1998; Saisto et al.,1999; Schullinger, 1993). A broader concept of maternal 'traumatic birth' emerged in the literatures in the 1990s (S. Allen, 1998; Saisto et al.,1999). In 2000, the updated fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM) was published, broadening the PTSD diagnostic criteria and a diagnosis for PTSD relating to childbirth became possible. Clinically significant distress resulting from childbirth, and not necessarily related to physical injury (without PTSD), made its way into the literature in the mid-2000s, where the term 'traumatic birth' has widened to include psychological distress or disturbance (Ayers et al., 2008; C. T. Beck, 2004). C. T. Beck (2004) described a 'traumatic birth' as individual to each woman in how she chooses to define, experience, and classify it.

Recently, there has been an increase in qualitative studies focusing on the meaning of women's birth experiences and how they internalise these, focusing on subjective and objective factors (Greenfield et al., 2016). Larkin et al. (2009) conducted a concept analysis, defining the birth experience as "an individual life event, incorporating interrelated subjective psychological and physiological processes, influenced by social, environmental, organisational and policy contexts" (p. 49).

Birth experience is a subjective, complex phenomenon, with a literature review indicating several determinants of a positive or negative experience. These include control, feeling informed around decisions and choices, expectations, interventions and support (Attanasio et al., 2014; Crowe & von Baeyer, 1989; Green et al., 1990; Green & Baston, 2003; Hodnett, 2002; Nilsson et al., 2013; Smarandache et al., 2016).

Control is a major contributing factor to a positive birth. Personal control, including feeling in control of support and pain, are all components of birth experience influencing positive psychological outcomes (P. Goodman et al., 2004; Green & Baston, 2003). Conversely, a lack of control has been highlighted as an aspect of a negative birth experience (Henriksen et al., 2017).

A woman's hopes, plans and expectations for her birth can also impact her experience. A mismatch between expectations and reality can influence a woman's evaluation of, and satisfaction with birth experience (Benoit et al., 2007; Green et al., 1990; Webb et al., 2021). Expectations around having a more natural birth have been positively associated with accepting and tolerating labour pain (van Haaren-ten Haken et al., 2018). In addition, Haines et al. (2012) found that pregnant women (n = 509) who viewed birth less naturally with higher levels of fear and concern had an increased likelihood of a negative birth experience.

Significant aspects of the birth experience are support, relationships and continuity of care with maternity providers (Brown & Lumley, 1998a; Homer et al., 2002). Karlström et al. (2015), in their descriptive qualitative study (n = 26), found that safety and support, as well as trust in their midwife, were critical for women to review their experience positively 6-7 years post-birth. In a mixed methods study (n = 93), themes associated with lower satisfaction at birth were inadequate support from maternity providers and choices around care (Benoit et al., 2007). So significant are attitudes, behaviour and quality of care that they have been identified as more powerful than pain (Hodnett, 2002). Consistent with this is retaining negative memories of the birth experience. Stadlmayr et al. (2006) found that women (n = 206) who perceived negative support from caregivers 48-96 hours after birth retained their negative birth evaluation 16 months later.

Whereas those who had a negative experience, but perceived their care and relationship positively, recalled memories of their birth more positively.

Mode of birth is also an essential aspect of the birth experience that has been widely studied (Carter et al., 2006; Hall et al., 2012; Kempe & Vikström-Bolin, 2020; Pang et al., 2008). A meta-analysis of 43 studies found that women were significantly less satisfied with their birth experience after a caesarean section than women who had a vaginal delivery (DiMatteo et al., 1996). Similarly, a retrospective cohort study of 16,775 women found obstetric complications and interventions, including induction and instrumental delivery, to be significantly associated with dissatisfaction with birth (Falk et al., 2019). A mixed methods study (n = 103) identified complications (e.g. general anaesthesia for caesarean or having to resuscitate baby) as a major theme related to a negative birth experience (Henriksen et al., 2017). Interestingly, in a sample of women (n = 20) interviewed up to twenty years after their birth, how they felt, were treated, and their level of control was deemed more critical than obstetric features of their labour (Simkin, 1991).

Culture is an important aspect of the birth experience. Culture refers to patterns or norms of behaviour within identifiable groups in society. Cultural groups include ethnic identity, social class, religion, and age, and individuals can be influenced by several cultures simultaneously (National Advisory Committee on Health and Disability, 1998). However, much birth experience research is framed in western culture and birthing practices instead of cross-cultural perspectives (Kitzinger, 2011). Culturally responsive care can enrich a woman's experience, whereas a lack of cultural responsiveness can have a negative impact. Often found in western cultures, an individualistic approach can contribute to a lack of feeling supported for some women during birth (Wardrop & Popadiuk, 2015). In NZ, a longitudinal qualitative study of Māori women's birth experiences (n = 16) showed key themes around culturally responsive maternity care, including Māori practices, whānau (family) support, accessibility, and communication as being important (Stevenson et al., 2016). Māori women have also expressed lower satisfaction levels with antenatal, labour, and delivery care compared to non-Māori women (Ratima & Crengle, 2013). A growing

body of qualitative research is exploring Māori women's experiences; however, additional mixed methods research would contribute to this by furthering understanding of aspects of the birth experience that are important for Māori women.

2.1.2 Consequences of Birth Experience

The potential influence and memory of birth experience can be long-lasting. Of 1309 Dutch women, most recalled their birth experience positively, although 16.5% recalled their experience as unhappy three years post-birth (Rijnders et al., 2008). Takehara et al. (2014) surveyed 584 Japanese women and found that a significant number accurately recalled memories of their childbirth compared to birth transcripts five years post-birth. Furthermore, an early study exploring impacts of women's birth experience 15-20 years after birth (n = 20) found that women's recall was robust, detailed, and accurate compared to notes taken at birth (Simkin, 1991). Both positive and negative experiences had a significant, prolonged, and powerful impact.

A woman's birth experience can also greatly impact her mental health. Although adverse experiences receive more attention, a positive birth experience can empower and strengthen women, resulting in a great sense of satisfaction (Nilsson et al., 2013). Women can have a renewed positive perception of their capabilities and assessment of themselves (Milan, 2003). In addition, a woman's sense of self can adjust and transform positively due to her birth experience, leading to growth (Parratt, 2002). More positive experiences have been associated with higher maternal self-esteem and contribute to how positively a mother perceives her baby (Reisz et al., 2015). Furthermore, a subsequent positive birth experience following a traumatic birth can be a redemptive, healing experience (Milan, 2003; Thomson & Downe, 2010).

In contrast, a negative birth experience can trigger mental distress and has been linked to postnatal depression, anxiety, and enduring mental health problems (Ayers et al., 2008; Bell & Andersson, 2016; Green et al., 1990). In addition, distress following a negative birth experience can result in a woman developing some or all of the symptoms of PTSD (Ayers & Pickering, 2001; Grekin &

O'Hara, 2014; Wijma et al., 1997). A more detailed description of associations between birth experience and postnatal mental distress is in Section 2.3.7.

Birth experience can also impact future reproductive and birth decisions. A positive experience has been associated with enhanced confidence and positive intentions for future deliveries (Attanasio et al., 2014). Conversely, a negative experience has been associated with an increased likelihood of a maternal request for a caesarean section in subsequent births. It is also linked with delaying or not having further children (Fenech & Thomson, 2014; Shorey et al., 2018) and an increased fear of subsequent deliveries (Saisto et al.,1999).

A negative experience may interfere with infant-mother bonding, how a mother engages and responds to her baby and her overall adjustment (C. T. Beck, 2004; Nicholls & Ayers, 2007). Support people and birth partners can also be adversely affected, and there are potential negative implications on relationships with partners and the wider family (Elmir & Schmied, 2021; Nicholls & Ayers, 2007; Soet et al., 2003). Overall, these studies provide clear evidence of the vast consequences and significance of the birth experience.

2.1.3 Measuring Birth Experience

Due to its multifaceted and subjective nature, there is no gold standard or standardised way of assessing birth experience, making comparisons of studies difficult (Larkin et al., 2009). Furthermore, many of the different instruments developed fail to account for the complexity of birth (Dencker et al., 2010). Research often uses Likert scales with 5 or 7 points, however more complex scales have also been developed. For example, the 34-item Mackey Childbirth Satisfaction Rating Scale examines multiple factors affecting childbirth satisfaction (P. Goodman et al., 2004) and the 22-item Childbirth Experience Questionnaire (CEQ) measures dimensions of childbirth experience (Dencker et al., 2010). Although these measures capture more of the complexities of the birth experience, the trade-off is greater participant burden. This is particularly pertinent during the postnatal period, where demands on women are high.

There are currently no scales to assess birth experience that have been validated for use in the NZ context. However, many qualitative studies have been conducted to gain insights into the complexity and impact of the experience (Howarth et al., 2012; Maude & Foureur, 2007; Stevenson et al., 2016).

2.2 Sleep Health

2.2.1 Sleep Physiology and Function

Sleep is a complex physiological process essential for physical and psychological functioning (Gander, 2003). Until the 1950s, sleep was considered a passive, dormant state of brain inactivity. However, the discovery of rapid eye movement (REM) sleep led to sleep being understood as an active, cyclical process comprising the discrete states of non-rapid eye movement (NREM) sleep and REM sleep (Carskadon & Dement, 2017). REM is a state of sleep where the brain is highly active and cerebral cortex activation is similar to wakefulness. Although the eyes are usually closed, they move rapidly. In REM sleep, breathing becomes irregular, there is muscle atonia, heart rate speeds up, and it is the state where most dreaming occurs (Blumberg et al., 2020; Kryger et al., 2017).

Conversely, relatively low levels of brain activity occur during NREM sleep, and it involves a progressive slowing of many physiological systems. NREM is categorised into sleep stages: Stage 1 (NREM1), Stage 2 (NREM2) and Stage 3 (NREM3) (Kryger et al., 2017). Seen as the state of consciousness between sleep and wake, sleep commonly begins in NREM1. Although muscles lose some tone, they are still active, and it is easy to be roused at this stage. NREM2 is a deeper stage of sleep, and conscious awareness of the external environment disappears. NREM3 is considered deep sleep, with fewer arousals, and it is the most difficult to awaken from. Body temperature, respiration, heart rate, brain activity and energy consumption are at their lowest compared to the other stages of sleep in NREM3 sleep (Colten et al., 2006; Patel et al., 2022).

Throughout a nocturnal sleep period, the body progresses through four to six sleep cycles, averaging about 90 minutes per cycle (Patel et al., 2022). Each sleep stage in the cycle is equally important. Sleep architecture refers to the basic organisational structure of sleep, comprising NREM sleep, REM sleep and wake.

Behaviourally, sleep is a reversible state involving disengagement and unresponsiveness to stimuli and the environment. Sleep performs an essential restorative function for both brain and body and is critical for maintaining cognitive functions (Frank & Heller, 2019; Smetacek, 2010). It is also a complex, dynamic process that facilitates learning and memory processing, metabolic processes and tissue restoration and maintains homeostatic balance (Carskadon & Dement, 2017; Tempesta et al., 2018; M. P. Walker & Stickgold, 2004).

2.2.2 Conceptual Model of Sleep Health

Sleep duration guidelines have been published, based on a multidisciplinary panel's experience and review of scientific evidence. It is recommended that most healthy adults obtain 7-9 hours of sleep per 24 hours regularly to maintain physiological and psychological health (Hirshkowitz et al., 2015). However, for some adults, as little as 6 or as much as 10 hours may be appropriate. Durations outside of this are not recommended.

Until recently, most sleep research focussed on sleep duration or sleep disorders. Buysse (2014) created a conceptual model of 'sleep health', defining it as "a multidimensional pattern of sleep-wakefulness, adapted to individual, social and environmental demands, that promotes physical and mental wellbeing. Good sleep health is characterised by subjective satisfaction, appropriate timing, adequate duration, high efficiency, and sustained alertness during waking hours" (p. 12). This definition expresses sleep as a positive construct important for health and wellbeing, instead of a deficit view of 'good' sleep simply being the absence of sleep disorders. This multidimensional approach focuses on all five dimensions of sleep: sleep timing, sleep continuity, sleep duration, sleep quality and daytime sleepiness. Sleep health is viewed on a continuum, and good sleep health may differ for individuals due to personal, social and environmental demands (Buysse, 2014).

2.2.3 Implications of Poor Sleep Health

Sleep health directly impacts waking functioning and physical and mental wellbeing (Buysse, 2014; Gander, 2003). Experimental sleep studies have found that sleep loss negatively impacts attention and vigilance and more complex cognitive executive functions like prioritisation and planning (Kendall et al., 2006; Lim & Dinges, 2008; M. P. Walker, 2009). Poor sleep (shortened or poor quality sleep) is associated with decreased psychomotor performance, impaired immune functioning, and physical and mental health problems (Gander, 2003; Zisapel, 2007). Mental health and sleep share bidirectional associations as sleep disturbances often occur before mental health distress. The majority of individuals with symptoms of low mood also experience sleep disorders (Franzen & Buysse, 2008).

Disturbed sleep (fragmented sleep) is negatively associated with cognitive and emotional regulation and functioning, thus lowering the psychological threshold for perceiving and dealing with stress and increasing vulnerability to stressful events (Tempesta et al., 2018; Vandekerckhove & Cluydts, 2010; M. P. Walker, 2009). In addition, sleep deprivation has been associated with amplifying negative reactions to adverse experiences and a more subdued response to positive ones (Tempesta et al., 2018; Zohar et al., 2005). The consequences of this response postnatally are concerning, given the adjustment and demands of caring for an infant.

2.2.4 Maternal Sleep Health

Common sleep disorders, such as restless legs, sleep apnoea or insomnia, may be exacerbated during the perinatal period (S. M. Abbott et al., 2014). Associations have also been identified between sleep and birth outcomes. Women with severely disrupted sleep in late pregnancy can have longer labours and up to five times the likelihood of having a caesarean section (K. A. Lee & Gay, 2004). An investigation using *Moe Kura* found that pregnant women who reported poor quality sleep were twice as likely to deliver their baby via emergency caesarean than those who reported better sleep quality (Paine et al., 2020).

Sleep is often more disjointed and disturbed post-birth. This is partially due to recovery from birth and infant-related sleep-wake patterns and feeding needs (Hunter et al., 2009). Moreover, maternal sleep disturbances can lead to increased daytime sleepiness and fatigue, with postnatal fatigue defined as an imbalance between activity and rest (K. A. Lee et al., 2000). Higher fatigue levels positively correlate with more disturbed sleep in the early postpartum period (Rychnovsky & Hunter, 2009). Postnatal women may also experience fatigue and sleep disruption at even greater levels than in late pregnancy (Gay et al., 2004).

Sleep satisfaction and duration decline sharply post-birth for the first three months, with sleep only recovering to pre-pregnancy levels six years after birth for many women (Richter et al., 2019). In a study of postnatal women (n = 50), Montgomery-Downs et al. (2010) found that average sleep duration was over 7 hours a day in the first 13 weeks, measured using wrist actigraphy (Section 2.2.5). It was, however, highly fragmented, resulting in low sleep efficiency. Fragmented sleep has been linked to poorer subjective sleep satisfaction and excessive daytime sleepiness (Lemola et al., 2013; Medic et al., 2017).

Women consistently rank fatigue as among their top concerns following birth (Kennedy et al., 2007; Kurth et al., 2011; Taylor & Johnson, 2013). Sleep disturbances and accompanying increases in fatigue negatively impact women's health, relationships, and parental capabilities (Gay et al., 2004). Incremental exhaustion leading to fatigue can impact concentration and alertness, raising the possibility of accidental harm to children (Kurth et al., 2011). After controlling for depression symptoms (n = 80), correlations were found between disturbed sleep, the quality of maternal bonding and the perception women have of their infant (Tikotzky, 2016). A lack of sleep and exhaustion has also been found to impact emotion regulation and decrease maternal enjoyment (Albanese et al., 2020).

There are also relationships between self-reported poor and disturbed sleep perinatally and depression symptoms (Bei et al., 2010; Bhati & Richards, 2015; Lawson et al., 2015). Further information on sleep and postnatal mental distress is provided in Section 2.3.6

Psychosocial factors are associated with poorer sleep perinatally (Francis et al., 2017; Okun et al., 2014; Signal et al., 2014) and *Moe Kura* research has identified inequities in perinatal sleep health in NZ. During pregnancy, abnormal sleep duration and excessive daytime sleepiness were greater for Māori than non-Māori women (Signal et al., 2014). Independent associations were also found between shorter sleep duration in pregnancy and women who were over 30, unemployed or worked at night.

Ethnic inequities in sleep are driven by the inequitable distribution of social determinants of health between Māori and non-Māori (Paine & Gander, 2016). Okun et al. (2014) found significantly poorer sleep quality and fragmented sleep in pregnant women (N = 170) who reported lower household income (<$50k year) compared with those with higher incomes. In addition, Francis et al. (2017) found that racial discrimination experienced perinatally was independently associated with poorer sleep quality in 640 women.

2.2.5 Measuring Sleep

Multidimensional sleep health can be assessed in numerous ways (El-Sheikh & Sadeh, 2015). Sleep measures depend on several factors, including availability of resources, research aim or clinical assessment goal.

Objective methods can measure detailed information on sleep architecture and sleep patterns (Krystal & Edinger, 2008). These include polysomnography and actigraphy. Polysomnography is the gold standard in sleep measurement as it provides information on sleep structure and physiological events that occur during sleep. It requires the placement of surface electrodes on the head and body to measure cortical activity, eye movements and muscle activity, and in some cases, respiratory function and heart physiology (Marino et al., 2013). However, polysomnography is time-consuming, resource-intensive and requires specialist skills and training.

An actigraph is a compact wearable device, often worn on the wrist, containing a motion sensor to monitor the occurrence and degree of movement. Actigraphy measures sleep/wake patterns via

detection based on the presence or absence of movement (Sadeh, 2015). Actigraphy is widely used as it is relatively non-intrusive, cost-effective and can continuously and objectively estimate sleep/wake patterns in natural settings (Sadeh, 2015). Polysomnography and actigraphy have been used in many studies to measure perinatal sleep (Garbazza et al., 2020; Gay et al., 2004; K. A. Lee et al., 2000; Okun et al., 2013).

Subjective or self-report measures of sleep are often delivered via questionnaires, sleep diaries or rating scales. A moderate correlation has been found between self-reported and objectively measured sleep duration, although subjective self-report tends to overestimate sleep duration compared to actigraphy (Herring et al., 2013; Lauderdale et al., 2008). In contrast, self-reported sleep-onset latency was found to be longer than that measured by polysomnography in both pregnant and nonpregnant women (Wilson et al., 2013).

Likert scale ratings are commonly used to assess subjective sleep quality and duration. Comprehensive subjective instruments have also been developed to assess sleep quality; these include the General Sleep Disturbance Scale (K. A. Lee, 1992) and the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1989). The PSQI has become the most frequently used subjective measurement of sleep quality, reporting good reliability (Cronbach's alpha 0.76) and construct validity (high correlations with other measures of sleep quality) (Fabbri et al., 2021). These instruments have been used to investigate sleep in the perinatal period (Lawson et al., 2015; K. A. Lee & Gay, 2004; Lewis et al., 2018).

The Epworth Sleepiness Scale (ESS) is another well-validated scale with a high level of internal consistency (Cronbach's alpha 0.88) designed to measure daytime sleepiness (Johns, 1991, 1992). The ESS has also been widely used in the perinatal period (Baumgartel et al., 2013; Kendzerska et al., 2014; Sarberg et al., 2016).

Limitations of subjective sleep measures include the respondent requiring a certain level of self-awareness, reliance on memory and the retrospective account of sleep. These limitations can

undermine accuracy, introducing recall bias. However, self-report measures reflecting women's perception of their sleep are easy to administer, convenient, economical, and non-intrusive (Bei et al., 2015).

2.3 Postnatal Mental Distress

2.3.1 Defining Postnatal Mental Distress

The WHO (2018) defines mental health as "a state of well-being in which an individual realises his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community" (para. 2). Mental health is more than the absence of mental illness and is integral to an individual's psychological, social and emotional wellbeing (Keyes, 2002; Office of the Surgeon General (US) et al., 2001). Furthermore, an individual's mental health is influenced by social determinants of health, including social, economic and physical environments, across different stages of life (World Health Organization, 2014).

The postnatal period is a time of substantial physiological and psychological adjustment. Women face demands of caring for an infant, changes in relationship dynamics and impacts on work and social activities, all of which can lead to significant stress (Affonso & Mayberry, 1990). During this time of vulnerability, most women will experience at least a mild affective disturbance (Seyfried & Marcus, 2003).

In a continuum of experiences, depression and anxiety symptoms are the most frequent type of mental distress experienced in the perinatal period (Keyes, 2002; Matthey et al., 2003; Reck et al., 2008; Schmied et al., 2013). Postpartum 'blues' is a mild, transient mood disturbance with an incidence of between 40%- 86% occurring in the first few days following birth (Buttner et al., 2012). At the severe end of the spectrum is postpartum psychosis; although rare (incidence 0.1%-0.5%), it has a rapid onset starting 2-3 days post-birth. Individuals can develop delusions, hallucinations, confused thinking, and grossly disorganised behaviour. Postpartum psychosis

represents a dramatic change from previous functioning, can jeopardise the mother's and infant's safety, and is considered a psychiatric emergency (Sit et al., 2006; VanderKruik et al., 2017).

More commonly, postnatal depression (PND) affects 13%-19% of women (Gavin et al., 2005; O'Hara & McCabe, 2013). PND is defined in the DSM fifth edition (DSM-5) as 'depressive disorder with peripartum onset'. For diagnosis, symptoms must be present for at least two weeks and include depressed mood, feelings of guilt and worthlessness, changes in sleep, lack of interest in once enjoyed activities, loss of energy, and suicidal thinking (American Psychiatric Association, 2013).

A substantial body of research exists on PND, but perinatal anxiety disorders have received less research attention (Highet et al., 2011; Matthey, 2008; Wenzel et al., 2005). The lack of consistency in terminology regarding definitions and symptoms of postnatal anxiety likely results in an underestimation of its prevalence (Folliard et al., 2020). However, research has suggested that anxiety disorders may be more prevalent in the perinatal period than depressive disorders (Fairbrother et al., 2016; Matthey et al., 2003; L. E. Ross & McLean, 2006; Wenzel et al., 2005). In *Moe Kura*, the prevalence of anxiety symptoms in late pregnancy was 25% for Māori women (n = 406) and 20% for non-Māori (n = 738) (Signal et al., 2017). In a review of 73 studies, the prevalence of postnatal anxiety ranged between 13%-40% (T. Field, 2018). This wide variation was partly due to differing definitions of anxiety and differences in the timing and methods used for screening.

Anxiety disorders include generalized anxiety disorder (GAD), panic disorder, generalized social phobia, and obsessive-compulsive disorder (Coelho et al., 2011). GAD is the most prevalent anxiety disorder, affecting women more frequently than men (Wittchen, 2002). GAD is characterized by 6 months of excessive anxiety and uncontrollable worry regarding life events or activities, accompanied by at least three symptoms of negative affect or tension (American Psychiatric Association, 2013). At eight weeks postpartum, Wenzel et al. (2003) found 4.4% of women met the diagnostic criteria for GAD, whereas 27.9% presented subsyndromal anxiety difficulties.

Anxiety symptoms are associated with an increased risk of PND (Coelho et al., 2011; Grigoriadis et al., 2019; Sutter-Dallay et al., 2004), and anxiety often occurs co-morbidly with depression perinatally (Kaufman & Charney, 2000; L. E. Ross & McLean, 2006; Stuart et al., 1998; Wenzel et al., 2005). Depression has become the common marker for postnatal distress, but a more appropriate, broader assessment in the postnatal period should include anxiety (R. Miller et al., 2006).

PTSD is included under Trauma and Stressor-Related Disorders in the DSM-5 (American Psychiatric Association, 2013). PTSD is characterised by exposure to a traumatic event and the development of symptoms that fall into four clusters: intrusion symptoms; negative alterations in cognition and mood; avoidance; and alterations in arousal (American Psychiatric Association, 2013). Distress following a negative birth experience can result in a woman developing some or all the symptoms of PTSD (Ayers & Pickering, 2001), with the incidence of PTSD after childbirth being approximately 2% (Ayers & Pickering, 2001; Grekin & O'Hara, 2014; Wijma et al., 1997). In addition, there is symptom overlap between PTSD and PND and high co-morbidity (White et al., 2006).

Overall, these studies illustrate the importance of recognising the range of mental distress that can occur across the perinatal period and viewing postnatal mental distress as a broad concept. A more accurate representation of postnatal mental distress may be a disturbance to postnatal wellbeing, encompassing mood, anxiety and stress (R. Miller et al., 2006). Te Hiringa Hauora/Health Promotion Agency (HPA) conducted wellbeing research in NZ and found the term 'mental distress' was easier for participants to relate to than labels such as depression and anxiety. Additionally, the term 'mental distress' was found to reduce stigma in those seeking support, with symptoms viewed as more temporary or transient (Kvalsvig et al., 2018). Mental distress is not a binary state. It instead operates on a continuum and can be transient, fluid and change based on internal and external stressors. Individuals can find themselves at any point on the mental distress spectrum (Keyes, 2002).

Labour and birth is a time of change and transition. As a result, many women struggle post-birth and experience different levels of suffering. Some symptoms may be regarded clinically as less severe but are still distressing and deserve attention. For example, an Australian study of 1,336 women found that 94% experienced physical or emotional health problems following birth (Brown & Lumley, 1998b). However, a quarter of these women did not report their problems to health care providers, yet 49% would have liked help and advice.

2.3.2 Postnatal Mental Distress, Ethnicity and Culture

In NZ, inequities exist in maternal mental health. Several NZ studies indicate that the prevalence of postnatal depressive symptoms is greater for Māori and Pacific women compared to general population prevalence rates (M. W. Abbott & Williams, 2006; McGill et al., 1995; Webster et al., 1994). This is largely due to identified risk factors, including lower income, younger age, and a higher rate of sole parenthood (M. W. Abbott & Williams, 2006). Māori women are also disproportionally impacted by life stress, anxiety, and symptoms of depression in the perinatal period (Signal et al., 2017; Waldie et al., 2015; Webster et al., 1994). Concerningly, suicide is the leading cause of maternal death in NZ, with Māori having statistically significantly higher rates than other ethnic groupings (PMMRC, 2021).

Minoritised cultures often experience marginalisation, including having their worldviews and knowledge set aside while being required to conform to the norms of the colonial society (Huygens & Nairn, 2016). Most research is conducted according to western systems, standards, and methodologies, yet culture influences how people view experiences and cope with adversity (Sadock et al., 2014). For some cultures, rituals or spiritual beliefs and practices can be used to adapt and cope with mental distress (Bonelli et al., 2012). Symptom expression in psychological distress can be culture specific. Culture affects how people perceive and describe symptoms and the meaning they assign to their distress (Evagorou et al., 2016; Tseng & Streltzer, 1997). However, it is important not to assume that distressing symptoms are culturally sanctioned (Tseng &

Streltzer, 1997), as different cultures have been found to share the same risk factors for disorders (Evagorou et al., 2016).

Evaluation and treatment of postnatal mental distress must consider cultural beliefs and practices (Bhugra & Bhui, 2018; Evagorou et al., 2016). A lack of support and recognition of cultural practices, beliefs and rituals surrounding the birth experience may increase postnatal mental distress (Dennis et al., 2007; Stevenson et al., 2016); therefore, more research is needed in this area.

2.3.3 Postnatal Mental Distress Risk Factors

The reported range of risk factors for developing postnatal mental distress is extensive, with complex interactions between biological, environmental and psychosocial factors (A. T. Beck & Alford, 2009; Pennington, 2005; D. E. Stewart et al., 2003). Mental health is shaped by social determinants of health, including physical environments, economic situation, housing and access to healthcare, across different stages of life (J. Allen et al., 2014) The negative impact of socioeconomic deprivation on an individual's health is well established (Marmot & Wilkinson, 2005). There is a clear social gradient whereby increasing deprivation is associated with an increasing prevalence of poor mental health (J. Allen et al., 2014; Campion et al., 2013). A meta-analysis of 51 studies reported evidence of socioeconomic inequalities in depression. Those living with greatest deprivation had a slightly increased risk of episode onset and moderate increases in symptom persistence (Lorant et al., 2003).

Methodological issues around differing timespans under study, lack of consistent terminology, and varied assessment methods can make comparing studies difficult. The literature on risk factors for postnatal mental distress primarily focuses on PND, although there is increasing research on factors related to postnatal anxiety, highlighting its significance (T. Field, 2018).

Systematic reviews and meta-analyses have consistently identified the following key risk factors associated with PND: a history of depression; life stress and negative life events; lack of social

support; family history of PND; and socioeconomic factors such as low income (C. T. Beck, 2001; Elwood et al., 2019; Ghaedrahmati et al., 2017; O'Hara & Swain, 1996; E. Robertson et al., 2004; Zhao & Zhang, 2020).

A meta-analysis of 59 studies found antenatal depression and anxiety, social support, life events and maternal psychopathology were the strongest predictors of PND (O'Hara & Swain, 1996). More recently, E. Robertson et al. (2004) conducted a substantial meta-analysis of over 24,000 women. They confirmed five factors having the strongest relationships to PND: antenatal depression and anxiety, stressful life events during the perinatal period, low levels of partner or social support, and a prior history of depression. In addition, marital relationship, neuroticism, SEP, and obstetric factors were found to have a small but significant association. A Swedish cohort study of over 700,000 women found that PND risk was 20 times higher for women with a history of depression (Silverman et al., 2017). Similarly, identified risk factors for postnatal anxiety include a previous psychiatric history, perceived lack of partner and social support, being under 30, and lower SEP (Bener et al., 2012; Wenzel et al., 2005).

Many Australasian studies have highlighted maternal mental distress risk factors. Schmied et al. (2013) reviewed eight perinatal longitudinal studies and found that a history of depression and a poor partner relationship were the strongest predictors of depression and anxiety. Dissatisfaction with a partner had the strongest association with postnatal depressive symptoms in a study of NZ Pacific women (n = 1,376). Those who had separated from their baby's father were also at higher risk of depression (M. W. Abbott & Williams, 2006). In their NZ community cohort study (n = 206), Webster et al. (1994) also found that being in an unhappy relationship or being single increased the likelihood of PND.

2.3.4 Consequences of Postnatal Mental Distress

The impact of mental distress at this critical time can be severe and long-lasting, affecting not only the mother but her baby, family and community (Foreman, 1998; Murray & Cooper, 1997; Seyfried & Marcus, 2003; D. E. Stewart et al., 2003). Perinatal mental health issues adversely impact

maternal morbidity, mortality, and ultimately, the survival and development of children (World Health Organization, 2020). In rare cases, child abuse, infanticide, self-harm, suicidal ideation or suicide can occur (Dobson & Sales, 2000; Hirst & Moutier, 2010; Oates, 2003). In NZ, the largest cause of maternal death is suicide (PMMRC, 2021).

Depression can impact a person's motivation, cognition and physical functioning and is a leading cause of disability worldwide (A. T. Beck & Alford, 2009). Moreover, aside from the immense toll on the individual and their family, there is a considerable societal and economic cost in lost productivity and burden on health systems (Begg et al., 2007; Conti & Burton, 1994; W. F. Stewart et al., 2003; Vos et al., 2020).

PND can negatively influence mother-infant relationships (Anderson et al., 1994; Diego et al., 2006; Murray & Cooper, 1997; Tronick & Reck, 2009), including attachment (Wilkinson & Mulcahy, 2010). In addition, women with postnatal depressive symptoms have been found to have cognitive biases that lead to more negative perceptions of themselves and motherhood (Anderson et al., 1994; Reck et al., 2012; Stein et al., 2010), as well as an increased risk of negative infant-feeding outcomes including breastfeeding difficulties (Dennis & McQueen, 2009).

Maternal anxiety disorders have also been negatively associated with parenting behaviours, infant development, infant growth, and children's mental health (Schneider et al., 2009; Woodruff-Borden et al., 2002). An observational study (n = 9,848) found that children of women with more persistent and severe PND were at an increased risk of behavioural problems (at age 3.5 years) and mental health problems (at age 18 years) (Netsi et al., 2018). This is consistent with a meta-analysis of 193 studies that found small but significant associations between maternal depression and a range of child behavioural outcomes and psychopathology. It highlighted that associations between maternal depression and children's outcomes varied depending on relevant moderators and studies that sampled low-income families yielded significantly higher effect sizes than those sampling middle or higher-income families (S. H. Goodman et al., 2011).

PND is associated with poorer partner mental health and lower relationship quality (Ballard et al., 1994; Boath et al., 1998). In addition, women with PND are at increased risk of recurrent episodes of depression (Josefsson & Sydsjö, 2007) and those with persistent PND have been found to experience symptoms up to 11 years post-birth (Netsi et al., 2018).

It must be acknowledged that although postnatal mental distress is common, the adverse outcomes described here are not inevitable. Also women with less severe or less persistent distress may still experience suffering, which may interfere with many aspects of their lives.

2.3.5 Screening and Treatment for Postnatal Mental Distress

Although a major issue, postnatal mental distress often remains unrecognised, underdiagnosed, and undertreated (Seehusen et al., 2005; Thio et al., 2006). Early identification and timely interventions can help alleviate symptoms, improve women's postnatal experience and reduce the risk of adverse outcomes (Coates et al., 2015; PMMRC, 2021; Thio et al., 2006), so screening and treatment are critical.

A clinical assessment and interview with a qualified professional are required to diagnose a mood or anxiety disorder (Goldman et al., 1999; Hoge et al., 2012). However, there are a wide range of self-report assessments and psychometric instruments to screen for symptoms. Commonly used screening tools for identifying low mood and anxiety symptoms in the general population include the General Health Questionnaire (Goldberg et al., 1997); the Beck Depression Inventory-II (A. T. Beck et al., 1996); the Generalized Anxiety Disorder 7-Item Scale (Spitzer et al., 2006); the Depression Anxiety Stress Scale (Lovibond et al., 1995); and the Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983).

Challenges when using existing depression measures postnatally led to the development of the Edinburgh Postnatal Depression Scale (EPDS), which is a screening tool to identify women requiring further clinical assessment (Cox et al., 1987). The EPDS was developed by incorporating items from Snaith's Irritability, Depression and Anxiety Scale and the Hospital Anxiety and

Depression Scale, alongside the developers' own identified constructs (Cox et al., 1987; Snaith et al., 1978; Zigmond & Snaith, 1983). Items were constructed specifically for PND; for example, somatic symptoms such as weight gain or fatigue that can be prevalent and normal outcomes in the postnatal period were excluded as misleading indicators of depression.

The EPDS is widely used to detect perinatal mental distress in women and has become one of the most well-used screening tools in the postnatal and antenatal periods (Gibson et al., 2009; Kozinszky & Dudas, 2015; Levis et al., 2020). It has been translated into over 57 languages but has not been validated for use in many cultures and countries (Cox et al., 2014; Henshaw, 2014). The EPDS is sensitive to anxiety and captures both the depression and anxiety dimensions of mental distress (Matthey, 2008).

Routine postnatal distress screening integrated into primary care settings, with referrals for follow-up treatment and care, is recommended (O'Hara & McCabe, 2013). Interventions for postnatal mental distress must be sensitive to women's needs and symptom severity, duration, and complexity. Options include psychological and pharmacological therapies and combined approaches (A. T. Beck & Alford, 2009). PND responds well to various treatment modalities with strong evidence for the efficacy of psychological interventions (O'Hara & McCabe, 2013). However, there are barriers to accessing interventions with a NZ study finding that only 13.4% of women (n = 225) experiencing postnatal depression symptoms (n = 67) were receiving treatment (Thio et al., 2006).

2.3.6 Sleep Health and Postnatal Mental Distress

Mental health and sleep share a bi-directional relationship (Franzen & Buysse, 2008; Harvey et al., 2011). Sleep disturbances are a symptom of many mental health disorders; for example, sleep disturbances and nightmares are symptoms of PTSD (American Psychiatric Association, 2013) and sleep disturbance is one of the most consistent symptoms of depression (Franzen & Buysse, 2008, 2008; Murphy & Peterson, 2015). Depressive symptoms were found in over half of 917 patients treated for sleep disorders (Vandeputte & de Weerd, 2003). Conversely, disturbed sleep is often

experienced before an episode of depression (Benca et al., 1997). Sleep is a modifiable factor in preventing and treating mood symptoms (Franzen & Buysse, 2008) and in supporting stress management, wellbeing and dealing with challenging situations (Hamilton et al., 2007; Zohar et al., 2005).

Multiple studies have shown relationships between poor sleep and postnatal mood (Bei et al., 2015; Lawson et al., 2015; Park et al., 2013). Sleep disturbances and difficulty falling asleep are associated with an increased likelihood of postnatal depressive symptoms (Bhati & Richards, 2015; Chaudron et al., 2001; Goyal et al., 2007). Lawson et al. (2015) conducted a systematic review to explore the relationship between sleep and postnatal mental distress. Significant associations were found between self-reported poor antenatal and postnatal sleep and PND, but insufficient evidence demonstrated a relationship between anxiety and PND. Clout and Brown (2015) identified an association between maternal sleep problems and PND; however, after controlling for antenatal distress, their results were non-significant. Thus highlighting the importance of controlling for prior mental distress. In the NZ context, using *Moe Kura*, Ladyman et al. (2021) found that after controlling for sociodemographic factors, poor sleep quality, latency (sleep onset), continuity (sleep maintenance) and greater daytime sleepiness were consistently associated with depressive symptoms in late pregnancy and postnatally.

Subjectively measured sleep quality has shown a stronger association with mood disturbance than objectively (actigraphy) measured sleep postnatally (Bei et al., 2010; Coo et al., 2014; Park et al., 2013; Volkovich et al., 2016). Thus the perception of sleep quality may also be an important indicator of low mood in women (Stremler et al., 2020).

2.3.7 Birth Experience and Postnatal Mental Distress

Given the impact of birth experience and detrimental effects of postnatal mental distress, limited research has examined their relationships. Most studies have focussed on PND and specific elements of the birth experience, such as natural birth, complications, or obstetric interventions (Blom et al., 2010; Carter et al., 2006) and fewer studies have investigated relationships between

birth experience and anxiety symptoms (Bell et al., 2016; Giakoumaki et al., 2009). While there is an established link between traumatic birth and posttraumatic stress symptoms (Garthus-Niegel et al., 2013; Grekin & O'Hara, 2014), studies examining PTSD are out of the scope of this research.

Mode of birth has been associated with differences in women's psychological and physical wellbeing post-birth. In their study on 5,332 British women, Rowlands and Redshaw (2012) found that different instruments used at birth can impact postnatal wellbeing, with a forceps-assisted vaginal birth reporting the poorest outcomes. Similarly, Fisher et al. (1997) found that women (*n* = 272) who experienced a spontaneous vaginal birth were less vulnerable to low mood at six weeks postpartum when compared to those who had a caesarean delivery. In their sample of 4,941 women, Blom et al. (2010) found that women experiencing pregnancy and obstetric complications, including emergency caesarean, foetal distress and medical induction, were more likely to score in the clinical range on the EPDS two months post-birth, independent of sociodemographic variables and pre-existing psychopathology.

However, research findings have been inconsistent, with other studies showing obstetric interventions and mode of delivery having no independent association with mental distress (Lobel & DeLuca, 2007; Sword et al., 2011; Wiklund et al., 2007). Carter et al. (2006) reviewed 24 studies that examined links between caesarean sections and PND, whereby five studies found significant negative associations, 15 found no associations, and four had mixed results. This suggests that mode of delivery may play a role in developing depression symptoms, particularly close to birth. However, its role is complex within the overall birth experience indicating other factors are important, including consideration of social determinants of mental health.

Gürber et al. (2017) found subjective birth experience was predictive of women's depressive symptoms and psychological adjustment four weeks post-birth (*n* = 189). Similarly, a mixed methods study (*n* = 93) found a significant association between lower subjective satisfaction of the birth experience and depression (measured using the Beck Depression Inventory) at 3-4 weeks post-birth (Benoit et al., 2007). In NZ, dissatisfaction with birth experience was associated with

PND risk early postpartum (*n* = 1,376, using the EPDS) (M. W. Abbott & Williams, 2006). These findings indicate the importance of the subjective birth experience, which may be more important than objective criteria (Stadlmayr et al., 2004).

Bell and Andersson (2016) conducted a systematic review investigating birth experience and PND, excluding measures of birth experience that were not subjective. Only 15 studies met their inclusion criteria, and none were qualitative. Overall they found evidence in 11 studies that a woman's negative birth experience may contribute to PND. However, major methodological challenges were found, including limitations in the heterogeneity of birth experience measures and variability in the timing of measures. In addition, most studies omitted to control for a history of antenatal depressive symptoms or psychoses, and further research was recommended.

A limited number of studies have examined relationships between birth experience and postnatal anxiety. Of these, Giakoumaki et al. (2009) investigated 235 women. They found that a negative labour experience was correlated with state anxiety, measured by the State-Trait Inventory, and with symptoms of depression, as measured by the EPDS. A limitation of this study was that anxiety and depression symptoms were not assessed antenatally . A prospective cohort study (*n* = 4657–4946) also found that the perception of a negative birth experience was associated with elevated anxiety symptoms but not depression symptoms at two and eight months postpartum (Bell et al., 2016).

The literature reviewed above identified key research gaps that warrant addressing. Maternal mental health is recognised as a global health priority, is the foundation of strong families and communities and a major issue in NZ. Of critical concern, ethnic inequities exist in maternal mental health in NZ. To achieve improved and equitable outcomes for Māori and non-Māori women, children, and their families, we need to better understand maternal mental health and risk factors for postnatal mental distress in NZ.

The birth experience is a significant event in a woman's life and a powerful part of a woman's transition to motherhood. However, there is limited research on birth experience in the NZ context, with little on the prevalence of positive or negative experiences for Māori and non-Māori women. There has been even less exploration of links between birth experience and the wider concept of postnatal mental distress.

Mental distress and sleep health share a close reciprocal connection, and the multiple dimensions of sleep health are potentially modifiable factors in preventing and treating some mental distress symptoms. Sleep disruption is common in the perinatal period; however, the possibility that sleep health is a pathway linking birth experience and postnatal mental distress has not been explored.

In addition, further research is required to better understand women's lived experiences and perceptions of labour and birth, including the range of factors that are important to women and that contribute to their experiences. Prioritising the voices of Māori women is imperative to ensure an understanding of Māori women's perspectives that can otherwise be lost.

In conclusion, a comprehensive examination of how Māori and non-Māori postnatal women are feeling, sleeping and experiencing their labour and birth is warranted. This could inform practical solutions for prevention, interventions and support for postnatal mental distress to help achieve equitable maternal mental health across the postnatal period.

2.4 Research Questions

Using data from the *Moe Kura* study (Section 3.1), this research aims to investigate links between birth experience, sleep, and postnatal mental distress in NZ by addressing the following questions:

Mixed Methods Research Question

What are Māori and non-Māori women's experiences of labour and birth in NZ, and what is the relationship between labour and birth experience, maternal sleep, and postnatal mental distress symptoms, based on a combination of quantitative and qualitative data?

Quantitative Research Questions

For Māori and non-Māori women:

1. What is the prevalence of positive or negative labour and birth experience?

2. What is the relationship between labour and birth experience and postnatal mental distress symptoms at 4-6 weeks and 11-13 weeks post-birth?

3. Does sleep health play a contributory role in the relationship between labour and birth experience and the symptoms of postnatal mental distress?

Qualitative Research Question

1. What are Māori and non-Māori women's perceptions, and how do they describe their labour and birth experience?

CHAPTER 3 METHODOLOGY

This chapter outlines the philosophical, theoretical and study design of this research. The first section describes the *Moe Kura* study, followed by an overview of the study's paradigm, theoretical lens, and mixed methods methodology. The quantitative and qualitative study methods and measures are then outlined.

3.1 Moe Kura Study Development and Data Collection

This research was conducted using data from the *Moe Kura: Mother and Child, Sleep and Wellbeing in Aotearoa/New Zealand (Moe Kura)* study, which was preceded by the *E Moe, Māmā: Maternal Sleep and Health in Aotearoa/New Zealand (E Moe, Māmā)* study (Signal et al., 2022). The initial aim of *E Moe, Māmā* was to investigate relationships between sleep across the perinatal period and a range of maternal health outcomes for Māori and non-Māori women (Paine et al., 2013).

An initial feasibility study was conducted in 2007 to develop and trial questionnaires for the large-scale community-based, longitudinal study (Sweeney et al., 2008). An expert advisory panel was established to provide input into the processes and final measures for *Moe Kura*. Leadership of *Moe Kura* was shared by Māori and non-Māori co-principal investigators, and Kaupapa Māori principles informed all stages of the research process (Paine et al., 2013) (Section 1.2).

To participate, women needed to be 16 years or older, carrying a single foetus and able to answer questions in English. Participants could complete questionnaires with assistance from the research team. Initially, women were recruited from the lower North Island of NZ; however, this was expanded nationwide. To achieve equal explanatory and analytical power for Māori, recruitment of non-Māori was closed earlier to attain sufficient Māori participants (Paine et al., 2013).

Recruitment for *E Moe, Māmā* was conducted by the Sleep/Wake Research Centre at Massey University from October 2009 to September 2011. Of 2,755 study packs sent to women, 1,199 consent forms were returned. Of these, eight women withdrew (two Māori), and five women (three

Māori) were excluded (one under 16; four women had twins). The final eligible cohort was 1,186 women, comprising 423 Māori and 763 non-Māori women aged 16 to 46 (Paine et al., 2013).

A comprehensive paper-based questionnaire was administered between 35-37 weeks of pregnancy and at 11-13 weeks post-birth, with a 5–10-minute interview completed over the telephone 4-6 weeks after birth. The Sleep and Health during Pregnancy questionnaire included demographics, general health, mental health, obstetric history, sleep and incorporated some retrospective questions on mental health (Appendix 1). The Postnatal Sleep and Health Questionnaire included repeated questions from the pregnancy questionnaire on demographics, general health, sleep, and mental health, in addition to birth experience and infant health (Appendix 3). The brief telephone survey comprised 9-items on birth, sleep and mental health (Appendix 2). Data from these three data collection waves are used in this thesis (Sections 3.5 and 3.6 and Table 1).

In 2012, the research team designed a second phase of the study to investigate relationships between mother and child sleep and health, inviting participants from *E Moe, Māmā* to participate in further research. In 2013, Dr Te Huirangi Waikerepuru (Taranaki, Ngāpuhi) from Te Matahiapo gifted the name '*Moe Kura*' to the study (Figure 1). He described '*Moe Kura*' as being "based in the concept of te au moe kura i te ao mārama: the peaceful treasured sleep as of the child into the world of ancient wisdom, wonderment and light" (Moe Kura, n.d.). Data were collected from 281 Māori and 629 non-Māori women and by proxy from their children at three years of age. Data from these questionnaires were not used in this thesis.

Figure 1

Moe Kura Logo

3.1.1 Ethics

The *E Moe, Māmā* study was granted ethics approval by the Central Health and Disability Ethics Committee (HDEC) in October 2009 (CEN/09/09/070). Ethics approval for the *Moe Kura* age 3 data collection was granted on 16th November 2012 (CEN/09/09/070/AM02).

All participants were supplied with consent forms and information sheets. The consent form contained a section relating to minimising harm if a participant showed elevated postnatal distress symptoms after completing the EDPS (Section 3.5.2.5). If a participant scored above the established clinical cut-off criteria (≥13) or indicated any self-harm ideation (item 10 on the EDPS, "*the thought of harming myself has occurred to me"*), a comprehensive protocol for follow-up was adhered to (Appendix 4).

3.2 Pragmatic Paradigm

This thesis was guided by a pragmatic paradigm, which recognises that research is influenced by the context in which it is conducted, including culture, politics and history (Morgan, 2014). The epistemological stance of pragmatism is that experience is the basis of knowledge, and a pragmatic paradigm focuses on choosing methods most appropriate for answering research questions. It values both objective and subjective knowledge while acknowledging the influence of the researcher's assumptions and worldviews (Tashakkori & Teddlie, 2010). Pragmatism moves away from the idea that quantitative and qualitative research is incompatible (Feilzer, 2010; Morgan, 2014). It is seen as a problem-orientated philosophy guiding mixed methods research and integrating quantitative and qualitative approaches (Johnson et al., 2007). The pragmatic paradigm aims to answer real-world questions within real-world contexts and with real-world practical applications (Creswell & Plano Clark, 2018; Feilzer, 2010). Thus, it was deemed appropriate in the researcher's aim to produce practical, socially useful knowledge.

3.3 Theoretical Lens

As previously outlined (Section 1.2), Kaupapa Māori epidemiology research principles informed *Moe Kura* which, amongst other things, ensured sufficiently large numbers of Māori women participated in the study; prioritised equal explanatory power; and ensured equal focus was given to Māori perspectives (Paine et al., 2013). The researcher, who identifies as Pākehā, recognises that they did not conduct Kaupapa Māori research, however this set of guiding principles ensures research is respectful to both Māori and non-Māori participants.

This thesis was also guided by a social determinants of mental health theoretical framework, informed by life course theory (J. Allen et al., 2014; World Health Organization, 2014). This situated women in the study within the broader societal context, recognising that mental health is largely influenced and shaped by the social, economic, and physical environments (social determinants of health) in which people live and operate at different stages of life (J. Allen et al., 2014; World Health Organization, 2014).

Health inequities are the result of the differential distribution of power and resources across society (Arcaya et al., 2015; Solar & Irwin, 2010). A life-course approach recognises the impact of social determinants varies across life and that exposures to risk in formative stages of life affect mental wellbeing years or decades later. As the range of risks to mental health is vast, responses need to be multi-layered, involving action across multiple sectors. This theoretical perspective and Kaupapa Māori research principles share social justice as a common construct (J. Allen et al., 2014; Solar & Irwin, 2010; S. Walker et al., 2006), which informed the research questions, data analysis and interpretation of findings.

3.4 Mixed Methods Methodology

Mixed methods research recognises the value of integrating results from quantitative and qualitative data collection methods and analysis, enabling research questions to be answered uniquely (Creswell & Plano Clark, 2018; Tashakkori & Teddlie, 2010). It is a methodology rather

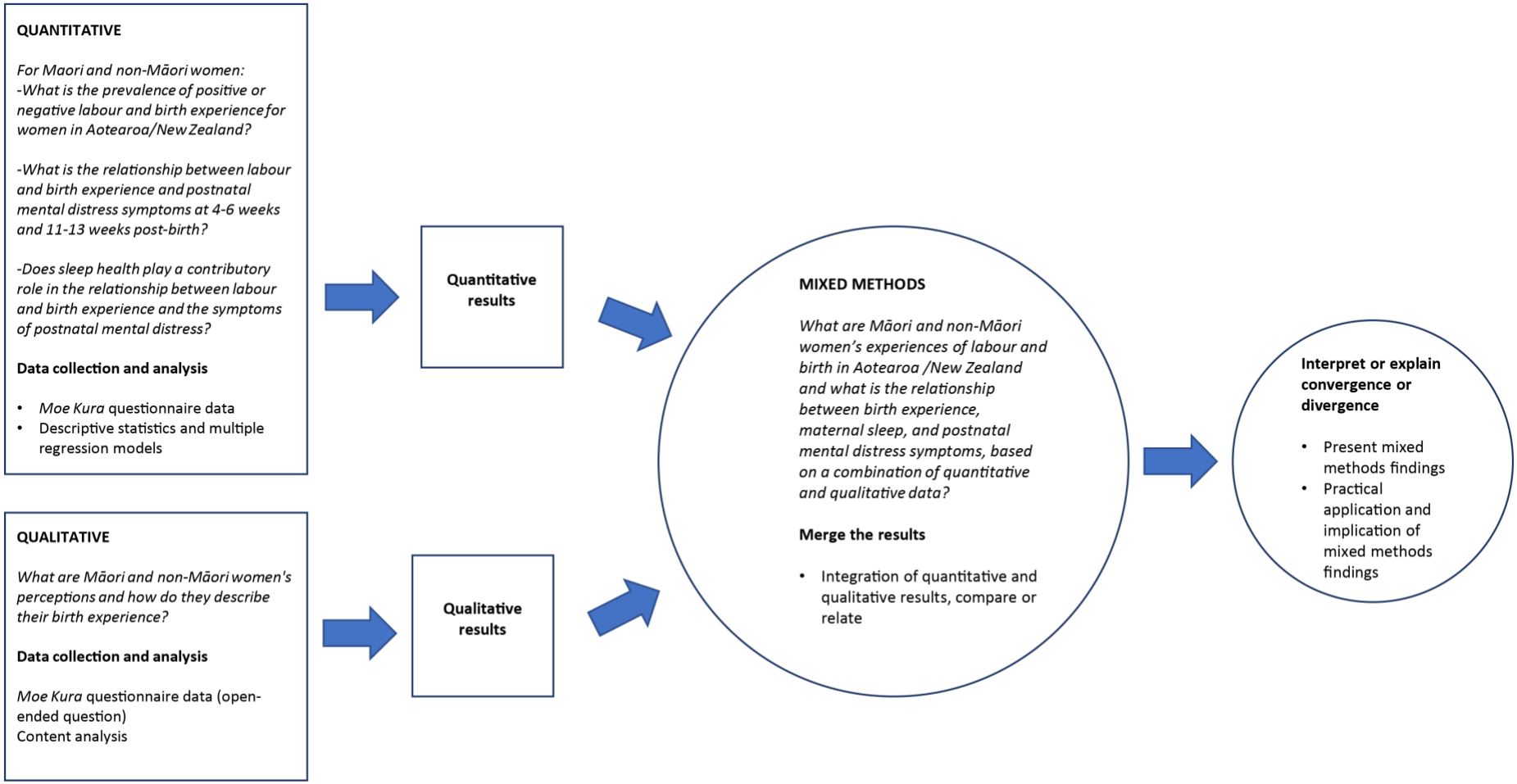
than just a method and acknowledges that qualitative and quantitative methods have different strengths and make different contributions (Johnson et al., 2007; Tashakkori & Teddlie, 2010). This integration of inquiry provides a breadth and depth of knowledge, enabling additional coverage of multiple aspects of a complex phenomenon that would be difficult to achieve through either method in isolation (Morgan, 2014). Therefore, mixed methods provides the best opportunity to obtain useful answers to research questions (Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 2010).

The aim of using a mixed methods methodology was to gain a more comprehensive understanding of birth experience, sleep and mental distress for Māori and non-Māori women, more so than could be achieved by using either quantitative or qualitative research alone. The rationale for quantitatively analysing data was to investigate patterns of association between these variables using a large sample and for the qualitative analysis to gain a more in-depth understanding of women's lived experiences of labour and birth.

A convergent parallel mixed methods study design (Creswell & Plano Clark, 2018) was used, as quantitative and qualitative data were collected and analysed concurrently. Equal weighting was given to both quantitative and qualitative findings (Figure 2). Results were integrated in the final stage of the study process, with practical outcomes guided by the theoretical lenses and pragmatic paradigm of this thesis.

Figure 2

Diagram of the Convergent Parallel Mixed Methods Study Design of This Thesis



3.5 Quantitative Study Methods

Details on the quantitative study data management, preparation, measures and analyses are provided below.

3.5.1 Data Management, Preparation and Researcher's Role

Moe Kura data from the Pregnancy (Appendix 1) and Postnatal (Appendix 3) questionnaires were previously double-entered using Epi Info (Version 3.5.1) [Computer software], cross-checked using the compare procedure in SAS (Version 9.1) and cleaned accordingly. Clean datasets were imported into IBM SPSS (Version 27.0) for current analyses.

The telephone survey data (Appendix 2) was manually recorded on a standardised calling sheet with women and then entered into a Microsoft Access database which was imported into Microsoft Excel for cleaning. Use of postnatal telephone survey data was limited prior to the current research, so it required data cleaning. A total of 10% of entries were cross-checked against original call sheets with an error rate of 0.3%, based on the total number of identified discrepancies divided by the total number of entries checked. During this process it was discovered that the sleep duration variable contained only whole numbers; therefore, the researcher and her supervisor re-entered the original survey sleep duration values in hours with decimals. Seven original paper surveys were missing, and it was pragmatically decided (with discussion with supervisors) to leave these participants in with only the whole number sleep duration. Clean data were imported into an SPSS database (Version 27.0) for current analyses.

Ethnicity data were not collected at the 4-6-week postnatal telephone survey. After discussions with supervisors, a pragmatic decision was made to merge ethnicity data from questionnaires in prioritised order of the 11-13 week postnatal questionnaire, 35 – 37 week pregnancy questionnaire and three-year postpartum questionnaire. Within the resulting postnatal telephone survey database, 1,062 ethnicity values were from the 11 –13 week postnatal questionnaire, 73 ethnicity values were from the late pregnancy questionnaire, and one ethnicity value was from the

3-year *Moe Kura* data set. Data from eight participants were excluded from analysis (participants who did not complete paper questionnaires, only the phone interview, and therefore had not provided ethnicity details).

These three databases were utilised in all subsequent analyses (Table 1). The researcher created variables of interest within each dataset and, where necessary, merged data across time points (e.g. birth experience variable with 4-6 week mental distress variable). Data was not stored or downloaded locally for data security purposes but held within the Massey University OneDrive system. All devices were password protected.

Table 1

Summary of Participant Numbers, Questionnaires and Timeframes Included for Analyses

	Sleep and Health in Pregnancy Questionnaire (*n* = 1,144)		Postnatal[a] Telephone Survey (*n* = 1,136)	Postnatal Sleep and Health Questionnaire (*n* = 1,085)
Number of Māori women	406	406	399	383
Number of non-Māori women	738	738	737	702
Timeframe	Prior to pregnancy (Retrospective)	35-37 weeks gestation	4-6 weeks postpartum	11-13 weeks postpartum

Note. [a]1,062 ethnicity values are from Postnatal Sleep and Health Questionnaire. 73 ethnicity values from sleep and health in pregnancy questionnaire, 1 ethnicity value from 3-year *Moe Kura* data, 8 missing ethnicity values were excluded from analysis.

The researcher developed a statistical analysis plan in collaboration with her supervisors, Dr Diane Muller and Professor Leigh Signal, and Dr Sarah-Jane Paine (Tūhoe), who is the co-principal investigator of *Moe Kura,* in conjunction with Professor Signal. The researcher coded and ran all descriptive statistics, prevalence estimates and regression analyses, which entailed self-directed learning informed by statistical guidance from supervisors and published literature.

3.5.2 Measures

Variables used in quantitative analyses were determined a priori, based on a review of the literature, the theoretical lenses guiding this study, and data availability (Section 3.1). Relevant

variables and the timepoint they were collected are shown in Table 2, with descriptions outlined further below.

Table 2

Moe Kura Variables in This Study

	Sleep and Health in Pregnancy Questionnaire 35-37 weeks gestation	Postpartum telephone survey 4-6 weeks post-birth	Postnatal Sleep and Health Questionnaire 11-13 weeks post-birth
Demographic variables	Parity (nulliparous /multiparous)		Maternal age (<20/20-<24/25-<29/30-<34/35-<39/ > 40yrs.) Maternal ethnicity (Māori /non-Māori)[a] NZDep2006 (quintile 1-5)
Covariates	Lead maternity carer History of depression (yes/no) Antenatal depression (yes/no) EPDS / Symptoms of depression and anxiety (significant/not significant)		Relationship with partner/support (happy/unhappy) Stressful life events (low stress/high stress) Where was your baby born Was your baby born as planned (yes/no) How was baby born/obstetric intervention (yes/no)
Sleep health variables		Sleep duration Quality of sleep	Sleep duration Quality of sleep Sleep disruption (dreams and nightmares) General Sleep Disturbance Scale – sleep quality, latency, continuity subscales Epworth Sleepiness Scale -daytime sleepiness
Birth experience variables			Labour and birth experience (positive/negative) Knew enough during birth experience (informed /not informed) Listened to during birth experience (listened to /not listened to)
Symptoms of mental distress variables		EPDS Anxiety subscale/ Symptoms of anxiety (significant/not significant)	EPDS / Symptoms of depression and anxiety (significant/not significant)

Note. EPDS= Edinburgh Postnatal Depression Scale. [a] Where ethnicity data weren't available at this timepoint, ethnicity was used from the 11-13 weeks gestation or Age 3 questionnaires.

3.5.2.1 Demographic Information

Demographic information included maternal ethnicity, age, SEP and parity (Table 2).

Ethnicity

Maternal ethnicity was measured using the NZ Census 2006 ethnicity question (Statistics New Zealand, 2006). Ethnicity is multidimensional and is a social, not a biological construct (Section 1.1.1). It is fluid and can change over time (Callister, 2011); therefore, ethnicity data were collected at multiple time points. In line with NZ ethnicity data collection protocols, women could select as many ethnic groups as they identified with (Ministry of Health, 2017). Women who identified as Māori, with or without other ethnic groups, were categorised as 'Māori', and all others were categorised as 'non-Māori'. This approach was informed by the Kaupapa Māori epidemiological research principles of the *Moe Kura* study and aligns with a Treaty of Waitangi-based comparison and ethnicity data protocols for health research in NZ (Ministry of Health, 2017; Paine et al., 2013).

Maternal age

This was calculated by adding a woman's date of birth to that of her baby born in the cohort (11-13 weeks postnatal questionnaire) to produce age (continuous) to one decimal place. A categorical maternal age variable was also derived (<20/20-<24/25-<29/30-<34/35-<39/ > 40yrs).

Socioeconomic position

SEP is multidimensional and challenging to measure (Haghdoost, 2012). This study's indicator of SEP is NZDep2006, an area-level index of relative socioeconomic deprivation based on residential address (Salmond et al., 2007). This best reflects the area-level deprivation index based on census data at the time of data collection. This was the fourth version in a series of small area indices of socioeconomic deprivation developed in NZ, updated regularly (Atkinson et al., 2019).

NZDep2006 was based on responses to nine items on the national census, creating eight social and material deprivation dimensions (Salmond et al., 2007). In order of weighting, these include income, home ownership, support (non-means-tested benefits or other benefits not associated

with economic deprivation as in a student allowance), educational qualifications, employment status, living space (bedroom occupancy), communication (access to a telephone); and access to transport (car). From these variables, principal components analysis is used to create an index, scaled to have a mean of 1000 index points and a standard deviation of 100 index points. An ordinal scale is then derived, splitting NZ into tenths of the distribution of the first principal component scores applied to small geographical units called 'mesh blocks', defined by Statistics NZ. In 2006 these meshblocks contained a median of 87 people. The deprivation index has a value from one (least deprived) to ten (most deprived). Decile one represents the 10% of least deprived areas and decile ten the 10% of most deprived areas (Atkinson et al., 2019).

NZDep is developed for research, advocacy and resource allocation (Atkinson et al., 2014). It is well-validated and reliable in investigating relationships between socioeconomic deprivation and health outcomes (Atkinson et al., 2014; Salmond & Crampton, 2012). However, no single measure can completely capture SEP and it must be kept in mind that NZDep is a relative, not absolute, measure of SEP (Salmond et al., 2007).

An external professional service matched women's maternal addresses to NZDep2006 values for the late pregnancy and 11-13 weeks postnatal questionnaires. Some women moved, so NZDep values changed across time for some participants. The assigned NZDep2006 decile was re-categorised to quintiles in this study (i.e. five levels, each representing 20% of small areas) as is standard practice (Salmond et al., 2007).

Parity

Parity (the number of times a woman had given birth, to an infant who was alive or not, after 20 weeks gestation) was asked about in the late pregnancy questionnaire. Parity was dichotomised as either nulliparous (women who had never given birth to a baby after 20 weeks gestation) or multiparous (women who had given birth after 20 weeks gestation one or more times previously).

3.5.2.2 Risk Factors for Postnatal Mental Distress

Based on a review of the literature (Chapter 2), several factors were identified for inclusion in analyses due to associations with symptoms of postnatal depression and anxiety (Table 2).

History of depression

A significant risk factor for postnatal mental distress is a prior history of mental distress and antenatal mental distress (C. T. Beck, 2001; O'Hara & Swain, 1996; Schmied et al., 2013; Wenzel et al., 2005). Two questions from the Pregnancy Risk Questionnaire (PRQ) (Austin et al., 2005) were used to assess an individual's history of depression before and during the current pregnancy. The PRQ, developed to identify the antenatal risk of postnatal depression, has adequate sensitivity (0.80) and specificity (0.80) (Austin et al., 2005; Beyondblue, 2011). The questions were "Have you ever been told by a health professional you were depressed or needed antidepressants?" and "During this most recent pregnancy, have you been distressed by feelings of anxiety or depression for 2 weeks or more?" A dichotomous (yes/no) variable was prepared. The late pregnancy questionnaire also measured the full EPDS (Chapter 2 and Section 3.5.2.5).

Family history of mental illness was measured in late pregnancy. The literature indicates this is a risk factor for postnatal mental distress (Kimmel et al., 2015; Özcan et al., 2017). Therefore, this variable was considered but was decided against due to the complexity of this relationship.

Relationship with partner (social support)

Relationship happiness was used as a proxy measure of social support. An unhappy relationship and low social support are strong predictors of postnatal depressive symptoms (M. W. Abbott & Williams, 2006; Chojenta et al., 2016; Schmied et al., 2013). Social support is a standard topic from the Pregnancy Risk Assessment Monitoring System (PRAMS) Phase 5, 2004-2008 questionnaire (Centers for Disease Control and Prevention, 2021; Shulman et al., 2018). PRAMS is an ongoing collaboration between 44 state health departments and the Centers for Disease Control and Prevention (CDC) in the United States of America (Centers for Disease Control and Prevention,

2021). Revised periodically, it is designed to supplement data on maternal behaviours and experiences before, during and after pregnancy (Gilbert et al., 1999).

The postnatal questionnaire asked, "If you have a partner, how is your relationship with them at the moment?" with a 7-point Likert-type scale, from 0 (perfectly happy) to 7 (extremely unhappy), and "not applicable" option. For this analysis, a dichotomous variable was created: happy (< 3) or unhappy or not applicable (> =3).

Stressful life events

Underlying stress is a known risk factor for postnatal depression (E. Robertson et al., 2004; Schmied et al., 2013). To measure stressful experiences, the life stress scale from the PRAMS questionnaire (Centers for Disease Control and Prevention, 2021) was utilised.. As the number of stressful life events on PRAMS increases, there are higher associations with postnatal depression symptoms (Salm Ward et al., 2017). Women were provided with 13 statements on stressful personal events and asked if any had occurred for them in the last 12 months (e.g. moving to a new address, being in a physical fight, or someone very close to them had died). Women with two or more stressors have been shown to have higher odds of postnatal depression symptoms (Mukherjee et al., 2017).

Researchers have conceptualised the questions of the life stress scale into three domains: relational, financial and physical health (Liu & Tronick, 2013). The odds of experiencing postnatal depressive symptoms were increased with stress in more than one domain (Salm Ward et al., 2017). In the current research, stressful life events were dichotomised as low stress (<2 stressors) or high stress (≥2 stressors).

3.5.2.3 General and Obstetric Factors

Several questions addressed maternal care, obstetric health and plans (Table 2). In the late pregnancy questionnaire, women were asked who was providing professional care for them during their pregnancy (independent midwife-team/hospital high-risk team/ hospital-based midwife-

team/ specialist obstetrician/ shared care/no one). This was used as a descriptive variable to understand the women's care provision split.

At 11-13 weeks postpartum, women were asked, "Where was your baby born?" and "Is this where you planned to give birth?" This was dichotomised into planned birth (yes/no). Mode of delivery was measured by asking, "How was your baby born?" with response options of induction, vaginally, forceps or ventose, caesarean- planned, emergency or unexpected. This was dichotomised as vaginally/obstetric intervention (induction, forceps or ventose, caesarean- planned, emergency or unexpected). The question "Were there any complications during the birth?" was dichotomised into complications (yes/no).

3.5.2.4 Birth Experience Measures

In this study, the woman defines the birth experience and included timeframe; however, the assumption is that for most women, this timeframe would be from the onset of labour until the baby is born and immediately after.

At 11-13 weeks postpartum, three items, utilising 6-point Likert-type scales, asked women retrospectively about their labour and birth experience (Table 2). The first asked, "Overall, how was your experience of labour and birth?" with a scale from 0 (Great better than I thought) to 2 (Challenging but manageable) to 5 (Terrible never again worse than I thought). This was prepared as a 3-level categorical variable: great (0-1), manageable (2-3) and terrible (4-5). The following items asked, "Did you feel you knew enough about what was going on during your birth experience? "and "Did you feel listened to during your labour and birth experience?" with scale responses from 0 (not at all) to 5 (very much). For this analysis, dichotomous variables were created: not informed (<=2) or informed (>=3), and not listened to (<=2) or listened to (>=3).

Ratings from all three labour and birth experience items were combined as a composite variable for analyses. This was dichotomised as a positive experience incorporating: overall labour and birth experience (<=2), informed (>=3) and listened to (>=3) and a negative experience

incorporating: overall labour and birth experience (>=3), not informed (<=2) and not listened to (<=2). Only one of the three criteria was required to be included in the 'negative' variable.

3.5.2.5 Postnatal Mental Distress Measures

The primary outcome variables in this study are postnatal depression and anxiety symptoms, as dimensions of postnatal mental distress (Chapter 2). These were measured using the EPDS (Cox et al., 1987). The EPDS anxiety subscale was measured at 4-6 weeks and 11-13 weeks postpartum, and the full EPDS was measured at 11-13 weeks postpartum (Table 2).

The EPDS is a 10-item self-report scale where women indicate severity of symptoms in the preceding seven days, with the total score ranging from 0-30 (Cox et al., 1987); designed to identify women requiring further clinical assessment. The EPDS authors recommended a clinical cut-off ≥13 to identify women with probable depression symptoms. In addition, a community and research cut-off of 10 or greater was suggested to identify women with more minor depression symptoms (Cox et al., 2014). The literature is divided on the optimal cut-offs, with suitability specific to individual contexts and studies. The cut-off score of ≥13 has been recommended for use in many studies with English-speaking women. It has clinical validity, giving the optimal balance of sensitivity (ranging from 68- 95%) and specificity (ranging from 78-96%) in identifying cases of major depression as defined by the DSM-IV criteria (Cox et al., 1996; Dennis, 2004; Gibson et al., 2009; Matthey et al., 2006; Murray & Carothers, 1990; O'Hara & Swain, 1996).

Australian and NZ guidelines also suggest ≥13 as potentially clinically significant depressive symptoms requiring follow-up; however, they also suggest a 10-12 cut-off as requiring a repeat of the EPDS to assess developing symptomology (Austin et al., 2013; Best Practice Advocacy Centre New Zealand, 2019). A meta-analysis found an EPDS cut-off of ≥13 was more appropriate to identify higher symptom levels (specificity; 95%); although a cut-off of 11 or greater maximised combined sensitivity (85%) and specificity (84%) when compared to semi-structured clinical interview (Levis et al., 2020). The EPDS has been used with women in a number of NZ studies (McGill et al., 1995; Webster et al., 1994). Ekeroma et al. (2012) validated the EPDS for use with

Pacific women in NZ (*n* = 1,376), with the EPDS correctly screening 62% of women diagnosed with depression by Composite International Diagnostic Interview. The best sensitivity (80%) and specificity (80%) was gained from cut-off scores of 10 or greater for Tongan and 11 or greater for Samoan women.

There has been no validation of the EPDS to establish cut-offs in NZ for Māori women. The well-used clinical cut-off allows interpretation and comparison with existing literature. A community cut-off recognises that a woman may not meet the DSM-5 criteria for depression; however, they may still be experiencing a significant level of distress with compromised functioning (Gjerdingen & Yawn, 2007). For these reasons, it was pragmatically decided to conduct analyses using both the lower/community cut-off (≥10) and the higher/clinical cut-off (≥13). Using two cut-offs is consistent with Raglan et al. (2021), who used both the clinical and lower cut-off to increase robustness of results. At 11-13 weeks postpartum, EPDS scores as a measure of mental distress were used as binary variables: mental distress symptoms not significant (community cut-off <10; clinical cut-off <13) or mental distress symptoms significant (community cut-off ≥10; clinical cut-off ≥13).

The EPDS is sensitive to anxiety, with three anxiety-subscale items identified as, "I have blamed myself unnecessarily when things went wrong", "I have been anxious or worried for no good reason", and "I have felt scared or panicky for no very good reason". Utilising these items, a cut-off of six or above has been shown to accurately detect women with anxiety disorders (Matthey, 2008). At 4-6 weeks postpartum and 11-13 weeks postpartum, the EPDS anxiety subscale scores were used as binary measures of mental distress (anxiety symptoms): anxiety symptoms not significant (<6) or anxiety symptoms significant (≥6).

3.5.2.6 Sleep Measures

The measures used to assess sleep were informed by Buysse's (2014) definition of 'sleep health' (Chapter 2). Four of Buysse's (2014) five sleep dimensions were investigated (duration, quality,

continuity and latency, and daytime sleepiness); sleep timing, the fifth dimension, was not measured in *Moe Kura.*

Sleep duration

In the 4-6 weeks postpartum telephone interview, women were asked, "So in total, how much sleep have you had in the last 24 hours?', with responses recorded as a decimal number. In the 11-13 week postpartum questionnaire, sleep duration was measured by the question "How many hours sleep, including naps, do you usually get in 24 hours?" with a note to think about the last week. Responses were used as a continuous variable and categorised based on National Sleep Foundation (Hirshkowitz et al., 2015) and associated NZ Ministry of Health sleep guidelines (Ministry of Health, 2018) (Chapter 2). At each timepoint, women were categorised as having short (<7 hours), recommended (>=7 to <=9 hours) or long (>9 hours) sleep (Howe et al., 2015).

Sleep quality

At 4-6 weeks postpartum, women were asked, "How would you rate the quality of your sleep in the last 24 hours?" with options of 0 (very good) to 3 (very poor). This was dichotomised as good (0-1) and poor (2-3) sleep.

The 11-13 week postpartum questionnaire measured sleep quality twice. Firstly by asking, "In the last week, how often did you get a good night's sleep?" with a scale from 0 (no nights) to 7 (every night). Four or more nights of good sleep were considered 'good sleep', and 'poor sleep' was considered three or fewer nights (Howe et al., 2015). Secondly, sleep quality was measured by the General Sleep Disturbance Scale (GSDS) Quality Subscale. This scale has been proven valid and reliable in multiple studies with perinatal women (K. A. Lee & Gay, 2004). The GSDS has 21-items and seven subscales designed to evaluate the nature and incidence of sleep disturbances. A previously established cut-off of subscale mean scores of >=3 indicates a clinically meaningful level of disturbance (K. A. Lee & Gay, 2011). The three-item sleep quality subscale starts with, "How often in the last week did you:", then asks, "Feel rested upon awakening at the end of a sleep period?", "Feel satisfied with the quality of your sleep?" and "Sleep poorly?" The first and last items

are reversed scored. Each item is rated on a 0 (never) to 7 (every day) numeric rating scale. The mean of the three sleep quality items was calculated for this study (Lee & Gay, 2011).

Sleep continuity and sleep latency

Sleep continuity and sleep latency were assessed using the GSDS sleep maintenance and sleep latency subscales (K. A. Lee, 1992). Items start with, "How often in the last week did you:" then for sleep continuity, ask "Wake up during your sleep period", and "Wake up too early at the end of a sleep period", then for sleep latency "Did you have difficulty getting to sleep". Each item is rated from 0 (never) to 7 (every day). This study calculated the mean for the continuity subscale (comprising the two items) and sleep latency (K. A. Lee, 1992; K. A. Lee & Gay, 2004). The combined continuity and sleep latency subscales were used as a continuous variable for multivariable regression models.

Daytime sleepiness

The Epworth Sleepiness Scale (ESS) measured daytime sleepiness (Johns, 1991). The ESS assesses daytime sleepiness in eight everyday situations using the question, "How likely are you to doze off in the following situations, in contrast to feeling just tired?". It then ranks probability from 0-3 (would never doze to high chance), with a maximum score of 24. The ESS has been well validated and deemed reliable and valid for use during the perinatal period (Baumgartel et al., 2013; Kendzerska et al., 2014; Sarberg et al., 2016). A dichotomised variable based on established cut-offs was prepared as not excessively sleepy (<10) and excessively sleepy (>=10).

Sleep disturbances

A traumatic birth experience may lead to some of the sleep symptoms seen in PTSD (Grekin & O'Hara, 2014). The 11-13 week postpartum questionnaire contained 17 items on sleep disruption based on the National Sleep Foundation Sleep in America poll (National Sleep Foundation, 2007). The question "How many nights in the last week did the following disturb your sleep?" was asked. Two items were of interest," Dreams" and "Nightmares", with ratings from 0 (no nights) to 7

(every night). A dichotomised variable was created for each as follows: rarely disturbed (<3 nights) or frequently disturbed (>=3 nights).

3.5.3 Data Analysis

Statistical analysis was conducted using IBM SPSS statistical software (Version 27.0), with an alpha level of .05 for analyses. Descriptive statistics (means, medians, standard deviations, and range) were produced for continuous demographic, birth experience, sleep and postnatal mental distress variables. In addition, univariate comparisons between Māori and non-Māori women were conducted using independent *t*-tests to compare means and Mann-Whitney *U* tests to compare medians (A. Field, 2018).

Distributions, accuracy and potential outliers of continuous variables were examined via visual screening of histograms, probability plots and boxplots, along with skewness and kurtosis statistics and the Shapiro-Wilk test of normality (A. Field, 2018). The large sample size was considered when deciding the most appropriate statistics to report. With large samples, *t*-tests are valid for any distribution, regardless of the shape of the data (Lumley et al., 2002). Based on the central limit theorem, the sampling distribution of the mean is assumed to be normal in large samples, with 'large' being defined as at least 30, with over 100 yielding an even better approximation of normal (A. Field, 2018).

One outlier was identified with a participant in the 4-6 week postpartum survey reporting sleep duration of 17 hours. Following the previously made decision in *Moe Kura* to exclude sleep duration outside the range of 2-16 hours, this entry was changed to missing. Data were assessed for the amount and pattern of missing values. Partner relationship/social support had 42 (3.9%) missing observations, and all other measures did not exceed 2.5% missing values. All missing items were left as missing.

Unadjusted prevalence estimates of categorical demographic, birth experience, sleep and mental distress variables were calculated using percentages and 95 % confidence intervals (CI). Univariate

comparisons by ethnicity (Māori vs non-Māori) included a comparison of 95% CI and Pearson's chi-square tests (A. Field, 2018). When 95% CI did not overlap, this was interpreted as a statistically significant difference (Austin & Hux, 2002).

Univariate associations between categorical birth experience and postnatal mental distress variables were examined using 95% CI and Pearson's chi-square tests, separately for Māori and non-Māori women. Univariate associations between birth experience and the EPDS as a continuous variable were then examined using a Kruskal-Wallis test, separately for Māori and non-Māori women (A. Field, 2018).

Hierarchical binary logistic regression models were conducted to examine associations between birth experience and postnatal mental distress and the contribution of identified social determinants of mental health, risk factors, and sleep health measures to these relationships (Table 3). A pseudo-R-squared, the Nagelkerke R Square, was calculated to test the fit of the regression model to the observed data (variance) alongside the Hosmer-Lemeshow test to assess the goodness of fit of the final models. Odds ratios (ORs) and 95% CI were calculated using maximum likelihood estimates from the regression models (A. Field, 2018).

Table 3

Hierarchical Binary Logistic Regression Model Structure

Model: Outcome variable	Reference category
EPDS Anxiety subscale 4-6 weeks	Mental distress symptoms not significant (<6 EPDS)
EPDS Anxiety subscale 11-13 weeks	Mental distress symptoms not significant (<6 EPDS)
EPDS Community cut-off 11-13 weeks	Mental distress symptoms not significant (<10 EPDS)
EPDS Community cut-off 11-13 weeks (Māori)	Mental distress symptoms not significant (<10 EPDS)
EPDS Community cut-off 11-13 weeks (non-Māori)	Mental distress symptoms not significant (<10 EPDS)
EPDS Clinical cut-off	Mental distress symptoms not significant (<13 EPDS)
Model: Predictor variables	
Block 1: Birth Experience	
Birth experience (positive/negative)	Positive
Block 2: Demographics: Block 1 plus	
Ethnicity (Māori/non-Māori)	non-Māori
Maternal age	N/A[a]
Neighbourhood deprivation (NZDep2006 Index quintile 1-5)	NZDep 1
Parity (multiparous/nulliparous)	Multiparous
Block 3: Risk Factor: Block 2 plus	
Antenatal mental distress (Mental distress symptoms not significant (<13 EPDS)/ Mental distress symptoms significant (>=13 EPDS))	Mental distress symptoms not significant (<13 EPDS)
Block 4: Sleep Variables: Block 3 plus	
Sleep variables[b]	
Sleep duration[c]	N/A[a]
Sleep duration categorical[d] (Short <7 hours/ Recommended >=7<=9/ Long >9 hours)	Recommended >=7<=9
Sleep quality[e] (Adequate <=1 scale/ Poor>=2 scale)	Adequate <=1 scale
GSDS quality subscale[f]	N/A[a]
GSDS continuity/latency subscale[g]	N/A[a]
Daytime sleepiness[h] (Not excessively sleepy (<10 ESS/ Excessively sleepy (>=10 ESS))	Not excessively sleepy (<10 ESS)
Sleep disruption dreams[i] (Rarely disturbed(<3 nights per week/ Frequently disturbed (>=3 nights per week)	Rarely disturbed(<3 nights per week)
Sleep disruption nightmares[j] (Rarely disturbed(<3 nights per week)/ Frequently disturbed (>=3 nights per week)	Rarely disturbed(<3 nights per week)

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a] Continuous variable; [b] One sleep variable per Block 4 model; [c] 4-6 weeks and 11-13 weeks postpartum; [d] 4-6 weeks and 11-13 weeks postpartum; [e] 4-6 weeks postpartum; [f] 11-13 weeks postpartum; [g] 11-13 weeks postpartum; [h] 11-13 weeks postpartum; [i] 11-13 weeks postpartum; [j] 11-13 weeks postpartum.

Prior to running the regression models, proposed independent variables were checked for multicollinearity based on the following values: tolerance <0.1, variance inflation factor (VIF) >10, eigenvalues <0.01, condition index >30 and proportion of variance >0.8 (A. Field, 2018). To avoid sparse data bias (Greenland et al., 2016), an event per variable (EPV) threshold of five, based on recommendations by Vittinghoff and McCulloch (2007), was used to help inform the decision regarding the number of predictor variables that could be reliably modelled. EPV was calculated by dividing the number of events by the number of variables, where 'events' were defined as the smaller of the two categories in outcome variables and 'variables' as the sum of degrees of freedom for all the independent variables in the model (P. C. Austin & Steyerberg, 2017).

This limited the range of covariates that could be reliably modelled; therefore, variables were chosen a priori based on those identified as the most relevant in the literature. The initial aim was to conduct multivariable models separately for Māori and non-Māori; however, this was not possible due to the small event numbers of most outcome variables. This resulted in using ethnicity as a predictor variable for all models except for the EPDS community cut-off outcome variable, which was able to be modelled separately for Māori and non-Māori women due to larger event numbers.

3.6 Qualitative Study Methods

An overview of the qualitative study processes and methods is provided below:

3.6.1 Ethical Considerations and Consultation

The scope and focus of this qualitative study meets that of the wider *Moe Kura* study, so fits within prior ethics approval (Section 3.1.2). The qualitative study design was informed by discussions with supervisors and Dr Sarah-Jane Paine (Tūhoe; co-Principal Investigator of *Moe Kura*).

3.6.2 Qualitative Study Design

As the aim was to explore Māori and non-Māori women's perceptions of their birth experience, a qualitative study was designed and implemented. Text data from the 11–13 weeks postpartum

questionnaire were analysed using qualitative content analysis. Qualitative content analysis is a method for analysing qualitative data and describing and interpreting its meaning (Schreier, 2013). Helpful in deepening the understanding of the human experience, it explores and describes complex phenomena and gives a voice to participants (Neuendorf, 2017), which fits well with the multifaceted nature of labour and birth.

Content analysis entails transforming text into an organised summary of key results, using a systematic, iterative method while maintaining a flexible approach (Cavanagh, 1997; Schreier, 2013; Tesch, 2013). Qualitative content analysis can be conducted either inductively or deductively (Elo & Kyngäs, 2008). With an inductive approach, researchers avoid using preconceived ideas, and the analysis is data driven. The deductive approach is concept-driven, based on theory and prior research (Hsieh & Shannon, 2005; Schreier, 2013). Manifest analysis uses participants' words, staying closer to the original meaning. With latent analysis, the researcher immerses themselves in the data to identify meanings around the intention of what has been said (Bengtsson, 2016).

This study took an exploratory approach using inductive, manifest analysis to gain insight into women's lived experiences by examining the presence and relationships of words, concepts, and patterns of women's reported text about their birth experience.

3.6.3 Data Collection

Although part of the broader scope, the core focus of *Moe Kura* was not women's perception of their birth experience. Therefore, limitations exist in the available text data which influenced the development of the qualitative study. In the 11-13 week postnatal questionnaire, question 30 asks, "Overall, how was your experience of labour and birth?" followed by a 6-point Likert scale as utilised previously in the quantitative analysis. A text box follows with, "Comments welcome". These comments were analysed in this qualitative study. An additional comment was included; one woman had chosen to share after question 40, "Did you feel listened to during your labour and birth experience?" It was logical to include this as it related to the qualitative research question and was in the quantitative study as part of the composite birth experience variable.

3.6.4 Data Preparation

Text comments were entered into a Microsoft Excel database by the *Moe Kura* research team post-data collection. For this study, the researcher prepared a database for analysis that included the variables maternal ethnicity, NZDep2006 and maternal age from the 11–13-week postnatal questionnaire with parity added from the 35-37 week pregnancy questionnaire. The researcher then anonymised comments, removing any identifying information, including names and locations. Māori and non-Māori women's comments were separated for analysis.

3.6.5 Data Analysis

Descriptive statistics of demographic data using IBM SPSS statistical software (Version 27.0) were produced to describe the sample characteristics. Content analysis was conducted using the process (Figure 3) outlined by Erlingsson and Brysiewicz (2017), based on descriptions by Hsieh and Shannon (2005), Graneheim and Lundman (2004) and Elo and Kyngäs (2008):

- Initially, comments were read and re-read to become immersed in the data and gain a general understanding of the main ideas expressed.
- Ensuring the core meaning was retained, the text was divided into smaller parts, called meaning units. The meaning units were then condensed.
- The condensed meaning units were 'coded' (given a label describing the content of the condensed meaning unit).
- The 'codes' were grouped into 'categories' that described different content aspects. These categories were grouped based on shared content or context.
- The final level of abstraction entailed identifying connections and developing themes based on two or more categories that shared something in common (Erlingsson & Brysiewicz, 2017).

Figure 3

Example of Analysis Leading to Higher Levels of Abstraction. Adapted from Erlingsson and Bryewicz (2017)

Higher levels of abstraction- latent meanings of text	**Theme**	The descriptive expression of underlying meaning i.e. latent content found by grouping categories.
	**Category**	A grouping of codes that are related through context or content.
	Code	A label that most exactly describes a particular condensed meaning unit.
	Condensed meaning units	A shortening of the meaning unit, ensuring the core meaning is retained.
Lower levels of abstraction- literal text	**Meaning unit**	The division of the text into smaller parts.

Text data based on perception and experience is multifaceted and carries meaning on multiple levels; therefore, there will always be different interpretations of meaning (Bengtsson, 2016; Erlingsson & Brysiewicz, 2017). Qualitative epistemologies reject the notion of a single objective reality; qualitative research is composed of multiple perspectives and realities formed by the individual's social context and history (Bauer et al., 2000). The researcher's role is to identify their position within the research, understanding that their experience, worldview, engagement and insights will influence the analysis; thus, it is a reflective process (Elo & Kyngäs, 2008).

Due to these philosophical and theoretical paradigms underpinning qualitative research, alternative terminologies exist to describe rigour (trustworthiness) in qualitative research compared to quantitative research (Rolfe, 2006). Trustworthiness is deemed important in evaluating the quality of qualitative research and includes establishing credibility, transferability, dependability and confirmability (Guba, & Lincoln, 2005). This concept of trustworthiness lends itself to 'cross matching' and auditing the coding process to assist in research rigour, especially

when using inductive qualitative content analysis (Elo et al., 2014). There is an argument that multiple viewpoints can produce a more consistent, transparent, richer description of the phenomenon, which in this case is women's perceptions of labour and birth (Elo et al., 2014). There are conflicting views in the literature on the appropriateness and requirements to seek agreement and intercoder reliability when using qualitative content analysis. With more interpretive analysis, there is an argument that multiple realities depend on subjective interpretations (Sandelowski, 1993).

The researcher in this thesis did all the coding and created the coding frame (a framework with coding definitions and labelled categories of which codes are added) (O'Connor & Joffe, 2020). During coding and coding frame development, the researcher engaged in an iterative process, reflecting on discussions and feedback from supervisors, reviewing codes and redefining categories. Categories were created inductively from the raw data. A pragmatic approach was taken, whereby a preliminary review of the literature was undertaken and later expanded while concurrently undertaking analysis (Giles, 2013; Neuendorf, 2017).

Being a novice researcher, considering the literature and consultation with supervisors informed the decision to assess intercoder reliability (ICR). ICR is a numerical measure of agreement between coders (O'Connor & Joffe, 2020). In addition to assessing rigour and the transparency of the coding frame, it provides confidence that the analysis goes beyond just the perception of the individual researcher (MacPhail et al., 2016; O'Connor & Joffe, 2020). Consistency is established with an additional researcher using the coding tool and reaching similar results (Morgan, 1993).

The literature indicates between 5% and 25% of content should be double-coded (Dominick & Wimmer, 2003; Riffe et al., 2019). In line with the pragmatic paradigm and in consultation with supervisors, an acceptable and manageable sample size for double-coding was determined at 20% (3 comments for Māori and 17 comments for non-Māori women). A randomly selected sample controls for selection bias (Riffe et al., 2019), therefore a random number generator was used to select comments. The meaning units of each comment were carried over within the coding frame,

and the researcher's supervisor coded these. The coding was compared and coding frame was then amended. Finally, after repeating the process, discussions and feedback between coders, the coding frame was updated.

Once the coding frame was finalised, intercoder agreement was calculated using Cohen's Kappa produced using SPSS statistical software (Version 27.0). Cohen's kappa is more robust than simply reporting percent agreement, as it considers chance (McHugh, 2012). The intercoder agreement had a Kappa value of 0.877 with an asymptomatic standard error of 0.080. As kappa was between 0.80-0.90, this was interpreted as a strong level of agreement (McHugh, 2012). The final analysis stage involved reporting and discussing findings, including personal reflections on the process.

CHAPTER 4 QUANTITATIVE STUDY RESULTS AND DISCUSSION: ASSOCIATIONS BETWEEN BIRTH EXPERIENCE, MATERNAL SLEEP AND POSTNATAL MENTAL DISTRESS

This chapter presents results of the quantitative analyses (Section 3.5) and an interpretation of these findings. First, a description of the study sample characteristics is presented, followed by univariate analyses investigating associations between birth experience and postnatal mental distress and multivariable regression models examining relationships between birth experience, sleep and postnatal mental distress. Finally, the discussion explores implications of the results within the context of the current literature.

4.1 Description of Participants

4.1.1 Maternal Age

The average age of women in the study was 30.79 years (*SD* = 5.89). Māori were significantly younger (*M* = 28.41 years, *SD* = 6.32) than non-Māori women (*M* = 32.08 years, *SD* = 5.21), *t* (668) = -9.71; *p* < .001 and a larger proportion of Māori women were under the age of 25 (Table 4).

Table 4

Proportion of Women by Age

Age	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			103.06	5	**<.001**
<20	7.83 (5.46-10.84)	1.99 (1.15-3.23)			
20–24	23.50 (19.46-27.93)	6.70 (5.02-8.72)			
25–29	22.45 (18.49-26.83)	20.23 (17.38-23.32)			
30–34	27.15 (22.88-31.77)	37.46 (33.94-41.09)			
35–39	15.14 (11.82-18.99)	26.64 (23.47-30.00)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at *p* = .05. 0 missing observations.

4.1.2 Socioeconomic Position

Proportions of women in each NZDep2006 quintile are shown in Table 5 and Figure 4. The distribution of women in each category differed by ethnicity, as indicated by results of the chi-

square analysis ($p < .001$) and 95% CI not overlapping. Māori women were over-represented in areas with the highest deprivation (quintile 5), and non-Māori women were over-represented in the areas of least deprivation (quintile 1).

Table 5

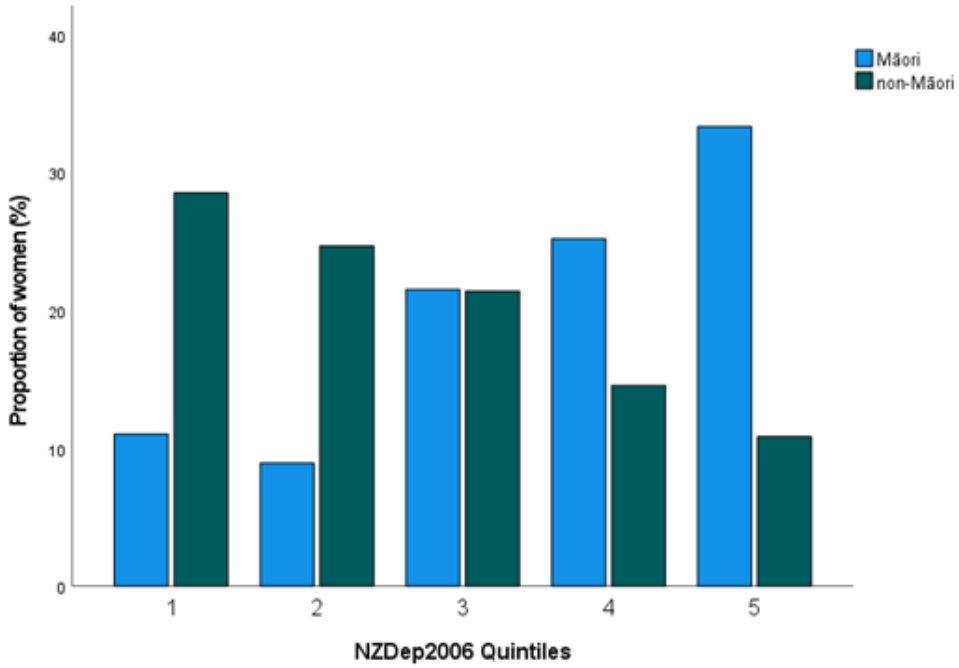
Proportion of Women by Area Deprivation Index (Categorised)

NZDep2006 Decile quintiles	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			147.70	4	**<.001**
1	11.02 (8.18-14.46)	28.53 (25.28-31.96)			
2	8.92 (6.37-12.10)	24.68 (21.60-27.97)			
3	21.52 (17.62-25.85)	21.40 (18.48-24.55)			
4	25.20 (21.04-29.73)	14.55 (12.09-17.30)			
5	33.33 (38.74-38.18)	10.84 (8.70-13.30)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 3 missing observations.

Figure 4

NZDep2006 and the Proportion of Women in Each Quintile Area (1 = Least Deprivation, 5 = Highest Deprivation)



4.1.3 Social Support

A significantly smaller proportion of Māori women (56%) reported their partner relationship (a proxy measure of social support) as happy compared with non-Māori women (76%; $p < .001$) (Table 6).

Table 6

Proportion of Women by Partner Relationship Category

Category of relationship	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			44.48	1	**<.001**
Happy <3	56.15 (61.22-50.97)	76.20 (79.28-72.91)			
Unhappy >=3 including N/A	43.85 (49.03-38.78)	23.80 (27.09-20.72)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 42 missing observations.

4.1.4 Stressful Life Events

Experiencing a stressful life event was a common occurrence (median [range]: Māori 2.0 [0-13], non-Māori 1.0 [0-13]). However, Māori women experienced significantly more stressful life events ($M = 2.31$, $SD = 2.06$) in the preceding 12 months compared with non-Māori ($M = 1.19$, $SD = 1.32$), $t(558) = 9.60$ $p < .001$ and a larger proportion of Māori women experienced two or more stressful life events (Table 7).

Table 7

Proportion of Women by Stressful Life Events in Preceding 12 months: Category

Category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			89.57	1	**<.001**
Low Stress <2	39.16 (34.37-44.12)	68.80 (65.30-72.15)			
High Stress >=2	60.84 (55.88-65.63)	31.20 (27.85-34.70)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 0 missing.

Stressful life events were split into three domains, conceptualised by Liu and Tronick (2013). When examined across these domains, a larger proportion of Māori women reported relationship, financial and physical stressors (Table 8).

Table 8

Proportion of Women by Stressful Life Events in Preceding 12 months: Domain-Specific Category

Domain	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Relational			52.02	1	**<.001**
Low Stress <2	79.90 (75.67-83.68)	94.16 (92.24-95.72)			
High Stress >=2	20.10 (16.32-24.33)	5.84 (4.28-7.76)			
Financial			23.56	1	**<.001**
Low Stress <2	83.03 (79.03-86.53)	92.59 (90.48- 94.36)			
High Stress >=2	16.97 (13.47-20.97)	7.41 (5.64- 9.52)			
Physical Health			20.69	1	**<.001**
Low Stress <2	84.33 (80.44-87.71)	93.02 (90.96-94.73)			
High Stress >=2	15.67 (12.29-19.56)	6.98 (5.27-9.04)			

Note. This analysis does not include questions on homelessness and jail time as not part of the domains. χ^2 is the Pearson chi-square test. Boldface is significant at p = .05. 0 observations missing.

4.1.5 Pregnancy and Birth

A significantly larger proportion of Māori women had given birth at least once before the current pregnancy (multiparous) (Table 9). Weeks' gestation was similar for Māori (M = 39.65, SD = 1.57) and non-Māori (M = 39.62., SD = 1.73), $t(1077) = 0.26$ p = .793), likely reflecting the requirement of the study that the first questionnaire be completed at 35-37 weeks' gestation.

Table 9

Parity

Parity	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			9.94	1	**.002**
Nulliparous	44.53 (39.67-49.47)	54.40 (50.77-57.99)			
Multiparous	55.47 (50.53-60.33)	45.60 (42.01-49.23)			

Note. Parity measured at 35-37 week prenatal questionnaire, χ^2 is the Pearson chi-square test. Boldface is significant at p = .05, 23 observations missing.

Two-thirds of women had an independent midwife or team of midwives as their lead maternity carer (Table 10). There were significant differences in type of maternity carers by ethnicity (p <. 001), with Māori women more likely to have a hospital-based midwife or team and non-Māori women more likely to have a specialist obstetrician or hospital high-risk team.

Table 10

Proportion of Women by Lead Maternity Carer

Lead maternity carer	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			43.95	6	**<.010**
Independent midwife/team	70.40 (65.80-74.70)	66.85 (63.39-70.18)			
Hospital high-risk team	2.74 (1.46-4.69)	6.79 (5.14-8.78)			
Hospital-based midwife/team	19.15 (15.54-23.21)	11.14 (9.02-13.57)			
Specialist Obstetrician	5.97 (3.96-8.61)	13.72 (11.38-16.35)			
Shared care	13.18 (10.14-16.75)	9.38 (7.43-11.64)			
No one	0.25 (0.03-1.16)	0.14 (0.01-0.63)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 3 missing observations.

Most women in the study gave birth in the place they had planned; however, a significantly larger proportion of Māori women gave birth in a place they had not planned (13%) (Table 11). A large number of women received an obstetric intervention, however a greater proportion of Māori women had a vaginal birth with no obstetric intervention (61%) than non-Māori women (47%; $p < .001$). In addition, a significantly larger proportion of non-Māori women reported complications with their birth (31%) than Māori women (22%; $p = .002$).

Table 11

Descriptive Statistics Related to Birthplace, Obstetric Interventions and Complications

Variable	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Birthplace as planned[a]					
Yes	87.47 (83.47-90.50)	92.71 (90.61-94.47)	8.21	1	**.004**
No	12.53 (9.50-16.13)	7.29 (5.53-9.39)			
How baby was born[b]					
Vaginally	60.57 (55.62-65.37)	47.01 (43.34-50.71)	18.27	1	**<.001**
Obstetric Intervention	39.43 (34.63-44.38)	52.99 (49.34-50.71)			
Complications[c]					
Yes	21.84 (17.91-26.20)	30.85 (27.50-34.35)	9.96	1	**.002**
No	78.16 (73.80-82.09)	69.15 (65.65-72.50)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, a = 2 missing observations , b = 0 missing observations, c = 8 missing observations.

4.2 Labour and Birth Experience

In response to the question, "Overall, how was your experience of labour and birth?" almost a quarter of women rated their birth as "great, better than I thought". Approximately one-third reported that their labour and birth experience was "challenging but manageable", and 5% of women described their labour and birth experience as "terrible, never again, much worse than I thought". There were no statistically significant differences in these proportions between Māori and non-Māori women (Table 12). Most women in the study reported a positive (great) or neutral (manageable) birth experience (Māori = 88%, non-Māori = 84%) (Table 13 and Figure 5) and patterns of labour and birth experience ratings were similar for Māori and non-Māori women (Figure 6).

Table 12

Proportion of Women by Labour and Birth Experience Ratings

Rating	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			6.88	5	.230
0 Great better than I thought	23.88 (19.81-28.35)	22.25 (19.29-25.44)			
1	15.75 (12.36-19.66)	18.26 (15.53-21.25)			
2 Challenging but manageable	33.07 (28.49-37.91)	27.39 (24.19-30.78)			
3	15.22 (11.88-19.09)	15.98 (13.41-18.83)			
4	7.61(5.27-10.60)	10.70 (8.57-13.15			
5 Terrible, never again much worse than I thought	4.46 (2.72-6.89)	5.42 (3.92-7.28)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 3 missing observations.

Table 13

Proportion of Women by Labour and Birth Experience Categories

Category	Māori % (95% CI)	non-Māori % (95% CI)	x^2	*df*	*p*
			4.13	2	.127
Great (0-1)	39.63 (34.81-44.61)	40.51 (36.92-44.18)			
Manageable (2-3)	48.29 (43.31-53.1)	43.37 (39.73-47.06)			
Terrible (4-5)	12.07 (9.09-15.63)	16.12 (13.54-18.98)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 3 missing observations.

Figure 5

Proportion of Women and Labour and Birth Experience Categories

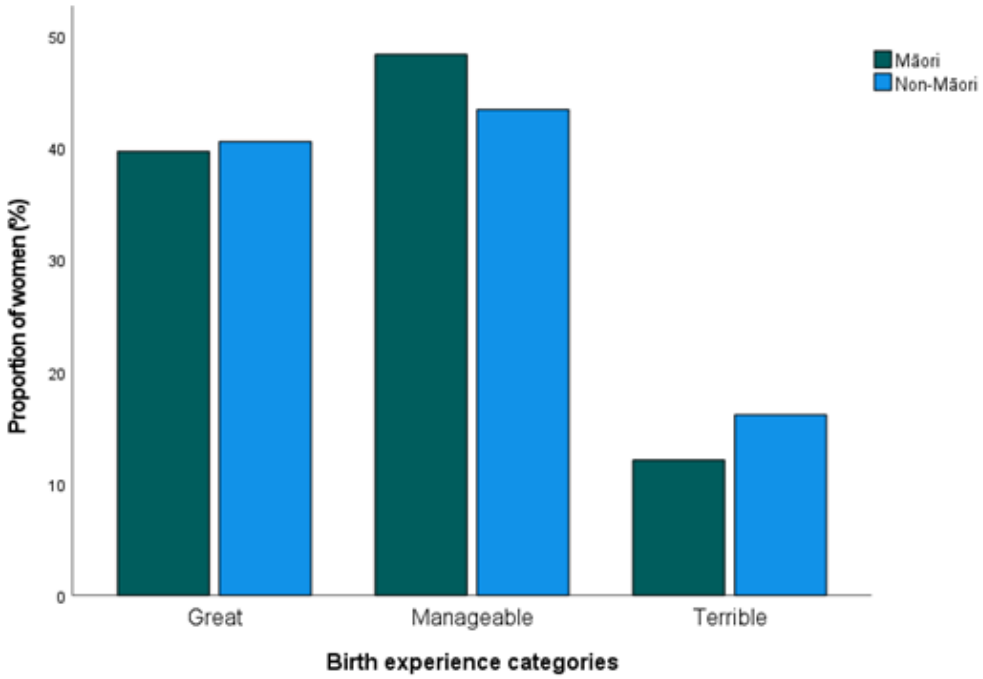
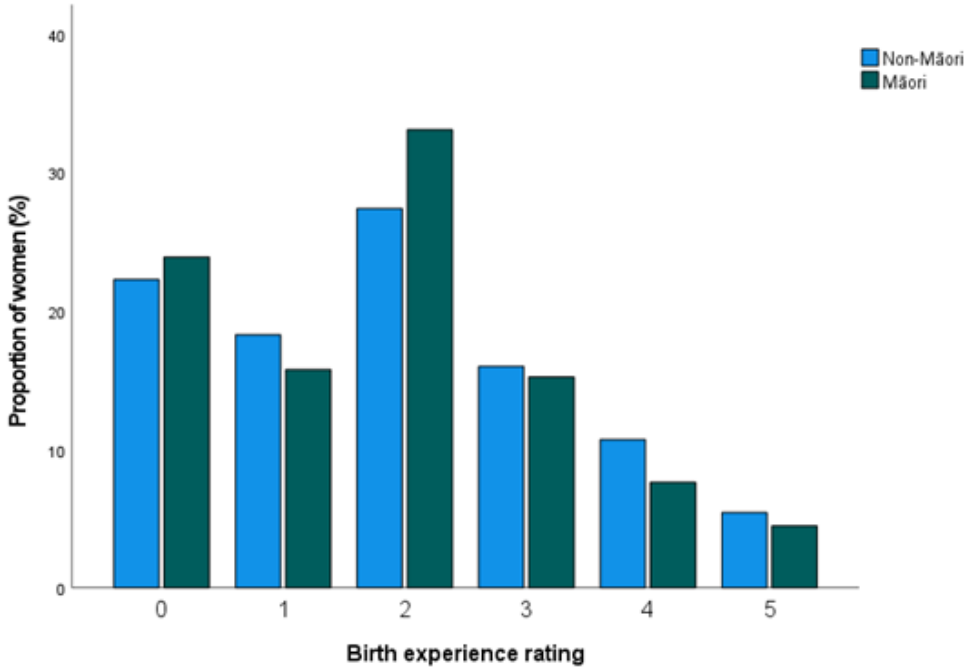


Figure 6

Proportion of Women at Each Labour and Birth Experience Rating (0 = Great, 5 = Terrible)



Two further questions were related to birth experience, "Did you feel you knew enough about what was going on during your birth experience?" ('informed'), and "Did you feel listened to during your

labour and birth experience?" ('listened to'), with a 5-item response scale (0 not at all to 5 very much). Overwhelmingly, most Māori and non-Māori women felt informed and listened to during their labour and birth experience (approximately 95% responded positively, rating a three or above on the scale). For the full scales, a larger proportion of Māori women reported feeling informed and listened to (Tables 14 and 15); however, there were no statistically significant differences by ethnicity when these measures were dichotomised (Table 16).

Table 14

Proportion of Women by 'Knew Enough' (Informed) During Labour and Birth Experience: Ratings

Rating	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			12.36	5	**.030**
0 Not at all	0.26 (0.03-1.22)	0.57 (0.19-1.36)			
1	2.09 (0.99-3.91)	2.01 (1.15-3.25)			
2	3.14 (1.73-5.26)	4.15 (2.86-5.83)			
3	13.09 (9.99-16.75)	11.89 (9.65-14.45)			
4	22.51 (18.54-26.90)	31.52 (28.15-35.04)			
5 Very much	58.90 (53.91-63.75)	49.86 (46.15-53.56)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 5 missing observations.

Table 15

Proportion of Women by 'Listened To' During Labour and Birth Experience: Ratings

Rating	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			12.58	5	**.028**
0 Not at all	1.05 (0.36-2.48)	1.15 (0.55-2.16)			
1	2.36 (1.18-4.27)	2.36 (1.27-3.45)			
2	3.41 (1.93-5.60)	2.59 (1.60-3.98)			
3	8.14 (5.71-11.20)	8.63 (6.72-10.89)			
4	17.59 (14.02-21.65)	26.76 (23.57-30.15)			
5 Very much	67.45 (62.63-72.01)	58.71 (55.01-62.32)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 9 missing observations.

Table 16

Proportion of Women by 'Informed' and' Listened To' During Labour and Birth Experience: Dichotomised

Variable	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Informed during birth[a]			0.64	1	.424
Not informed (<=2)	5.50 (3.54-8.13)	6.73 (5.05-8.77)			
Informed (>=3)	94.50 (91.87-96.46)	93.27 (91.23-94.95)			
Listened to during birth[b]			0.36	1	.548
Not listened to (<=2)	6.82 (4.61-9.69)	5.90 (4.33-7.84)			
Listened to (>=3)	93.18 (90.31-95.39)	94.10 (92.16-95.67)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a]5 missing observations. [b]9 missing observations.

Ratings from all three birth experience items (overall birth experience rating, informed and listened to) were combined to create a composite variable. This composite variable was used in further univariate and multivariable regression analyses. This variable was dichotomised as a 'positive experience' being based on the following criteria; overall experience (<=2), informed (>=3) and listened to (>=3). A 'negative experience' was based on at least one of the three items with the following criteria; overall experience (>=3), informed (<=2) and listened to (<=2). Results based on this composite measure were not significantly different for Māori and non-Māori women, with approximately two-thirds of women rating their labour and birth experience as positive and one-third as negative (Table 17).

Table 17

Proportion of Women Reporting a Positive or Negative Experience Based on the Composite Measure of Labour and Birth Experience

Variable	Māori % (95% CI)	non-Māori% (95% CI)	χ^2	*df*	*p*
			1.088	1	0.297
Positive experience	68.93 (64.17-73.41)	65.81 (62.24-69.25)			
Negative experience	31.07 (26.59-35.83)	34.19 (30.75-37.76)			

Note. Labour and birth composite measure; Positive Experience= positive birth experience rating (<=2), listened to (>=3), informed (>=3). Negative Experience (at least one of the three criteria required) = negative birth experience rating (>=3) not listened to (<=2), not informed (<=2). χ^2 is the Pearson chi-square test. Boldface is significant at p = .05., 0 missing observations.

4.3 Maternal Sleep

This section describes women's sleep health during the postnatal period.

4.3.1 Sleep Duration

Total sleep duration (previous 24 hours at 4-6 weeks and usual sleep in 24 hours at 11-13 weeks postpartum) was, on average, significantly longer for Māori than non-Māori women. However, the effect size was small (d = 0.13; d = 0.30). There was little difference between mean sleep duration across both time points for either Māori or non-Māori women (Table 18).

Table 18

Average Sleep Duration

Timepoint	Māori *M* (*SD*)	non-Māori *M* (*SD*)	*t*	*df*	*p*	*d*
4-6 weeks[a] postpartum	7.70 (1.97)	7.48 (1.56)	1.96	672.46	**.050**	0.13
11-13 weeks[b] postpartum	7.79 (1.90)	7.35 (1.21)	4.07	542.56	**<.001**	0.30

Note. [a] Question: "So in total, how much sleep have you had in the last 24 hours? (in hours)1 missing observation [b] Question: "How many hours sleep, including naps, do you usually get in 24 hours?".13 missing observations.
t is t-test statistic, *df* is degrees of freedom, *d* is Cohen's d effect size, bold is significant at p = 0.05.

Although the majority of women at both time points were getting the recommended amount of sleep, one-third of women at 4-6 weeks and one-quarter of women at 11-13 weeks postpartum had short sleep (Table 19). More women were obtaining recommended amounts of sleep at the 11-13 week timepoint than the 4-6-week timepoint and a significantly larger proportion of Māori women were long sleepers than non-Māori women.

Table 19

Proportion of Women by Sleep Duration

Sleep duration	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
4-6 weeks[a] postpartum			11.57	2	**.003**
Short <7	29.82 (25.49-34.45)	31.66 (28.37-35.08)			
Recommended >=7<=9	52.63 (47.73-57.50)	57.88 (54.29-61.41)			
Long >9	17.54 (14.05-21.50)	10.46 (8.41-12.83)			
11-13 weeks[b] postpartum			40.07	2	**<.001**
Short <7	23.14 (19.09-27.60)	27.01 (23.81-30.40)			
Recommended >=7<=9	61.70 (56.71-66.51)	68.82 (65.31-72.18)			
Long >9	15.16 (11.81-19.05)	4.17 (2.87-5.85)			

Note. Categories are based on the National Sleep Foundation (Hirshkowitz et al., 2015) and associated NZ Ministry of Health guidelines (Ministry of Health, 2018). χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$,. [a] 1 missing observation. [b] 13 missing observations.

4.3.2 Sleep Quality

Several facets of sleep quality were measured, including women reporting the quality of sleep obtained over the last 24 hours at 4-6 weeks postpartum (Table 20) and the number of nights in the last week they had a good night's sleep at 11-13 weeks postpartum (Table 21). In addition, at 11-13 weeks postpartum, sleep quality was measured using the three-item sleep quality subscale of the General Sleep Disturbance (GSDS). Sleep continuity was measured via the GSDS Maintenance Insomnia Subscale, and sleep latency was measured via 1-item on the GSDS scale (K. A. Lee, 1992; K. A. Lee & Gay, 2004) (Table 22).

Table 20

Proportion of Women by Sleep Quality: 4–6 Weeks Postpartum

Category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			.001	1	.979
Good Sleep (<1)	86.22 (82.58-89.33)	86.16 (83.53-88.51)			
Poor Sleep (>=2)	13.78 (10.67-17.42)	13.84 (11.49-16.47)			

Note. Question: "How would you rate the quality of your sleep in the last 24 hours?" Options, 0-very good to 3-very poor. 0 missing observations. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$.

At 4-6 weeks postpartum, there was no statistically significant difference in ratings for good and poor sleep between Māori and non-Māori women. The majority of women rated their sleep in the last 24 hours as good quality (Table 20). At 11-13 weeks postpartum, women rated more nights a

week as being good quality, however approximately 45% of women rated their sleep quality as poor, with only three nights (or less) of good quality sleep. Proportions were similar for Māori and non-Māori women (Table 21).

Table 21

Proportion of Women by Sleep Quality: 11–13 Weeks Postpartum

Category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			2.36	1	.125
Good Sleep (>=4 nights)	57.74 (52.74-62.63)	52.87 (49.16-56.56)			
Poor Sleep (<=3 nights)	42.26 (37.37-47.26)	47.13 (43.44-50.84)			

Note. Question: "In the last week, how often did you get a good night's sleep?" Options: 0 (never) to 7 (every day). 8 missing observations. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$.

Mean scores for the GSDS sleep quality and continuity subscales were above three, indicating a clinically meaningful level of sleep disturbance (Table 22). Sleep quality subscale scores did not differ by ethnicity, however sleep continuity scores were, on average, higher for non-Māori women indicating higher disruption, although the effect size was small (*d* =-.20). Sleep latency subscale scores indicated that, on average, most women did not have difficulty getting to sleep. The median (range) score were 3.67 (0-7) for the sleep quality subscale, 3.50 (0-7) for the sleep continuity subscale, and 1.00 (0-7) for the sleep latency subscale for Māori and non-Māori women.

Table 22

Average GSDS Sleep Subscales: 11–13 Weeks Postpartum

GSDS Sleep Subscales	Māori *M* (SD)	non-Māori *M* (*SD*)	*t*	*df*	*p*	*d*
Sleep Quality[a]	3.73 (1.76)	3.73 (1.85)	-0.30	1081	.976	-0.002
Sleep Continuity[b]	3.28(2.25)	3.72 (2.29)	-3.09	1080	**.002**	-0.20
Sleep Latency[c]	1.51 (1.80)	1.35 (1.66)	1.38	728.22	.169	.90

Note. GSDS = General Sleep Disturbance Scale. All questions start with: "How often in the last week did you?' Options: 0 (never) to 7 (every day).[a] "Feel rested upon awakening at the end of a sleep period?", "Feel satisfied with the quality of your sleep?" "Sleep poorly?" 2 missing observations). [b] "Wake up during your sleep period", "Wake up too early at the end of a sleep period", 3 missing observations, [c] "How often in the past week did you have difficulty getting to sleep", 3 missing observations), *t* is t-test statistic, *df* is degrees of freedom, *d* is effect size, bold is significant at $p = .05$.

4.3.3 Daytime Sleepiness

Daytime sleepiness was measured by the Epworth Sleepiness Scale, with higher scores indicating greater sleepiness (Johns, 1991). The mean was 6.18 (*SD* = 3.90) for Māori and 5.84 (*SD* = 3.91) for

non-Māori women, *t* (1063)= 1.37, *p* = .172. The median was 5.0 for both Māori (range 0–22) and non-Māori (range 0–24) women, and there was no significant difference in the proportion of Māori (19%) and non- Māori (17%) women who reported excessive daytime sleepiness (Table 23).

Table 23

Proportion of Women by Daytime Sleepiness: 11–13 Weeks Postpartum

ESS Category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			0.86	1	.353
Not excessively sleepy (<10 nights)	80.97 (76.75-84.70)	83.24 (80.32-85.88)			
Excessively sleepy (>=10 nights)	19.03 (15.30-23.25)	16.76 (14.12-19.68)			

Note. ESS= Epworth Sleepiness Scale. χ^2 is the Pearson chi-square test. Boldface is significant at *p* = .05. 20 missing observations.

4.3.4 Sleep Disruption

A similar proportion of Māori (18%) and non-Māori (14%) women reported sleep being frequently disturbed by dreams (Table 24). While most women's sleep was rarely disturbed by nightmares, approximately 6% of Māori and 3% of non-Māori women were frequently disturbed by nightmares.

Table 24

Proportion of Women by Sleep Disruption: 11–13 Weeks Postpartum

Variable	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Dreams[a]			2.85	1	.092
Rarely disturbed (<3 nights)	82.45 (78.36-86.04)	86.32 (83.60-88.73)			
Frequently disturbed (>=3 nights)	17.55 (13.96-21.64)	13.68 (11.27-16.40)			
Nightmares[b]			4.80	1	**.029**
Rarely disturbed (<3 nights)	93.60 (90.78-95.75)	96.52 (94.95-97.70)			
Frequently disturbed (>=3 nights)	6.40 (4.25-9.22)	3.48 (2.30-5.05)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at *p* = .05. [a]22 missing observations., [b]21 missing observations.

4.4 Prior History of Symptoms of Mental Distress

A significantly greater proportion of non-Māori women (26%) reported a prior history of depression, as assessed by a health professional, compared to Māori women (20%; *p* = .010)(Table

25). In contrast, a significantly larger proportion of Māori women (22%) than non-Māori women (15%; p = .003) scored 13 or above on the EPDS measured in late pregnancy, indicating symptoms of antenatal mental distress (Cox et al., 1987). Approximately 26% of Māori women reported experiencing symptoms of mental distress for 2-weeks or more in their current pregnancy compared to approximately 20% of non-Māori women (p = .009) (Table 25).

Table 25

Descriptive Statistics Related to Prior Symptoms of Mental Distress

Variable	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Prior history of depression[a]			6.55	1	**.010**
Yes	19.51 (15.87-23.57)	26.26 (23.17-29.53)			
No	80.49 (76.43-84.13)	73.74 (70.47-76.83)			
EPDS in pregnancy[b]			9.02	1	**.003**
Mental distress symptoms significant (>=13)	22.44 (18.57-26.72)	15.31 (12.85-18.04)			
Mental distress symptoms not significant (<13)	77.56 (73.28-81.43)	84.69 (81.96-87.15)			
Symptoms of mental distress in recent pregnancy[c]			6.80	1	**.009**
Yes	26.44 (22.21-31.03)	19.57 (16.76-22.63)			
No	73.56 (68.97-77.79)	80.43 (77.37-83.24)			

Note. EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at p = .05. [a] 35-37-week pregnancy questionnaire, 4 missing observations. [b] 11-13-week postnatal questionnaire, 5 missing observations, [c] 11-13-week postnatal questionnaire, 3 missing observations.

4.5 Symptoms of Postnatal Mental Distress

Symptoms of postnatal distress were measured using the EPDS anxiety subscale at 4-6 weeks and 11-13 weeks postpartum and the full EPDS at 11-13 postpartum. At 4-6 weeks postpartum, mean EPDS anxiety subscale scores were 2.45 (*SD* = 1.96) for Māori women and 2.46 (*SD* = 1.84) for non-Māori women. There was no statistically significant difference by ethnicity, $t(1134)=0.62$, p = .950. At 11-13 weeks postpartum, mean EPDS anxiety subscale scores were 2.63 (*SD* = 2.05) for Māori women and 2.48 (*SD* = 1.89) for non-Māori women, $t(731)=1.14$, df = 730.55, p = .256. At the 11-13 week timepoint, a significantly larger proportion of Māori women (11%) had EPDS scores above

the clinical cut-off for anxiety symptoms (>6) compared to non-Māori (7%), p = .030 (Table 26). Median (range) EPDS anxiety subscale scores for Māori and non-Māori women were 2.0 (0–9) at 4-6 weeks postpartum, and at 11-13 weeks postpartum were 2.0 (0–9) for Māori and 2.0 (0–8) for non-Māori women.

Table 26

Descriptive Statistics for Postnatal Mental Distress (EPDS Anxiety Subscales)

EPDS Anxiety subscale category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
4-6 weeks postpartum[a]			2.78	1	.096
Anxiety symptoms not significant (<6)	91.73 (88.72-94.13)	94.30 (92.45-95.80)			
Anxiety symptoms significant (>6)	8.27 (5.87-11.28)	5.70 (4.20-7.55)			
11-13 weeks postpartum[b]			4.71	1	**.030**
Anxiety symptoms not significant (<6)	89.01 (85.58-91.85)	92.86 (90.77-94.59)			
Anxiety symptoms significant (>6)	10.99 (8.15-14.42)	7.14 (5.41-9.23)			

Note. EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at p = .05. [a] 0 missing observations. [b]3 missing observations.

At 11-13 weeks postpartum, the full EPDS average score was 6.04 (*SD* = 4.69) for Māori and 5.53 (*SD* = 4.07) for non-Māori women, t (695.96) = 1.78, p = .076. The median (range) for Māori women was 5.0 (0–22) and for non-Māori 5.0 (0–25). When using both the community and clinical cut-offs, there were significant differences in the proportion of women with elevated scores between Māori and non-Māori women (Table 27). A larger proportion of Māori women reported higher mental distress symptoms (community cut-off, p = .019; clinical cut-off p = .034).

Table 27

Descriptive Statistics for Postnatal Mental Distress (EPDS) at 11–13 Weeks Postpartum

EPDS category	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
Community Cut-off			5.48	1	**.019**
Mental distress symptoms not significant (<10)	79.06 (74.77-82.91)	84.69 (81.88-87.22)			
Mental distress symptoms significant (>=10)	20.94 (17.09-25.23)	15.31 (12.78-18.12)			
Clinical Cut-off			4.49	1	**.034**
Mental distress symptoms not significant (<13)	88.74 (85.28-91.62)	92.56 (90.44-94.33)			
Mental distress symptoms significant (>=13)	11.26 (8.38-14.72)	7.44 (5.67-9.56)			

Note. EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at p = .05, 4 missing observations.

4.6 Univariate Associations Between Birth Experience and Postnatal Mental Distress Symptoms

Univariate analyses investigating associations between birth experience and postnatal mental distress symptoms for Māori indicated a significant association between birth experience ratings and EPDS anxiety subscale scores at 4-6 weeks postpartum (p = .024) but not at 11-13 weeks postpartum (Table 28). This relationship for Māori women remained consistent at the two time points using the dichotomised composite birth experience variable (Table 30). For non-Māori women, there was no significant association between birth experience ratings and EPDS anxiety subscale scores at 4-6 weeks or 11-13 weeks postpartum (Table 29). However, there was a significant association between the dichotomous composite measure of birth experience and EPDS anxiety subscale scores at both 4-6 weeks (p = .002) and 11-13 weeks postpartum (p = .032) (Table 31).

Table 28

Associations Between EPDS Anxiety Subscale Scores and Labour and Birth Experience Ratings for Māori Women

EPDS Anxiety subscale	0 % (95% CI)	1 % (95% CI)	2 % (95% CI)	3 % (95% CI)	4 % (95% CI)	5 % (95% CI)	χ^2	*df*	*p*
4-6 weeks postpartum[a]							12.93	5	**.024**
Anxiety symptoms not significant (<6)	96.51 (90.98-99.01)	91.23 (81.84-96.57)	95.83 (91.11-98.39)	87.72 (77.40-94.34)	88.46 (72.31-96.64)	76.47 (53.28-91.49)			
Anxiety symptoms significant (>6)	3.49 (0.99-9.02)	8.77 (3.43-18.16)	4.17 (1.61-8.89)	12.28 (5.66-22.60)	11.54 (3.36-27.69)	23.53 (8.51-46.72)			
11-13 weeks postpartum[b]							1.99	5	.851
Anxiety symptoms not significant (<6)	92.22 (85.34-96.45)	86.67 (76.41-93.49)	88.10 (81.59-92.87)	87.93 (77.76-94.44)	93.10 (79.67-98.54)	88.24 (67.32-97.47)			
Anxiety symptoms significant (>6)	7.78 (3.55-14.66)	13.33 (6.51-23.59)	11.90 (7.13-18.41)	12.07 (5.56-22.24)	6.90 (1.46-20.33)	11.76 (2.53-32.68)			

Note. Birth experience ratings in response to the question, "Overall, how was your experience of labour and birth?", 0="great, better than I thought". 2= "challenging but manageable", and 5= as "terrible, never again, much worse than I thought". EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 36 missing observations, as no birth exp data, [b] 3 missing observations.

Table 29

Associations Between EPDS Anxiety Subscale Scores and Labour and Birth Experience Ratings for Non-Māori Women

EPDS Anxiety subscale	0 % (95% CI)	1 % (95% CI)	2 % (95% CI)	3 % (95% CI)	4 % (95% CI)	5 % (95% CI)	χ^2	*df*	*p*
4-6 weeks postpartum[a]							9.26	5	.090
Anxiety symptoms not significant (<6)	96.77 (93.08-98.76)	97.66 (93.88-99.34)	93.16 (88.91-96.11)	90.99 (84.61-95.27)	90.54 (82.32-95.67)	91.43 (78.86-97.53			
Anxiety symptoms significant (>6)	3.23 (1.24-6.92)	2.34 (0.66-6.12)	6.84 (3.89-11.09)	9.01 (4.73-15.39)	9.46 (4.33-17.68)	8.57 (2.47-21.14)			
11-13 weeks postpartum[b]							9.75	5	.080
Anxiety symptoms not significant (<6)	92.26 (87.26-95.70)	94.53 (89.56-97.52)	95.31 (91.62-97.66)	93.75 (88.12-97.16)	88.00 (79.25-93.89)	83.78 (69.59-92.94)			
Anxiety symptoms significant (>6)	7.74 (4.30-12.74)	5.47 (2.48-10.44)	4.69 (2.34-8.38)	6.25 (2.84-11.98)	12.00 (6.11-20.75)	16.22 (7.06-30.41)			

Note. Birth experience ratings in response to the question, "Overall, how was your experience of labour and birth?", 0="great, better than I thought". 2= "challenging but manageable", and 5= as "terrible, never again, much worse than I thought". EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 44 missing observations as no birth exp data, [b] 3 missing observations.

Table 30

Associations Between EPDS Anxiety Subscale Scores and Labour and Birth experience for Māori Women: Composite Measure

EPDS Anxiety subscale	Positive % (95% CI)	Negative % (95% CI)	χ^2	*df*	*p*
4-6 weeks postpartum[a]			8.41	1	**.004**
Anxiety symptoms not significant (<6)	94.82 (91.55-97.07)	85.96 (78.72-91.41)			
Anxiety symptoms significant (>6)	5.18 (2.93-8.45)	14.04 (8.59-21.28)			
11-13 weeks postpartum[b]			.132	1	.716
Anxiety symptoms not significant (<6)	89.39 (85.25-92.68)	88.14 (81.40-93.03)			
Anxiety symptoms significant (>6)	10.61 (7.32-14.75)	11.86 (6.97-18.60)			

Note. Labour and birth composite measure; Positive = positive birth experience rating (<=2), listened to (>=3), informed (>=3). Negative (at least one of the three criteria required) = negative birth experience rating (>=3) not listened to (<=2), not informed (<=2). EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 52 missing observations as no birth exp data, [b] 1 missing observations.

Table 31

Associations Between EPDS Anxiety Subscale Scores and Labour and Birth Experience for Non-Māori Women: Composite Measure

EPDS Anxiety subscale	Positive % (95% CI)	Negative % (95% CI)	χ^2	*df*	*p*
4-6 weeks postpartum[a]			9.62	1	**.002**
Anxiety symptoms not significant (<6)	96.08 (94-97.57)	90.21 (85.92-93.52)			
Anxiety symptoms significant (>6)	3.92 (2.43-6.00)	9.79 (6.48-14.08)			
11-13 weeks postpartum[b]			4.60	1	**.032**
Anxiety symptoms not significant (<6)	94.36 (91.97-96.19)	89.96 (85.67-93.29)			
Anxiety symptoms significant (>6)	5.64 (3.81-8.03)	10.04 (6.71-14.33)			

Note. Labour and birth composite measure; Positive = positive birth experience rating (<=2), listened to (>=3), informed (>=3). Negative (at least one of the three criteria required) = negative birth experience rating (>=3) not listened to (<=2), not informed (<=2). EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a]51 missing observations as no birth exp data, [b] 2 missing observations.

At 11-13 weeks postpartum, univariate analyses indicated that for Māori (Table 32) and non-Māori (Table 33) women, there was no significant association between birth experience ratings and scores on the full EPDS scale, both for the community and clinical cut-offs. Furthermore, there was no statistically significant relationship between the composite measure of birth experience and full EPDS scale scores for either Māori (Table 34) or non-Māori (Table 35) women.

The Kruskal-Wallis test was used to measure significant differences between birth experience ratings and postnatal mental distress symptoms. This test revealed no statistically significant difference across all of the five birth experience ratings with EPDS anxiety subscale scores (used as a continuous variable) for Māori women *(n* = 363) at 4-6 weeks postpartum, *H (*5) = 6.85, *p* = .232. However, a significant difference was identified between the five birth experience ratings and continuous EPDS anxiety subscale scores for non-Māori (*n* = 693) at 4-6 weeks postpartum, *H* (5) = 21.88, *p* = .001. At 11-13 weeks postpartum, the test revealed no statistically significant difference in total EPDS scores (used as a continuous variable) across all of the five birth experience ratings for Māori women *(n* = 380) at *H (*5) = 3.78, *p* = .582. Again, there was a significant difference when investigating the relationship between the five birth experience ratings and continuous total EPDS scores for non-Māori (*n* = 698), *H* (5) = 13.30, *p* = .021, at 11-13 weeks postpartum.

Table 32

Associations Between EPDS Scores and Labour and Birth Experience Ratings for Māori Women

Full EPDS 11-13 weeks postpartum	0 % (95% CI)	1 % (95% CI)	2 % (95% CI)	3 % (95% CI)	4 % (95% CI)	5 % (95% CI)	χ^2	*df*	*p*
Community Cut-off[a]							3.88	5	.566
Mental distress symptoms not significant (<10)	85.56 (77.22-91.65)	73.33 (61.24-83.24)	78.57 (70.81-85.04)	77.59 (65.68-86.81)	75.86 (58.35-88.50)	82.35 (59.99-94.77)			
Mental distress symptoms significant (>=10)	14.44 (8.35-22.78)	26.67 (16.76-38.76)	21.43 (14.96-29.19)	22.41 (13.19-34.32)	24.14 (11.50-41.65)	17.65 (5.23-40.01)			
Clinical Cut-off[b]							2.371	5	.796
Mental distress symptoms not significant (<13)	90.00 (82.55-94.94)	86.67 (76.41-93.49)	90.48 (84.43-94.69)	84.48 (73.59-92.03)	89.66 (74.90-97.00)	94.12 (75.64-99.36)			
Mental distress symptoms significant (>=13)	10.00 (5.06-17.45)	13.33 (6.51-23.59)	9.52 (5.31-15.57)	15.52 (7.97-26.41)	10.34 (3.00-25.10)	5.88 (0.64-24.36)			

Note. Birth experience ratings in response to the question, "Overall, how was your experience of labour and birth?", 0="great, better than I thought". 2= "challenging but manageable", and 5= as "terrible, never again, much worse than I thought". EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$.[a] 0 missing observations. [b] 3 missing observations.

Table 33

Associations Between EPDS Scores and Labour and Birth Experience Ratings for Non-Māori Women

Full EPDS 11-13 weeks postpartum	0 % (95% CI)	1 % (95% CI)	2 % (95% CI)	3 % (95% CI)	4 % (95% CI)	5 % (95% CI)	χ^2	*df*	*p*
Community Cut-off [a]							2.736	5	.741
Mental distress symptoms not significant (<10)	85.16 (78.94-90.09)	85.94 (79.14-91.13)	84.90 (79.33-89.42)	83.93 (76.30-89.83)	86.49 (77.35-92.83)	75.68 (60.29-87.23)			
Mental distress symptoms significant (>=10)	14.84 (9.91-21.06)	14.06 (8.87-20.86)	15.1 (10.58-20.67)	16.07 (10.17-23.70)	13.51 (7.17-22.65)	24.32 (12.77-39.71)			
Clinical Cut-off [b]							6.19	5	.289
Mental distress symptoms not significant (<13)	92.26 (87.26-95.70)	94.53 (89.56-97.52)	94.27 (90.30-96.92)	91.96 (85.85-95.95)	90.54 (82.32-95.67)	83.78 (69.59-92.94)			
Mental distress symptoms significant (>=13)	7.74 (4.30-12.74)	5.47 (2.48-10.44)	5.73 (3.08-9.70)	8.04 (4.05-14.15)	9.46 (4.33-17.68)	16.22 (7.06-30.41)			

Note. Birth experience ratings in response to the question, "Overall, how was your experience of labour and birth?", 0="great, better than I thought". 2= "challenging but manageable", and 5= as "terrible, never again, much worse than I thought". EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 0 missing observations, [b] 3 missing observations.

Table 34

Associations Between EPDS Scores and Labour and Birth Experience for Māori Women: Composite Measure

Full EPDS 11-13 weeks postpartum	Positive % (95% CI)	Negative % (95% CI)	χ^2	*df*	*p*
Community Cut-off [a]			.801	1	.371
Mental distress symptoms not significant (<10)	80.30 (75.19-84.76)	76.27 (68.02-83.25)			
Mental distress symptoms significant (>=10)	19.70 (15.24-24.81)	23.73 (16.75-31.98)			
Clinical Cut-off[b]			.906	1	.341
Mental distress symptoms not significant (<13)	89.77 (85.69-92.99)	86.44 (79.41-91.71)			
Mental distress symptoms significant (>=13)	10.23 (7.01-14.31)	13.56 (8.29-20.59)			

Note. Labour and birth composite measure; Positive = positive birth experience rating (<=2), listened to (>=3), informed (>=3). Negative (at least one of the three criteria required) = negative birth experience rating (>=3) not listened to (<=2), not informed (<=2). EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 0 missing observations. [b] 3 missing observations.

Table 35

Associations Between EPDS Scores and Labour and Birth Experience for Non-Māori Women: Composite Measure

Full EPDS 11-13 weeks postpartum	Positive % (95% CI)	Negative % (95% CI)	χ^2	*df*	*p*
Community Cut-off [a]			1.025	1	.311
Mental distress symptoms not significant (<10)	85.68 (82.27-88.65)	82.77 (77.59-87.16)			
Mental distress symptoms significant (>=10)	14.32 (11.35-17.73)	17.23 (12.84-22.41)			
Clinical Cut-off [b]			3.67	1	.056
Mental distress symptoms not significant (<13)	93.93 (91.47-95.84)	89.92 (85.61-93.26)			
Mental distress symptoms significant (>=13)	6.07 (4.16-8.53)	10.08 (6.74-14.39)			

Note. Labour and birth composite measure; Positive = positive birth experience rating (<=2), listened to (>=3), informed (>=3). Negative (at least one of the three criteria required) = negative birth experience rating (>=3) not listened to (<=2), not informed (<=2). EPDS= Edinburgh Postnatal Depression Scale. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$. [a] 0 missing observations, [b] 3 missing observations.

4.7 Relationships Between Birth Experience, Sleep and Postnatal Mental Distress Symptoms

Pre-determined hierarchical binomial logistic regression analyses were conducted to investigate relationships between birth experience, sleep and postnatal mental distress, and how other covariates influenced these relationships (Section 3.5.3; Table 3). The birth experience dichotomous composite variable was used for all further analyses (Section 4.2).

4.7.1 EPDS Anxiety Subscale at 4–6 Weeks Postpartum

As outlined in Table 36, results of hierarchical models investigating EPDS anxiety subscale scores at 4-6 weeks postpartum indicated that a negative birth experience was associated with 2.7 greater odds of experiencing anxiety symptoms at this timepoint (block 1). Adjustment for age, ethnicity, SEP and parity did not attenuate this relationship (birth experience OR still 2.7; block 2). Further adjustment for antenatal mental distress slightly attenuated the relationship between negative birth experience and increased odds of anxiety (OR 2.6; block 3). After additional adjustment for sleep duration or sleep quality, relationships between birth experience and anxiety symptoms remained similar, whereby negative birth experience was significantly independently associated with anxiety symptoms (OR 2.5 – 2.7) (block 4).

In fully adjusted models (block 4) that contained sleep duration variables, antenatal mental distress was also independently associated with elevated anxiety symptoms (OR 1.9). Hosmer-Lemeshow test results for fully adjusted models (block 4) indicated adequate goodness of fit (p >.05); however, R^2 values indicated that the models only accounted for a small proportion of the variance (approximately 7%).

4.7.2 EPDS Anxiety Subscale at 11–13 Weeks Postpartum

Table 37 presents results of hierarchical models examining EPDS anxiety subscale scores at 11-13 weeks postpartum. Unadjusted models indicated that negative birth experience was associated with 1.6 greater odds of experiencing elevated anxiety symptoms at this timepoint (block 1).

Adjustment for age, ethnicity, SEP and parity did not attenuate this relationship (birth experience OR still 1.6; block 2). However, further adjustment for antenatal mental distress (block 3) fully attenuated the relationship between negative birth experience and anxiety symptoms (birth experience OR was no longer significant). With additional adjustment for sleep variables (block 4), relationships between negative birth experience and elevated anxiety symptoms remained similar (still non-significant).

In fully adjusted models (block 4), some facets of sleep health were independently associated with increased odds of anxiety symptoms (after adjusting for all covariates) at 11-13 weeks postpartum, with the strength of association differing depending on the sleep measure (GSDS continuity/latency subscale OR 1.21; ESS OR 1.7; sleep disruption-nightmares OR 3.7). Antenatal mental distress was also significantly independently associated with anxiety symptoms in all fully adjusted models (OR 4.5-4.9). Hosmer-Lemeshow test results for block 4 models indicated sufficient goodness of fit (p >.05). As indicated by the R^2 values, these models accounted for approximately 12% to 16% of the variance.

Table 36

EPDS Anxiety Subscale at 4–6 Weeks Postpartum

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	Sleep quality[c] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.038	.038	.038
Birth experience			
Positive	*Ref*	*Ref*	*Ref*
Negative	**2.69 (1.62- 4.47)**	**2.69 (1.62- 4.47)**	**2.68 (1.61-4.56)**
Block 2: Demographics Nagelkerke R Square	.056	.056	.056
Birth experience	**2.73 (1.63-4.57)**	**2.73 (1.63-4.57)**	**2.72 (1.62-4.55)**
Ethnicity			
non-Māori	*Ref*	*Ref*	*Ref*
Māori	1.34 (0.75-2.37)	1.34 (0.75-2.37)	1.34 (0.76-2.38)
Maternal age	0.98 (0.93-1.03)	0.98 (0.93-1.03)	0.98 (0.93-1.03)
Neighbourhood deprivation (NZDep2006 Index)			
Quintile 1	*Ref*	*Ref*	*Ref*
Quintile 2	1.18 (0.52-2.72)	1.18 (0.52-2.72)	1.18 (0.52-2.72)
Quintile 3	1.16 (0.52-2.60)	1.16 (0.52-2.60)	1.16 (0.51-2.60)
Quintile 4	1.75 (0.80-3.86)	1.75 (0.80-3.86)	1.75 (0.80-3.86)
Quintile 5	0.74 (0.29-1.93)	0.74 (0.29-1.93)	0.74 (0.29-1.93)
Parity			
Multiparous	*Ref*	*Ref*	*Ref*
Nulliparous	1.04 (0.61-1.78)	1.04 (0.61-1.78)	1.04 (0.61-1.79)
Block 3: Risk Factor Nagelkerke R Square	.066	.066	.066
Birth experience	**2.57 (1.53-4.33)**	**2.57 (1.53-4.33)**	**2.57 (1.53-4.32)**

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	Sleep quality[c] OR (95% CI)
Ethnicity	1.32 (0.74-2.34)	1.32 (0.74-2.34)	1.32 (0.75-2.35)
Maternal age	0.98 (0.94-1.03)	0.98 (0.94-1.03)	0.98 (0.94-1.03)
Neighbourhood deprivation (NZDep2006 Index)			
Quintile 2	1.21 (0.53-2.79)	1.21 (0.53-2.79)	1.21 (0.53-2.79)
Quintile 3	1.15 (0.51-2.59)	1.15 (0.51-2.59)	1.14 (0.51-2.57)
Quintile 4	1.77 (0.80-3.90)	1.77 (0.80-3.90)	1.77 (0.80-3.90)
Quintile 5	0.73 (0.28-1.88)	0.73 (0.28-1.88)	0.73 (0.28-1.88)
Parity	1.10 (0.64-1.90)	1.10 (0.64-1.90)	1.10 (0.64-1.90)
Antenatal mental distress			
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**1.86 (1.04-3.33)**	**1.86 (1.04-3.33)**	**1.86 (1.04-3.33)**
Block 4: Sleep Variables			
Nagelkerke R Square	.067	.070	.071
Birth experience	**2.60 (1.54-4.37)**	**2.65 (1.56-4.44)**	**2.49 (1.48-4.20)**
Ethnicity	1.31 (0.74-2.33)	1.35 (0.76-2.39)	1.32 (0.75-2.35)
Maternal age	0.99 (0.94-1.04)	0.99 (0.94-1.04)	0.99 (0.94-1.03)
Neighbourhood deprivation (NZDep2006 Index)			
Quintile 2	1.22 (0.53-2.81)	1.21 (0.53-2.79)	1.24 (0.54-2.85)
Quintile 3	1.14 (0.51-2.58)	1.17 (0.52-2.63)	1.18 (0.52-2.66)
Quintile 4	1.76 (0.80-3.87)	1.81 (0.82-3.99)	1.77 (0.80-3.91)
Quintile 5	0.73 (0.28-1.88)	0.74 (0.28-1.90)	0.74 (0.29-1.92)
Parity	1.08 (0.63-1.87)	1.09 (0.63-1.87)	1.15 (0.66-1.99)
Antenatal mental distress	**1.85 (1.03-3.31)**	**1.87 (1.04-3.34)**	1.78 (0.99-3.20)
Sleep variables			

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	Sleep quality[c] OR (95% CI)
Sleep duration continuous	1.05 (0.91-1.21)		
Sleep duration			
Short <7 hours		0.69 (0.37-1.27)	
Recommended >=7<=9		*Ref*	
Long >9 hours		0.79 (0.36-1.73)	
Sleep quality			
Adequate <=1 scale			*Ref*
Poor>=2 scale			1.61 (0.85-3.01)

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale, EPDS= Edinburgh Postnatal Depression Scale. [a] n = 1006, missing 268, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 3.04$ (8), p = .932 [b]n = 1,006, missing 268, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 9.07$ (8), $p = .336$ [c] n = 1,007, missing 267, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 9.56$ (8), $p = .297$. Boldface OR significant at 95% CI not spanning 1.

Table 37

EPDS Anxiety Subscale at 11–13 Weeks Postpartum

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.009	.009	.009	.009	.010	.008	.006
Birth experience							
Positive	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Negative	**1.58 (1.01- 2.47)**	**1.58 (1.01- 2.47)**	**1.59 (1.01-2.49)**	**1.59 (1.01-2.48)**	**1.63 (1.04-2.56)**	**1.56 (1.00-2.45)**	1.49 (0.94-2.34)
Block 2: Demographics Nagelkerke R Square	.036	.036	.035	.036	.041	.032	.032
Birth experience	**1.62 (1.03-2.56)**	**1.62 (1.03-2.56)**	**1.64 (1.04-2.58)**	**1.63 (1.03-2.58)**	**1.68 (1.06-2.67**)	**1.61 (1.02-2.54)**	1.52 (0.96-2.42)
Ethnicity							
non-Māori	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Māori	1.23 (0.75-2.03)	1.23 (0.75-2.03)	1.30 (0.79-2.14)	1.30 (0.79-2.14)	1.32 (0.80-2.19)	1.22 (0.74-2.00)	1.26 (0.76-2.09)
Maternal age	0.99 (0.95-1.03)	0.99 (0.95-1.03)	0.99 (0.94-1.03)	0.99 (0.95-1.03)	0.98 (0.94-1.02)	0.98 (0.94-1.02)	0.98 (0.94-1.02)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 1	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Quintile 2	0.81 (0.38-1.75)	0.81 (0.38-1.75)	0.82 (0.38-1.77)	0.82 (0.38-1.03)	0.74 (0.34-1.64)	0.81 (0.37-1.74)	0.88 (0.40-1.90)
Quintile 3	0.99 (0.49-2.01)	0.99 (0.49-2.01)	0.91 (0.44-1.87)	0.91 (0.44-1.87)	0.90 (0.44-1.84)	0.99 (0.48-2.00)	0.98 (0.47-2.04)
Quintile 4	1.00 (0.47-2.11)	1.00 (0.47-2.11)	1.04 (0.50-2.17)	1.04 (0.50-2.17)	1.00 (0.48-2.10)	1.04 (0.50-2.18)	1.09 (0.52-2.31)
Quintile 5	1.63 (0.80-3.32)	1.63 (0.80-3.32)	1.57 (0.77-3.20)	1.58 (0.78-3.22)	1.52 (0.74-3.10)	1.49 (0.73 3.05)	1.56 (0.75-3.22)
Parity							
Multiparous	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Nulliparous	0.64 (0.40-1.03)	0.64 (0.40-1.03)	0.68 (0.42-1.09)	0.68 (0.42-1.09)	0.65 (0.40-1.04)	0.67 (0.42-1.07)	0.69 (0.43-1.12)
Block 3: Risk Factor	.123	.123	.123	.124	.124	.120	.116

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Nagelkerke R Square							
Birth experience	1.33 (0.83-2.14)	1.33 (0.83-2.14)	1.34 (0.83-2.15)	1.33 (0.82-2.14)	1.38 (0.86-2.23)	1.31 (0.81-2.11)	1.25 (0.77-2.03)
Ethnicity	1.26 (0.76-2.09)	1.26 (0.76-2.09)	1.32(0.80-2.18)	1.33 (0.80-2.20)	1.35 (0.81-2.25)	1.25 (0.75-2.07)	1.29 (0.77-2.15)
Maternal age	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.6-1.04)	1.00 (0.96-1.04)	1.00 (0.95-1.04)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	0.85 (0.39-1.86)	0.85 (0.39-1.86)	0.86 (0.39-1.88)	0.86 (0.39-1.88)	0.80 (0.36-1.79)	0.85 (0.39-1.86)	0.92 (0.42-2.04)
Quintile 3	0.98 (0.47-2.02)	0.98 (0.47-2.02)	0.91 (0.43-1.89)	0.91 (0.43-1.89)	0.91 (0.43-1.90)	0.98 (0.47-2.03)	0.98 (0.46-2.06)
Quintile 4	0.96 (0.45-2.02)	0.96 (0.45-2.02)	1.00 (0.47-2.13)	1.00 (0.47-2.12)	0.99 (0.46-1.24)	1.01 (0.48-2.16)	1.06 (0.49-2.27)
Quintile 5	1.53 (0.74-3.15)	1.53 (0.74-3.15)	1.49 (0.72-3.06)	1.51 (0.73-3.12)	1.44 (0.70-2.98)	1.42 (0.69-2.95)	1.50 (0.72-3.13)
Parity	0.76 (0.46-1.25)	0.76 (0.46-1.25)	0.80(0.49-1.31)	0.80 (0.49-1.30)	0.75(0.46-1.24)	0.79 (0.48-1.30)	0.81 (0.50-1.33)
Antenatal mental distress							
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**4.93 (3.06-7.93)**	**4.93 (3.06-7.93)**	**4.98 (3.09-8.02)**	**5.04 (3.13-8.12)**	**4.79 (2.96-7.74)**	**4.98 (3.09-8.02)**	**4.85 (2.99-7.87)**
Block 4: Sleep Variables							
Nagelkerke R Square	.128	.126	.165	.142	.131	.124	.136
Birth experience	1.32 (0.82-2.12)	1.30 (0.81-2.10)	1.21 (0.75-1.96)	1.29 (0.80-2.08)	1.35 (0.83-2.19)	1.33 (0.82-2.14)	1.23 (0.76-2.00)
Ethnicity	1.28 (0.78-2.13)	1.27 (0.76-2.10)	1.28 (0.76-2.14)	1.35 (0.82-2.24)	1.30 (0.78-2.17)	1.25 (0.75-2.08)	1.25 (0.75-2.10)
Maternal age	1.00 (0.95-1.04)	1.00 (0.96-1.05)	1.00 (0.95-1.04)	1.00 (0.96-1.04)	1.00 (0.95-1.04)	1.00 (0.96-1.04)	1.00 (0.96-1.05)
Neighbourhood deprivation (NZDep2006 Index)							

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Quintile 2	0.83 (0.38-1.82)	0.84 (0.38-1.84)	0.91 (0.41-2.01)	0.81 (0.37-1.79)	0.78(0.35-1.74)	0.85 (0.39-1.87)	0.90 (0.40-2.01)
Quintile 3	0.99 (0.48-2.05)	0.99 (0.48-2.05)	0.97 (0.46-2.05)	0.90 (0.43-1.89)	0.91 (0.44-1.91)	1.02 (0.49-2.11)	1.04 (0.49-2.21)
Quintile 4	0.96 (0.45-2.06)	0.98 (0.45-2.10)	1.01 (0.47-2.17)	0.96 (0.45-2.06)	0.95 (0.45-2.01)	1.03 (0.48-2.20)	1.058 (0.50-2.34)
Quintile 5	1.62 (0.78-3.33)	1.59 (0.77-3.27)	1.58 (0.76-3.31)	1.45 (0.70-3.01)	1.45(0.70-3.00)	1.42 (0.68-2.94)	1.56 (0.74-3.29)
Parity	0.79 (0.48-1.30)	0.78 (0.47-1.28)	0.82 (0.50-1.34)	0.78 (0.48-1.28)	0.74 (0.45-1.22)	0.79 (0.48-1.30)	0.83 (0.50-1.37)
Antenatal mental distress	**4.85 (3.01-7.81)**	**4.90 (3.04-7.89)**	**4.49 (2.77-7.28)**	**4.80 (2.97-7.75)**	**4.74 (2.92-7.68)**	**4.92 (3.05-7.94)**	**4.86 (2.98-7.91)**
Sleep variables							
Sleep duration continuous	0.88 (0.75-1.03)						
Sleep duration							
Short <7 hours		1.42 (0.85-2.38)					
Recommended >=7<=9 Long >9 hours		*Ref* 1.00 (0.43-2.34)					
GSDS sleep quality subscale			1.36 (0.18-1.56)				
GSDS continuity/latency subscale				**1.21 (1.06-1.38)**			
Daytime sleepiness							
Not excessively sleepy (<10 ESS)					*Ref*		
Excessively sleepy (>=10 ESS)					**1.72 (1.00-2.97)**		
Sleep disruption-dreams							
Rarely disturbed(<3 nights per week)						*Ref*	

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Frequently disturbed (>=3 nights per week)						1.46 (0.82-2.62)	
Sleep disruption-nightmares							
Rarely disturbed(<3 nights per week)							*Ref*
Frequently disturbed (>=3 nights per week)							**3.72 (1.71-8.11)**

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a] n = 1018, missing 256, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 7.25$ (8), $p = .510$ [b] n = 1,018, missing 256, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 3.57$ (8), $p = .894$ [c] n = 1,026, missing 248, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 4.29$ (8), $p = .830$ [d] n = 1025, missing 249, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 5.45$ (8), $p = .709$ [e] n = 1,010, missing 264, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 4.56$ (8), $p = .803$ [f] n = 1,009, missing 265, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 2.16$ (8), $p = .975$ [g] n = 1011, missing 263, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 7.25$ (8), $p = .510$. Boldface OR significant at 95% CI not spanning 1.

4.7.3 EPDS Community Cut-Off at 11–13 Weeks Postpartum

Table 38 shows the results of hierarchical models examining EPDS scores ≥10 (community cut-off; indicative of elevated levels of mental distress) at 11-13 weeks postpartum. Results indicated that a negative birth experience was not statistically significantly associated with symptoms of mental distress at this timepoint based on EPDS community cut-off scores (block 1), as indicated by 95% CI spanning 1. Adjustment for demographic (block 2), antenatal mental distress (block 3) and sleep (block 4) had a minimal impact on these (non-significant) associations.

In fully adjusted models (block 4), multiple aspects of sleep health were independently associated with postnatal mental distress at 11-13 weeks postpartum (sleep duration-short sleep vs recommended OR 1.7; GSDS quality subscale OR 1.5; GSDS continuity/latency subscale OR 1.4; ESS OR 1.7; sleep disruption-nightmares OR 2.4). In addition, ethnicity was significantly independently associated with EPDS scores ≥10, whereby Māori mothers had approximately 1.5 greater odds of mental distress compared with non-Māori mothers. Antenatal mental distress was also significantly independently associated with elevated EPDS scores (≥10; OR 4.7-5.2). Hosmer-Lemeshow test results for fully adjusted models indicated adequate goodness of fit ($p > .05$). As indicated by the R^2 values, these models explained approximately 13% to 21% of the variance.

Table 38

EPDS Community Cut-Off at 11–13 Weeks Postpartum

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.003	.003	.003	.003	.003	.003	.002
Birth experience							
Positive	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Negative	1.27 (0.91- 1.78)	1.27 (0.91- 1.78)	1.27 (0.90- 1.77)	1.26 (0.90-1.78)	1.28 (0.91-1.79)	1.25 (0.89-1.75)	1.24 (0.88-1.74)
Block 2: Demographics Nagelkerke R Square	.022	.022	.024	.024	.024	.021	.023
Birth experience	1.29 (0.92-1.82)	1.29 (0.92-1.82)	1.29 (0.92-1.82)	1.29 (0.92-1.82)	1.31 (0.93-1.85)	1.28 (0.90-1.80)	1.27 (0.90-1.79)
Ethnicity							
non-Māori	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Māori	1.45 (0.97-2.10)	1.45 (0.97-2.10)	**1.45 (1.00-2.10)**	**1.45 (1.00-2.11)**	**1.50 (1.03-2.18)**	**1.46 (1.01-2.13)**	**1.51 (1.03-2.20)**
Maternal age	**1.00 (1.00-2.10)**	**1.00 (1.00-2.10)**	1.00 (0.97-1.03)	1.00 (0.97-1.03)	1.00 (0.97-1.03)	1.00 (0.97-1.03)	1.00 (0.97-1.03)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 1	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Quintile 2	1.04 (0.63-1.74)	1.04 (0.63-1.74)	1.05 (0.63-1.75)	1.05 (0.63-1.75)	1.09 (0.65-1.81)	1.07 (0.64-1.79)	1.10 (0.66-1.83)
Quintile 3	0.69 (0.40-1.18)	0.69 (0.40-1.18)	0.66 (0.38-1.12)	0.66 (0.38-1.12)	0.67 (0.39-1.15)	0.71 (0.41-1.22)	0.68 (0.40-1.18)
Quintile 4	1.02 (0.60-1.73)	1.02 (0.60-1.73)	1.07 (0.64-1.81)	1.07 (0.64-1.81)	1.04 (0.61-1.77)	1.03 (0.60-1.76)	1.02 (0.60-1.74)
Quintile 5	1.23 (0.72-2.10)	1.23 (0.72-2.10)	1.20 (0.70-2.05)	1.21 (0.71-2.07)	1.18 (0.69-2.03)	1.18 (0.69-2.04)	1.18 (0.68-2.02)
Parity							
Multiparous	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Nulliparous	0.86 (0.61-1.22)	0.86 (0.61-1.22)	0.87 (0.62-1.23)	0.87 (0.62-1.23)	0.88 (0.62-1.24)	0.86 (0.61-1.22)	0.89 (0.63-1.26)
Block 3: Risk Factor	.129	.129	.129	.131	.132	.127	.126

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Nagelkerke R Square							
Birth experience	1.07 (0.74-1.53)	1.07 (0.74-1.53)	1.07 (0.74-1.54)	1.06 (0.74-1.52)	1.07 (0.74-1.55)	1.04 (0.72-1.51)	1.05 (0.73-1.52)
Ethnicity	**1.47 (1.00-2.17)**	**1.47 (1.00-2.17)**	**1.47 (1.00-2.15)**	**1.48 (1.00-2.17)**	**1.52 (1.03-2.25)**	**1.50 (1.02-2.21)**	**1.54 (1.04-2.28)**
Maternal age	1.01 (0.98-1.05)	1.01 (0.98-1.05)	1.01 (0.98-1.05)	1.01 (0.98-1.05)	1.01 (0.98-1.05)	1.01 (0.98-1.05)	1.01 (0.98-1.05)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	1.09 (0.64-1.85)	1.09 (0.64-1.85)	1.10 (0.65-1.86)	1.10 (0.65-1.86)	1.17 (0.69-2.00)	1.12 (0.66-1.92)	1.15 (0.67-1.95)
Quintile 3	0.65 (0.38-1.14)	0.65 (0.38-1.14)	0.63 (0.36-1.10)	0.63 (0.36-1.10)	0.65 (0.37-1.14)	0.68 (0.39-1.20)	0.66 (0.37-1.15)
Quintile 4	0.98 (0.57-1.70)	0.98 (0.57-1.70)	1.03 (0.60-1.78)	1.03 (0.60-1.78)	1.02 (0.59-1.77)	0.99 (0.57-1.73)	0.98 (0.56-1.70)
Quintile 5	1.15 (0.66-2.00)	1.15 (0.66-2.00)	1.13 (0.65-1.97)	1.15 (0.66-2.00)	1.11 (0.63-1.95)	1.13 (0.64-1.98)	1.12 (0.64-1.97)
Parity	1.02 (0.71-1.47)	1.02 (0.71-1.47)	1.02 (0.71-1.46)	1.01 (0.71-1.46)	1.02 (0.71-1.47)	1.02 (0.70-1.46)	1.04 (0.72-1.50)
Antenatal mental distress							
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**5.09 (3.48-7.44)**	**5.09 (3.48-7.44)**	**5.06 (3.47-7.39)**	**5.13 (3.51-7.49)**	**5.19 (3.54-7.62)**	**5.10 (3.48-7.47)**	**5.05 (3.43-7.41)**
Block 4: Sleep Variables							
Nagelkerke R Square	.144	.142	.217	.184	.141	.132	.134
Birth experience	1.04 (0.72-1.49)	1.02 (0.71-1.48)	0.90 (0.62-1.31)	0.99 (0.68-1.43)	1.05 (0.73-1.53)	1.06 (0.73-1.53)	1.04 (0.72-1.50)
Ethnicity	**1.52 (1.03-2.24)**	**1.52 (1.03-2.24)**	1.49 (0.99-2.22)	**1.55 (1.05-2.30)**	**1.48 (1.00-2.19)**	**1.50 (1.02-2.21)**	**1.52 (1.02-2.25)**
Maternal age	1.01 (0.97-1.04)	1.01 (0.98-1.04)	1.01 (0.97-1.04)	1.01 (0.97-1.04)	1.01 (0.98-1.04)	1.01 (0.98-1.05)	1.02 (0.98-1.05)
Neighbourhood deprivation (NZDep2006 Index)							

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Quintile 2	1.06 (0.62-1.80)	1.07 (0.63-1.82)	1.20 (0.70-2.08)	1.04 (0.61-1.79)	1.14 (0.67-1.95)	1.12 (0.66-1.92)	1.14 (0.67-1.96)
Quintile 3	0.66 (0.38-1.16)	0.67 (0.38-1.17)	0.67 (0.38-1.20)	0.62 (0.35-1.09)	0.65 (0.37-1.15)	0.70 (0.40-1.23)	0.68 (0.38-1.19)
Quintile 4	0.98 (0.56-1.70)	1.00 (0.57-1.73)	1.07 (0.61-1.88)	0.99 (0.57-1.73)	1.00 (0.57-1.73)	1.01 (0.58-1.76)	0.99 (0.57-1.73)
Quintile 5	1.24 (0.71-2.18)	1.22 (0.70-2.14)	1.24 (0.71-2.17)	1.10 (0.63-1.94)	1.12 (0.63-1.96)	1.12 (0.64-1.97)	1.14 (0.65-2.00)
Parity	1.09 (0.75-1.57)	1.07 (0.74-1.55)	1.09 (0.75-1.59)	0.98 (0.68-1.42)	1.01 (0.70-1.47)	1.01 (0.70-1.46)	1.05 (0.73-1.52)
Antenatal mental distress	**5.01 (3.42-7.35)**	**5.13 (3.50-7.51)**	**4.68 (3.15-6.96)**	**4.99 (3.38-7.38)**	**5.18 (3.52-7.61)**	**5.06 (3.45-7.42)**	**5.04 (3.42-7.41)**
Sleep variables							
Sleep duration continuous	0.82 (0.72-0.93)						
Sleep duration categorical							
Short <7 hours		**1.69 (1.15-2.48)**					
Recommended >=7<=9		*Ref*					
Long >9 hours		0.73 (0.36-1.47)					
GSDS Quality Subscale			**1.49 (1.34-1.66)**				
GSDS continuity/latency Subscale				**1.36 (1.23-1.50)**			
Daytime sleepiness							
Not excessively sleepy (<10 ESS)					*Ref*		
Excessively sleepy (>=10 ESS)					**1.69 (1.11-2.57)**		
Sleep disruption – Dreams							
Rarely disturbed(<3 nights per week)						*Ref*	

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Frequently disturbed (>=3 nights per week)						1.47 (0.94-2.30)	
Sleep disruption – Nightmares							
Rarely disturbed(<3 nights per week)							*Ref*
frequently disturbed (>=3 nights per week)							**2.42 (1.20-4.86)**

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a]*n* = 1,017, missing 257, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 6.25$ (8), $p = .620$. [b] *n* = 1,017, missing 257, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 6.01$ (8), $p = .646$ [c] *n* = 1,025, missing 249, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 2.71$ (8), $p = .951$. [d] *n* = 1,024, missing 250, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 6.54$ (8), $p = .587$. [e] *n* = 1,009, missing 265, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 7.51$ (8), $p = .483$. [f] *n* = 1,008, missing 266, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 13.55$ (8), $p = .094$. [g] *n* = 1,010, missing 264, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 6.67$ (8), $p = .572$. Boldface OR significant at 95% CI not spanning 1.

4.7.4 EPDS Community Cut-Off at 11–13 Weeks Postpartum Modelled Separately for Māori Women and Non-Māori Women

Table 39 (Māori women) and Table 40 (non-Māori women) outline results of the hierarchical models examining EPDS scores ≥10 (community cut-off) at 11-13 weeks postpartum for Māori and non-Māori separately, as described in Section 3.4.6. Results indicated that a negative birth experience was not statistically significantly associated with symptoms of mental distress for either Māori or non-Māori women (Tables 39 and 40; block 1). Adjustment for demographic variables (Tables 39 and 40; block 2), antenatal mental distress (Tables 39 and 40; block 3), and sleep health (Tables 39 and 40; block 4) had minimal influence on these (non-significant) relationships.

In fully adjusted models for Māori women (Table 39; block 4), some facets of sleep health were independently associated with postnatal mental distress symptoms at 11-13 weeks postpartum (GSDS quality subscale OR 1.5; GSDS continuity/latency subscale OR 1.2; ESS OR 2.5). For non-Māori women (Table 40; block 4), multiple aspects of sleep health were also independently associated with postnatal mental distress (sleep duration-short sleep vs recommended OR 2.2; GSDS quality subscale OR 1.5; GSDS continuity/latency subscale OR 1.5).

Furthermore, antenatal mental distress was significantly independently associated with elevated EPDS scores (≥10) for Māori (OR 5.0-6.2) and non-Māori women (OR 4.5-5.0) at 11-13 weeks postpartum. The Hosmer-Lemeshow tests conducted for fully adjusted models for both Māori and non-Māori women indicated adequate goodness of fit (p >.05). The R^2 values indicated that these models explained approximately 17% to 27% of the variance for Māori and approximately 10% to 19% for non-Māori women.

4.7.5 EPDS Clinical Cut-Off at 11–13 Weeks Postpartum

Table 41 presents results of hierarchical models examining EPDS scores ≥13 (clinical cut-off; indicative of potentially clinical levels of mental distress) at 11-13 weeks postpartum. Unadjusted models indicated that negative birth experience was associated with approximately 1.6 greater

odds of experiencing symptoms of postnatal mental distress at this timepoint (block 1). Adjustment for age, ethnicity, SEP and parity did not attenuate this relationship (birth experience OR still approximately 1.6; block 2). However, additional adjustment for antenatal mental distress (block 3) did fully attenuate the association between negative birth experience and symptoms of mental distress at 11-13 weeks postpartum (birth experience OR was no longer significant). With further adjustment for sleep health variables (block 4), relationships between negative birth experience and postnatal mental distress remained similar (still non-significant).

The fully adjusted models (block 4) indicated that multiple aspects of sleep health were independently associated with postnatal mental distress (sleep duration-short sleep vs recommended OR 1.9; GSDS quality subscale OR 1.6; GSDS continuity/latency subscale OR 1.4; sleep disruption-nightmares OR 3.1). In addition, antenatal mental distress was significantly independently associated with elevated EPDS scores (≥13; OR 4.4-5.3) in all fully adjusted models. Hosmer-Lemeshow test results for block 4 models showed sufficient goodness of fit (p >.05). The R^2 values indicated that the models accounted for approximately 14%-22% of the variance.

Table 39

EPDS Community Cut-Off at 11–13 Weeks Postpartum for Māori Women

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.004	.004	.004	.004	.006	.004	.005
Birth experience							
Positive	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Negative	1.29 (0.75- 2.22)	1.29 (0.75- 2.22)	1.29 (0.75- 2.22)	1.29 (0.75- 2.21)	1.37(0.79-2.35)	1.29 (0.75-2.22)	1.33 (0.76-2.29)
Block 2: Demographics Nagelkerke R Square	.037	.037	.035	.035	.036	.034	.036
Birth experience	1.34 (0.77-2.32)	1.34 (0.77-2.32)	1.34 (0.77-2.31)	1.33 (0.77-2.30)	1.42 (0.82-2.47)	1.34 (0.77-2.32)	1.39 (0.80-2.41)
Maternal age	0.99 (0.94-1.03)	0.99 (0.94-1.03)	0.98 (0.94-1.03)	0.99 (0.94-1.03)	0.99 (0.94-1.03)	0.98 (0.94-1.03)	0.98 (0.94-1.03)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 1	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Quintile 2	1.13 (0.39-3.25)	1.13 (0.39-3.25)	1.13 (0.39-3.26)	1.13 (0.39-3.26)	1.20 (0.41-3.49)	1.18 (0.41-3.42)	1.31 (0.45-3.82)
Quintile 3	0.44 (0.16-1.17)	0.44 (0.16-1.17)	0.44 (0.16-1.16)	0.44 (0.16-1.16)	0.43 (0.16-1.16)	0.44 (0.16-1.17)	0.44 (0.16-1.17)
Quintile 4	0.72 (0.29-1.77)	0.72 (0.29-1.77)	0.75 (0.31-1.84)	0.75 (0.31-1.84)	0.72 (0.29-1.77)	0.75 (0.31-1.84)	0.75 (0.31-1.85)
Quintile 5	0.91 (0.38-2.16)	0.91 (0.38-2.16)	0.87 (0.37-2.07)	0.89 (0.37-2.10)	0.82 (0.35-1.96))	0.84 (0.35-2.00)	0.83 (0.35-1.98)
Parity							
Multiparous	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Nulliparous	0.67 (0.37-1.19)	0.67 (0.37-1.19)	0.69 (0.39-1.22)	0.69 (0.39-1.22)	0.71 (0.40-1.26)	0.71 (0.40-1.26)	0.72 (0.41-1.28)
Block 3: Risk Factor Nagelkerke R Square	.172	.172	.178	.183	.189	.172	.180
Birth experience	1.15 (0.64-2.07)	1.15 (0.64-2.07)	1.14 (0.64-2.06)	1.12 (0.62-2.02)	1.23 (0.68-2.22)	1.13 (0.63-2.04)	1.19 (0.66-2.15)
Maternal age	1.00 (0.95-1.05)	1.00 (0.95-1.05)	1.00 (0.95-1.05)	1.00 (0.96-1.05)	1.00 (0.95-1.05)	1.00 (0.95-1.05)	1.00 (0.95-1.05)

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	1.30 (0.42-4.05)	1.30 (0.42-4.05)	1.31 (0.42-4.11)	1.32 (0.42-4.13)	1.51 (0.48-4.78)	1.36 (0.44-4.27)	1.61 (0.51-5.07)
Quintile 3	0.44 (0.16-1.26)	0.44 (0.16-1.26)	0.44 (0.16-1.26)	0.44 (0.16-1.26)	0.45 (0.16-1.29)	0.46 (0.16-1.30)	0.46 (0.16-1.30)
Quintile 4	0.80 (0.31-2.08)	0.80 (0.31-2.08)	0.83 (0.32-2.15)	0.83 (0.32-2.17)	0.80 (0.31-2.11)	0.83 (0.32-2.16)	0.83 (0.32-2.18)
Quintile 5	1.08 (0.43-2.70)	1.08 (0.43-2.70)	1.05 (0.42-2.64)	1.10 (0.44-2.77)	0.99 (0.39-2.52)	1.03 (0.41-2.59)	1.03 (0.41-2.59)
Parity	0.78 (0.42-1.44)	0.78 (0.42-1.44)	0.80 (0.43-1.47)	0.79 (0.43-1.46)	0.80 (0.43-1.49)	0.82 (0.45-1.51)	0.83 (0.45-1.53)
Antenatal mental distress							
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**5.60 (3.08-10.17)**	**5.60 (3.08-10.17)**	**5.89 (3.25-10.67)**	**6.13 (3.37-11.17)**	**6.24 (3.42-11.40)**	**5.73 (3.15-10.44)**	**6.00 (3.28-10.98)**
Block 4: Sleep Variables							
Nagelkerke R Square	.183	.184	.265	.200	.218	.173	.191
Birth experience	1.13 (0.63-2.04)	1.18 (0.65-2.14)	0.92 (0.50-1.71)	1.09 (0.60-1.97)	1.23 (0.67-2.25)	1.14 (0.63-2.06)	1.20 (0.66-2.17)
Maternal age	1.00 (0.95-1.05)	0.99 (0.95-1.05)	1.00 (0.95-1.05)	0.99 (0.94-1.04)	1.00 (0.95-1.05)	1.00 (0.95-1.05)	1.00 (0.95-1.05)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	1.35 (0.43-4.26)	1.32 (0.42-4.14)	2.40 (0.72-8.04)	1.50 (0.47-4.72)	1.72 (0.54-5.49)	1.37 (0.44-4.29)	1.68 (0.53-5.34)
Quintile 3	0.47 (0.16-1.33)	0.48 (0.17-1.37)	0.53 (0.18-1.57)	0.46 (0.16-1.33)	0.48 (0.17-1.41)	0.47 (0.16-1.33)	0.49 (0.17-1.39)
Quintile 4	0.82 (0.31-2.14)	0.82 (0.31-2.15)	1.00 (0.37-2.75)	0.83 (0.32-2.17)	0.82 (0.31-2.17)	0.83 (0.32-2.17)	0.84 (0.32-2.21)
Quintile 5	1.21 (0.48-3.08)	1.17 (0.46-2.99)	1.33 (0.50-3.50)	1.13 (0.44-2.86)	1.11 (0.43-2.87)	1.03 (0.41-2.59)	1.03 (0.40-2.62)
Parity	0.83 (0.45-1.55)	0.81 (0.43-1.51)	0.87 (0.46-1.65)	0.78 (0.42-1.44)	0.78 (0.41-1.47)	0.82 (0.44-1.51)	0.82 (0.44-1.52)
Antenatal mental distress	**5.53 (3.03-10.07)**	**5.68 (3.12-10.37)**	**5.01 (2.70-9.32)**	**5.69 (3.10-10.43)**	**6.20 (3.36-11.44)**	**5.75 (3.16-10.49)**	**6.05 (3.29-11.11)**

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Sleep variables							
Sleep duration continuous	0.87 (0.74-1.03)						
Sleep duration categorical							
Short <7 hours		1.04 (0.52-2.08)					
Recommended >=7<=9		*Ref*					
Long >9 hours		0.48 (0.19-1.23)					
GSDS Quality Subscale			**1.53 (1.27-1.85)**				
GSDS continuity/latency Subscale				**1.19 (1.01-1.40)**			
Daytime sleepiness							
Not excessively sleepy (<10 ESS)					*Ref*		
Excessively sleepy (>=10 ESS)					**2.52 (1.31-4.87)**		
Sleep disruption – Dreams							
Rarely disturbed(<3 nights per week)						*Ref*	
Frequently disturbed (>=3 nights per week)						1.25 (0.60-2.58)	
Sleep disruption – Nightmares							
Rarely disturbed(<3 nights per week)							*Ref*
Frequently disturbed (>=3 nights per week)							2.44 (0.89-6.68)

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a] n = 342, missing 75, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 8.75 (8), p = .364 [b] n = 347, missing 70, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 9.33 (8), p = .315 . [c] n = 346, missing 71, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 12.94 (8), p = .114 [d] n = 346, missing 71, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 6.23 (8), p = .622 [e] n = 339, missing 78, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 3.16 (8), p = .924 [f] n = 342, missing 75, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 11.08 (8), p = .197 [g] n = 341, missing 76 Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 12.65 (8), p = .125. Boldface OR significant at 95% CI not spanning 1.

Table 40

EPDS Community Cut-Off at 11–13 Weeks Postpartum for Non-Māori Women

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.003	.003	.003	.003	.002	.002	.002
Birth experience							
Positive	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Negative	1.27 (0.82- 1.96)	1.27 (0.82- 1.96)	1.27 (0.82- 1.96)	1.27 (0.82-1.96)	1.25 (0.80-1.93)	1.23 (0.79-1.91)	1.20 (0.77-1.87)
Block 2: Demographics Nagelkerke R Square	.008	.008	.010	.010	.009	.007	.007
Birth experience	1.24 (0.80-1.94)	1.24 (0.80-1.94)	1.24 (0.80-1.94)	1.24 (0.80-1.94)	1.22 (0.78-1.91)	1.22 (0.78-1.91)	1.17 (0.75-1.84)
Maternal age	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.00 (0.96-1.05)	1.01 (0.96-1.05)	1.00 (0.96-1.05)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 1	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Quintile 2	1.02 (0.57-1.83)	1.02 (0.57-1.83)	1.03 (0.58-1.86)	1.03 (0.58-1.86)	1.06(0.59-1.92)	1.05 (0.58-1.90)	1.05 (0.58-1.90)
Quintile 3	0.85 (0.45-1.61)	0.85 (0.45-1.61)	0.79 (0.41-1.50)	0.79 (0.41-1.50)	0.81 (0.42-1.56)	0.89 (0.47-1.69)	0.85 (0.44-1.62)
Quintile 4	1.21 (0.62-2.36)	1.21 (0.62-2.36)	1.29 (0.67-2.49)	1.29 (0.67-2.49)	1.26 (0.64-2.46)	1.19 (0.60-2.35)	1.18 (0.60-2.33)
Quintile 5	1.41 (0.68-2.94)	1.41 (0.68-2.94)	1.41 (0.68-2.94)	1.41 (0.68-2.94)	1.46 (0.70-3.07)	1.45 (0.69-3.04)	1.48 (0.71-3.11)
Parity							
Multiparous	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Nulliparous	1.01 (0.65-1.57)	1.01 (0.65-1.57)	1.01 (0.65-1.57)	1.01 (0.65-1.57)	1.01 (0.65-1.58)	0.98 (0.63-1.53)	1.04 (0.66-1.62)
Block 3: Risk Factor Nagelkerke R Square	.099	.099	.094	.094	.093	.095	.088
Birth experience	1.02 (0.64-1.62)	1.02 (0.64-1.62)	1.03 (0.64-1.63)	1.03 (0.64-1.63)	0.99 (0.62-1.59)	0.99 (0.62-1.59)	0.97 (0.61-1.56)
Maternal age	1.02 (0.97-1.07)	1.02 (0.97-1.07)	1.02 (0.97-1.06)	1.02 (0.97-1.06)	1.02 (0.97-1.06)	1.02 (0.98-1.07)	1.02 (0.97-1.06)

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	1.03 (0.56-1.89)	1.03 (0.56-1.89)	1.04 (0.57-1.91)	1.04 (0.57-1.91)	1.10 (0.60-2.01)	1.07 (0.58-1.97)	1.06 (0.58-1.93)
Quintile 3	0.82 (0.42-1.57)	0.82 (0.42-1.57)	0.77 (0.39-1.49)	0.77 (0.39-1.49)	0.80 (0.41-1.56)	0.86 (0.44-1.66)	0.81 (0.42-1.59)
Quintile 4	1.12 (0.56-2.23)	1.12 (0.56-2.23)	1.20 (0.61-2.37)	1.20 (0.61-2.37)	1.20 (0.60-2.40)	1.11 (0.55-2.25)	1.09 (0.54-2.21)
Quintile 5	1.09 (0.50-2.36)	1.09 (0.50-2.36)	1.09 (0.50-2.37)	1.09 (0.50-2.37)	1.15 (0.53-2.49)	1.13 (0.52-2.46)	1.18 (0.54-2.55)
Parity	1.19 (0.75-1.89)	1.19 (0.75-1.89)	1.18 (0.74-1.86)	1.18 (0.74-1.86)	1.19 (0.75-1.89)	1.16 (0.73-1.84)	1.20 (0.76-1.91)
Antenatal mental distress							
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**4.90 (2.96-8.09)**	**4.90 (2.96-8.09)**	**4.66 (2.81-7.71)**	**4.66 (2.81-7.71)**	**4.68 (2.81-7.81)**	**4.79 (2.88-7.94)**	**4.55 (2.73-7.60)**
Block 4: Sleep Variables							
Nagelkerke R Square	.122	.125	.188	.185	.095	.102	.096
Birth experience	0.97 (0.61-1.56)	1.02 (0.97-1.06)	0.86 (0.53-1.40)	0.94 (0.59-1.52)	0.98 (0.61-1.57)	1.01 (0.63-1.61)	0.95 (0.59-1.53)
Maternal age	1.01 (0.96-1.06)	1.00 (0.54-1.84)	1.01 (0.96-1.05)	1.03 (0.98-1.07)	1.02 (0.97-1.06)	1.02 (0.98-1.07)	1.02 (0.98-1.07)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	0.97 (0.53-1.79)	1.00 (0.54-1.84)	1.01 (0.96-1.05)	0.90 (0.48-1.69)	1.07 (0.58-1.97)	1.07 (0.58-1.96)	1.04 (0.57-1.91)
Quintile 3	0.82 (0.42-1.60)	0.87 (0.45-1.68)	0.81 (0.41-1.60)	0.73 (0.37-1.44)	0.79 (0.41-1.55)	0.89 (0.46-1.74)	0.83 (0.42-1.63)
Quintile 4	1.14 (0.57-2.30)	1.15 (0.57-2.38)	1.17 (0.57-2.37)	1.21 (0.60-2.44)	1.18 (0.59-2.37)	1.15 (0.57-2.34)	1.13 (0.56-2.27)
Quintile 5	1.09 (0.50-2.39)	1.09 (0.78-1.99)	1.11 (0.50-2.49)	0.96 (0.43-2.15)	1.13 (0.52-2.46)	1.11 (0.51-2.43)	1.23 (0.57-2.67)

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Parity	1.26 (0.80-2.01)	1.25 (0.78-1.99)	1.26 (0.78-2.01)	1.10 (0.69-1.77)	1.18 (0.74-1.88)	1.15 (0.72-1.83)	1.24 (0.78-1.97)
Antenatal mental distress	**4.86 (2.93-8.09)**	**5.00 (3.00-8.34)**	**4.56 (2.69-7.74)**	**4.94 (2.92-8.38)**	**4.70 (2.81-7.85)**	**4.66 (2.80-7.76)**	**4.50 (2.69-7.53)**
Sleep variables							
Sleep duration continuous	0.73 (0.60-0.90)						
Sleep duration categorical							
Short <7 hours		**2.23 (1.39-3.56)**					
Recommended >=7<=9		*Ref*					
Long >9 hours		1.34 (0.45-3.94)					
GSDS Quality Subscale			**1.49 (1.31-1.71)**				
GSDS continuity/latency Subscale				**1.52 (1.32-1.74)**			
Daytime sleepiness							
Not excessively sleepy (<10 ESS)					*Ref*		
Excessively sleepy (>=10 ESS)					1.32 (0.75-2.31)		
Sleep disruption – Dreams							
Rarely disturbed(<3 nights per week)						*Ref*	
Frequently disturbed (>=3 nights per week)						1.67 (0.95-2.96)	
Sleep disruption – Nightmares							

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Rarely disturbed(<3 nights per week)							*Ref*
Frequently disturbed (>=3 nights per week)							2.60 (0.98-6.89)

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a]*n* = 675, missing 70, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 4.73 (8), p = .786 [b] *n* = 675, missing 70, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 7.16 (8), p = .520 [c] *n* = 678, missing 67, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 6.17 (8), p = .628 [d] *n* = 678, missing 67, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 8.96 (8), p = .346 . [e] *n* = 670, missing 75, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 1060 (8), p = .226 [f] *n* = 666, missing 7, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 14.00 (8), p = .082 [g] *n* = 669, missing 76, Block 4 Hosmer-Lemeshow: $\chi^2(df)$ = 8.51 (8), p = .386. Boldface OR significant at 95% CI not spanning

Table 41

EPDS Clinical Cut-Off at 11–13 Weeks Postpartum

	Continuous sleep duration[a] OR (95% CI)	Categorical sleep duration[b] OR (95% CI)	GSDS sleep quality subscale[c] OR (95% CI)	GSDS continuity/ latency subscale[d] OR (95% CI)	ESS daytime sleepiness[e] OR (95% CI)	Sleep disruption-dreams[f] OR (95% CI)	Sleep disruption-nightmares[g] OR (95% CI)
Block 1: Birth Experience Nagelkerke R Square	.010	.010	.010	.010	.010	.011	.010
Birth experience							
Positive	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Negative	**1.64 (1.06- 2.55)**	**1.64 (1.06- 2.55)**	**1.62 (1.04-2.51)**	**1.62 (1.04-2.51)**	**1.61 (1.04-2.51)**	**1.66 (1.06-2.59)**	**1.64 (1.05-2.55)**
Block 2: Demographics Nagelkerke R Square	.051	.051	.049	.050	.049	.050	.051
Birth experience	**1.66 (1.06-2.60)**	**1.66 (1.06-2.60)**	**1.65 (1.05-2.58)**	**1.65 (1.05-2.57)**	**1.65 (1.05-2.59)**	**1.69 (1.08-2.66)**	**1.65 (1.05-2.61)**
Ethnicity							
non-Māori	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Māori	1.40 (0.85-2.30)	1.40 (0.85-2.30)	1.33 (0.81-2.58)	1.34 (0.81-2.19)	1.34 (0.81-2.21)	1.34 (0.81-2.22)	1.37 (0.82-2.28)
Maternal age	0.95 (0.91-0.99)	0.95 (0.91-0.99)	0.95 (0.91-0.99)	0.95 (0.91-0.99)	0.94 (0.91-0.98)	0.94 (0.91-0.98)	0.94 (0.90-0.98)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 1	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Quintile 2	0.86 (0.43-1.70)	0.86 (0.43-1.70)	0.86 (0.43-1.71)	0.86 (0.43-1.71)	0.90 (0.45-1.81)	0.85 (0.43-1.69)	0.91 (0.46-1.83)
Quintile 3	0.49 (0.23-1.05)	0.49 (0.23-1.05)	0.50 (0.23-1.05)	0.50 (0.23-1.05)	0.52 (0.24-1.81)	0.49 (0.23-1.05)	0.52 (0.25-1.12)
Quintile 4	0.66 (0.32-1.36)	0.66 (0.32-1.36)	0.70 (0.34-1.44)	0.70 (0.34-1.44)	0.72 (0.35-1.49)	0.65 (0.31-1.34)	0.68 (0.33-1.41)
Quintile 5	0.99 (0.50-1.97)	0.99 (0.50-1.97)	0.99 (0.50-1.95)	0.99 (0.50-1.96)	0.98 (0.49-1.96)	0.92 (0.46-1.83)	0.96 (0.48-1.92)
Parity							
Multiparous	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Nulliparous	0.80 (0.50-1.28)	0.80 (0.50-1.28)	0.78 (0.49-1.24)	0.78 (0.49-1.24)	0.77 (0.48-1.23)	0.81 (0.51-1.30)	0.83 (0.52-1.32)
Block 3: Risk Factor	.142	.142	.138	.139	.144	.138	.138

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Nagelkerke R Square							
Birth experience	1.35 (0.84-2.16)	1.35 (0.84-2.16)	1.34 (0.84-2.14)	1.33 (0.83-2.13)	1.32 (0.82-2.13)	1.37 (0.85-2.20)	1.35 (0.84-2.18)
Ethnicity	1.42 (0.86-2.36)	1.42 (0.86-2.36)	1.35 (0.81-2.23)	1.36 (0.82-2.24)	1.36 (0.81-2.27)	1.37 (0.82-2.28)	1.39 (0.83-2.34)
Maternal age	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.00)
Neighbourhood deprivation (NZDep2006 Index)							
Quintile 2	0.92 (0.45-1.86)	0.92 (0.45-1.86)	0.92 (0.46-1.87)	0.93 (0.46-1.87)	1.01 (0.49-2.06)	0.92 (0.45-1.86)	0.99 (0.49-2.03)
Quintile 3	0.46 (0.21-1.01)	0.46 (0.21-1.01)	0.47 (0.22-1.02)	0.47 (0.22-1.02)	0.50 (0.23-1.10)	0.47(0.22-1.02)	0.50 (0.23-1.09)
Quintile 4	0.63 (0.30-1.33)	0.63 (0.30-1.33)	0.68 (0.32-1.40)	0.67 (0.32-1.40)	0.71 (0.34-1.48)	0.63 (0.30-1.32)	0.65 (0.31-1.39)
Quintile 5	0.93 (0.46-1.87)	0.93 (0.46-1.87)	0.93 (0.46-1.87)	0.94 (0.47-1.90)	0.92 (0.45-1.88)	0.87 (0.43-1.77)	0.92 (0.45-1.87)
Parity	0.97 (0.59-1.58)	0.97 (0.59-1.58)	0.93 (0.57-1.50)	0.92 (0.57-1.50)	0.91 (0.56-1.49)	0.98 (0.60-1.59)	0.98 (0.60-1.60)
Antenatal mental distress							
Mental distress symptoms not significant (<13 EPDS)	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*	*Ref*
Mental distress symptoms significant (>=13 EPDS)	**5.14 (3.20-8.26)**	**5.14 (3.20-8.26)**	**5.03 (3.14-8.05)**	**5.07 (3.17-8.13)**	**5.34 (3.32-8.60)**	**5.00 (3.11-8.05)**	**5.00 (3.10-8.08)**
Block 4: Sleep Variables							
Nagelkerke R Square	.158	.157	.219	.192	.151	.142	.153
Birth experience	1.32 (0.83-2.12)	1.29 (0.80-2.08)	1.17 (0.73-1.90)	1.27 (0.79-2.05)	1.29 (0.80-2.09)	1.40 (0.87-2.25)	1.34 (0.83-2.16)
Ethnicity	1.47 (0.89-2.44)	1.49 (0.89-2.47)	1.32 (0.78-2.23)	1.45 (0.87-2.42)	1.31 (0.78-2.19)	1.38 (0.83-2.30)	1.37 (0.81-2.30)
Maternal age	0.95 (0.91-0.99)	0.96 (0.91-1.00)	0.95 (0.91-0.99)	0.95 (0.91-0.99)	0.96 (0.92-1.00)	0.96 (0.92-1.00)	0.96 (0.92-1.10)
Neighbourhood deprivation (NZDep2006 Index)							

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Quintile 2	0.89 (0.44-1.81)	0.90 (0.44-1.84)	1.01 (0.49-2.08)	0.84 (0.41-1.72)	0.98 (0.48-2.01)	0.92 (0.45-1.86)	0.97 (0.47-2.00)
Quintile 3	0.47 (0.22-1.03)	0.48 (0.22-1.04)	0.50 (0.23-1.11)	0.46 (0.21-0.99)	0.50 (0.23-1.10)	0.49 (0.23-1.06)	0.52 (0.24-1.14)
Quintile 4	0.63 (0.30-1.32)	0.65 (0.31-1.37)	0.66 (0.31-1.40)	0.62 (0.29-1.31)	0.68 (0.32-1.44)	0.63 (0.30-1.34)	0.66 (0.31-1.41)
Quintile 5	1.02 (0.50-2.06)	1.01 (0.50-2.04)	0.96 (0.47-1.99)	0.87 (0.43-1.78)	0.92 (0.45-1.88)	0.87 (0.43-1.76)	0.93 (0.45-1.91)
Parity	1.05 (0.64-1.73)	1.05 (0.64-1.72)	0.98 (0.60-1.60)	0.91 (0.56-1.49)	0.90 (0.55-1.47)	0.98 (0.60-1.60)	1.00 (0.61-1.64)
Antenatal mental distress	**5.00** (3.10-8.05)	**5.15** (3.20-8.30)	**4.44** (2.74-7.21)	**4.78** (2.95-7.73)	**5.28** (3.27-8.52)	**4.93** (3.06-7.96)	**5.01** (3.09-8.12)
Sleep variables							
Sleep duration continuous	0.80 (0.68-0.94)						
Sleep duration categorical							
Short <7 hours		**1.88 (1.14-3.11)**					
Recommended >=7<=9		*Ref*					
Long >9 hours		0.68 (0.27-1.67)					
GSDS Quality Subscale			**1.55 (1.34-1.79)**				
GSDS continuity/latency Subscale				**1.41 (1.23-1.61)**			
Daytime sleepiness							
Not excessively sleepy (<10 ESS)					*Ref*		
Excessively sleepy (>=10 ESS)					1.66 (0.96-2.87)		
Sleep disruption – Dreams							
Rarely disturbed(<3 nights per week)						*Ref*	

	Continuous sleep duration[a]	Categorical sleep duration[b]	GSDS sleep quality subscale[c]	GSDS continuity/ latency subscale[d]	ESS daytime sleepiness[e]	Sleep disruption-dreams[f]	Sleep disruption-nightmares[g]
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Frequently disturbed (>=3 nights per week)						1.56 (0.88-2.74)	
Sleep disruption – Nightmares							
Rarely disturbed(<3 nights per week)							*Ref*
Frequently disturbed (>=3 nights per week)							**3.11 (1.43-6.76)**

Note. GSDS= General Sleep Disturbance Scale; ESS= Epworth Sleepiness Scale; EPDS= Edinburgh Postnatal Depression Scale. [a] n =1,017, missing 257, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 4.11$ (8), $p = .847$. [b] n = 1,017, missing 257, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 5.21$ (8), $p = .7.35$. [c] n = 1,025, missing 249, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 8.28$ (8), $p = .407$. [d] n = 1,024, missing 250, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 8.94$ (8), $p = .310$. [e] n = 1,009, missing 265, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 12.41$ (8), $p = .145$. [f] n = 1,008, missing 266, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 8.26$ (8), $p = .408$ [g] n = 1,010, missing 26, Block 4 Hosmer-Lemeshow: $\chi^2(df) = 8.06$ (8), $p = .428$. Boldface OR significant at 95% CI not spanning 1.

4.8 Quantitative Discussion

The quantitative study utilised a large sample, comprising 383 Māori and 702 non-Māori women aged 16 to 46 in the *Moe Kura* study. In this sample, Māori women were over-represented in areas of greater socioeconomic deprivation. This pattern of socioeconomic deprivation was comparable to 2012 NZ population figures (Salmond & Crampton, 2012). Māori women were generally younger, with a median age of 28 years compared to a median age of 33 years for non-Māori. This reflects NZ population-level figures for women giving birth, with a median of 25.7 years for Māori and 30.7 years for NZ European women (Statistics New Zealand, 2019). Parity was also similar to NZ population figures in that a greater proportion of Māori women had given birth at least once (after 20 weeks gestation). In 2012, 34% of Māori women and 42% of European women in NZ had not given birth and did so for the first time (Ministry of Health, 2015). In this sample 45% of Māori and 54% of non-Māori women had not given birth previously.

To contextualise this investigation, social support, stressful life events, obstetric and birth factors were described for Māori and non-Māori women. A significantly smaller proportion of Māori women described their partner relationship (a proxy measure of social support) as 'happy'. NZ studies have found that partner dissatisfaction and an unhappy relationship are associated with an increased likelihood of postnatal depression (M. W. Abbott & Williams, 2006; Webster et al., 1994) In their comprehensive review, Schmied et al. (2013) found poor partner relationships were one of the strongest predictors of perinatal depression and anxiety. Postnatally, Māori women in this sample also reported significantly more stressful life events in the prior 12 months than non-Māori. As previously reported by Signal et al. (2017), life stress in pregnancy was more prevalent for Māori than non-Māori women in *Moe Kura*. In addition, in their meta-analysis, E. Robertson et al. (2004) identified a strong relationship between postnatal depression and stressful life events during the perinatal period. The inequitable patterns of socioeconomic deprivation, social support and life stress data highlight the greater burden and additional stress Māori women in this study experienced.

Most Māori and non-Māori women in this study had an independent midwife or team of midwives as their lead maternity carer. However, a significantly larger proportion of Māori women had a hospital-based midwife. In contrast, more non-Māori women had a specialist obstetrician or a hospital high-risk team. Māori women did report fewer complications than non-Māori, potentially driven by mode of birth as a larger proportion of Māori women had unassisted non-instrumental vaginal births. However, findings may also reflect systemic inequities within NZ's maternity services. This may include financial and geographical barriers to care, as Māori women are more likely to live rurally and in areas with greatest socioeconomic deprivation (Ministry of Health, 2014). In addition, as illustrated in the literature previously, there are inequities in access to and experiences within maternity care for Māori. For example, Makowharemahihi et al. (2014) found many Māori women felt inadequately supported when enrolling in maternity care and a lack of information and resources made navigating maternity services difficult. In addition, Stevenson et al. (2016) found that some Māori women struggled with provider communication and poor access to support services which impacted their experiences.

A significantly smaller proportion of Māori women reported obstetric interventions than non-Māori women in this study. Several NZ studies found similar results while controlling for a range of demographic factors, indicating unjust healthcare 'inequities' rather than simply 'differences'. Although Sadler et al. (2002) found no difference in caesarean rates, lower rates of other obstetric interventions were found between Māori and Pacific women compared to non-Māori and non-Pacific women after controlling for age, parity and obstetric risk factors. Whereas Harris et al. (2007) noted significantly lower caesarean rates among Māori compared to non-Māori women, and deprivation contributed to some but not all of this difference, with possible explanations being patient-provider interactions and differential access to information and care. Midwifery care is known to increase the incidence of a vaginal birth with lower rates of interventions (Soltani & Sandall, 2012), which may have partly explained the lower rates of intervention and complications for Māori women in this sample. However, neonatal and maternal mortality rates and poorer birth outcomes in NZ are statistically significantly higher for Māori than for NZ European women

(PMMRC, 2021). Thus, the current study's findings likely reflect, at least in part, ethnic inequities in obstetric intervention access and provision.

There are likely many complex factors responsible for these inequities between Māori and non-Māori. These include systemic disadvantages within the health system experienced by Māori and inequities in wider determinants of health, including systemic racism. When the healthcare professional is from a dominant societal group power imbalances are exacerbated (Dawson et al., 2019). In addition, cultural miscommunication and unconscious bias within the health system can contribute to differences in the standard of care Māori receive (Houkamau & Clarke, 2016; McCreanor & Nairn, 2002). For example, the 2001-02 NatMedCar survey found doctors spent 17 percent less time consulting with Māori than non-Māori patients (Jansen & Jansen, 2013). Likewise, Harris et al. (2018) reported that NZ medical students demonstrated implicit and explicit bias favouring NZ Europeans, although this was not associated with clinical decision-making. Previous research has also found that Māori are more likely to report experiences of racial discrimination by health professionals than non-Māori (Harris et al., 2006).

Achieving health equity requires examining models of care and how and whom they privilege. This study's findings support the need for equitable maternity service provision, which prioritises the needs of Māori women and reduces barriers (e.g., information, transport, financial, cultural) to access and care. Promoting diversity of maternity health professionals and culturally safe and responsive care may also help target this imbalance (Papps & Ramsden, 1996). An integrated system that partners with Māori, where Māori women are supported with information and resources to navigate the maternity process in the entire perinatal period, is required (Dawson et al., 2019). Additionally, this illustrates the importance of research focusing on and prioritising the rights of Māori women, including their birth experience.

To investigate the prevalence of positive or negative birth experience in this study, a composite dichotomous measure incorporating three dimensions of birth experience (overall experience, informed, and listened to; Section 4.2) was analysed. The results were not statistically significantly

different for Māori and non-Māori women, with 69% of Māori and 66% of non-Māori women rating their birth experience as positive and 31% of Māori and 34% of non-Māori women rating their birth experience as negative. Although characteristics of this sample were reflective of the NZ population, results were not weighted to produce population-level prevalence estimates. However, if this sample's figures were applied to the 59,818 women who gave birth in 2019 (25% identifying as Māori), this would equate to 10,319 Māori rating their birth experience positively and 4,636 rating their birth experience negatively. For non-Māori, based on the 2019 number of women giving birth, this would equate to 29,610 rating their birth positively and 15,254 negatively. These figures highlight how important this area of research is for all women giving birth in NZ.

Most women in this study had a more positive experience, with the greatest proportion rating their birth experience as 'challenging but manageable'. This is encouraging as a positive birth experience can be psychologically positive, empowering, and even lead to personal growth and transformation (Nilsson et al., 2013; Nishi & Usuda, 2017; Parratt, 2002). However, of concern is that a third of women rated their labour and birth negatively. Similar results have been found in several international studies on birth trauma, where up to a third of women identify some aspects of their birth as traumatic (Ayers, 2004; Creedy et al., 2000; Soet et al., 2003). In contrast, some studies have identified lower rates of negative birth experience, with proportions between 7% and 21% (Henriksen et al., 2017; Smarandache et al., 2016; Waldenström et al., 2004). The discrepancies in these findings may be attributed to differences in how birth experience was defined, measured, and collected within studies. Due to the subjective multidimensional nature of birth experience, measurement is complex, and there is no gold standard measure (Larkin et al., 2009).

The finding that a considerable proportion of women in this sample had a negative experience suggests that further work is required to understand and improve the birth experience and evaluate the potential impact on women and their families. This study included being informed and listened to within the composite birth experience measure. Most Māori and non-Māori (approximately 94%) women reported they knew enough and were listened to. Prior studies have

noted that birth satisfaction is related to empathetic support and verbal and non-verbal communication of health professionals (Baranowska et al., 2021). Māori women's birth experiences have been found to be negatively impacted by poor communication and cultural misunderstandings, whereas feeling listened to facilitated more positive experiences (Stevenson et al., 2016). Health professionals must recognise the importance of communication, ensuring they encourage active inquiry, and that information is tailored to individual women. Maternity care must be collaborative, culturally safe, informative, and empowering, to facilitate women to contribute to and understand decisions relating to their births. In addition, equity-based social and health policies, responsive models of maternity care and targeted funding to improve birthing environments, support and access to maternity services may increase the possibility of a more positive experience for all women.

Further investigation was conducted to explore associations between birth experience and anxiety symptoms and how sleep may contribute to these relationships. Unadjusted models indicated that a negative birth experience was associated with greater odds of anxiety symptoms (as measured by the EPDS anxiety subscale) at 4- 6 weeks postpartum. Women had over 2.5 greater odds of experiencing significant anxiety symptoms in this early postpartum period if they had reported a negative perception of their birth experience. This association remained similar after adjusting for demographics, antenatal mental distress and sleep, indicating that a negative birth experience may increase the risk of anxiety symptoms within the 4-6 week period following birth irrespective of SEP, antenatal mental distress and sleep health.

These results support the limited number of studies that have identified significant associations between a negative birth experience and postnatal anxiety in the first few weeks postpartum (Bell et al., 2016; Giakoumaki et al., 2009). Therefore, support straight after birth and across this window may be particularly important for women with a negative birth experience. Practices need to be implemented to normalise and encourage women to seek support after a negative experience. This support needs to be freely available, e.g. without financial or geographical barriers. Providing

accessible and timely psychological interventions and supporting women to process and review their experiences may also enable a more favourable transition to motherhood.

At 11-13 weeks postpartum, negative birth experience was associated with 1.6 greater odds of experiencing elevated anxiety symptoms after adjusting for ethnicity, age, socioeconomic deprivation and parity, indicating a weaker strength of association at this later timepoint. In contrast to findings at 4-6 weeks postpartum, further adjustment for antenatal mental distress fully attenuated this relationship. Thus, other factors not included in models may play more of a role in the risk of anxiety symptoms at 11-13 weeks after birth.

A possible explanation for this difference in association at 11-13 weeks postpartum may be that, for some women, time dissipates the negative psychological impact of a negative birth experience as they adjust to motherhood's challenges and new reality. As they get further away from their birth, women may recover psychologically and physically, thus reducing the association between a negative birth experience and anxiety symptoms. This finding was in contrast to Bell et al. (2016) who found the association between a negative birth experience and anxiety symptoms remained significant and consistent over time when measured at two months and eight months postpartum.

The fact that antenatal mental distress fully attenuated the relationship between birth experience and anxiety symptoms at 11-13 weeks suggests that prior mental distress is a key driver of postnatal anxiety. Wenzel et al. (2005) examined risk factors for postnatal anxiety and found that a previous psychiatric history predicted higher anxiety symptoms at eight weeks postpartum. Van der Zee-van den Berg et al. (2021) also found a history of depression was associated with a higher risk of postnatal anxiety. Women with antenatal anxiety or anxiety around their labour and birth are likelier to have poorer birth and child outcomes (Dencker et al., 2019; Dowse et al., 2020; Mudra et al., 2020). Considering the results of the current study, this indicates that identifying, monitoring, and supporting women with a prior history of mental distress is important for helping to reduce the likelihood of anxiety symptoms in the postpartum period. A systematic review found that partner support, particularly emotional support, was a modifiable factor in improving

perinatal anxiety (Pilkington et al., 2015). Therefore, findings support the importance of health professionals involving partners and whānau (family) with antenatal care, routinely inquiring about women's support networks and partner relationships, and offering targeted support and services such as relationship counselling when required.

Perinatal anxiety occurs more frequently than perinatal depression, yet it is often less understood (Folliard et al., 2020) and not as easily recognised (Highet et al., 2011; R. Miller et al., 2006). Moreover, studies have shown that anxiety symptoms can be present in isolation and are unique in the perinatal period (Folliard et al., 2020; Matthey et al., 2003; R. Miller et al., 2006). These quantitative findings highlight that anxiety symptoms require as much attention as depression symptoms and the importance of a broader approach to assessing and understanding postnatal mental distress.

Different psychological approaches and interventions are necessary to support anxiety. This study, like others, illustrates the need to develop validated measures to assess anxiety symptoms in the perinatal period (Matthey et al., 2003). Furthermore, although there are recommendations in NZ to screen for perinatal mood symptoms, women are still not routinely screened (Mellor et al., 2019; PMMRC, 2021). This reinforces the need for formal policies for routine screening for perinatal distress including anxiety, routine assessment, and debriefing of birth experience in follow-up postnatal care, and identifying, monitoring, and supporting women who have experienced a negative labour and birth.

Relationships were also examined between birth experience and postnatal mental distress using the full EPDS as a composite measure of anxiety and depression symptoms at 11-13 weeks postpartum. Birth experience was not significantly associated with elevated EPDS scores when the community cut-off (≥10) was used in models including all women and when Māori and non-Māori women were analysed separately. In contrast, associations were identified between a negative birth experience and greater odds of elevated EPDS scores at the clinical cut-off (≥13), indicating more severe mental distress levels. This association was found in unadjusted models and remained

similar when adjusted for demographic variables. These results suggest that birth experience may have more of an influence on more severe symptoms. However, this outcome contradicts Saisto et al. (2001) who found that birth experience was not a predictor for the most depressed women (over 90th percentile) but was for women with less severe symptoms. These contrasting findings highlight the complexity of relationships between birth experience and maternal mental distress, and further investigation into factors that may influence the severity of symptoms is warranted. This also highlights the importance of supporting women to have a positive birth experience to minimise the risk of mental distress, both elevated and at the more severe clinical level.

The addition of antenatal mental distress to models fully attenuated the association between birth experience and EPDS clinical cut-off scores, again highlighting that antenatal mental distress is a key risk factor for postnatal mental distress. Several studies have found significant associations between a negative birth experience and postnatal depression after adjusting for various factors, including age, ethnicity and social deprivation (M. W. Abbott & Williams, 2006; Sorenson & Tschetter, 2010; Weisman et al., 2010). A systematic review found that 11 out of 15 studies showed a significant association between birth experience and postnatal depression (Bell & Andersson, 2016). However, only two studies controlled for symptoms of antenatal depression. A range of mental distress measures were used in studies; for example, Mohammad et al. (2011) used the EPDS and Saisto et al. (2001) a combination of questionnaires, including the Beck depression inventory. Adding to the complexity of comparing study findings, different time frames in measurement and definitions of birth experience were also used (Bell & Andersson, 2016). The current research controlled for antenatal depression using the EPDS, a reliable, validated tool (Cox et al., 1987) that partly explains the contrast in findings and the lack of significant associations.

There is a complex aetiology to perinatal anxiety and depression (Biaggi et al., 2016) and anxiety and depression symptoms are highly comorbid (C. T. Beck & Driscoll, 2005; Giakoumaki et al., 2009; Himmelhoch et al., 2001). Therefore, the current study's results corroborate those of Bell et al. (2016), suggesting that improving women's birth experience may decrease the likelihood of

postnatal anxiety symptoms at 4-6 weeks but not necessarily postnatal depression. However, as the full EPDS was not measured at 4-6 weeks postpartum in the current study, additional research is required to understand this distinction.

Sleep health was also investigated in this study, to inform practical solutions to improve wellbeing in the postnatal period. In all models, relationships between birth experience and postnatal mental distress were not greatly attenuated by adjusting for sleep health, indicating that sleep may not be a primary pathway through which negative birth experience contributes to postnatal mental distress. However, several independent associations were found between various measures of sleep health and postnatal mental distress at 11-13 weeks postpartum, but not between sleep and anxiety symptoms at 4-6 weeks postpartum. As Ladyman et al. (2021) investigated previously using *Moe Kura* data, relationships between sleep and depressive symptoms provide a basis for early detection and novel interventions. Therefore, good sleep health, often underestimated, may potentially modify the risk of postnatal mental distress a few months after having a baby.

At 11-13 weeks postpartum, sleep continuity, latency, daytime sleepiness, and sleep disruption (nightmares) all had significant independent associations with anxiety symptoms, whereas there was no independent association between sleep duration or sleep quality and anxiety symptoms. In their systematic review, Lawson et al. (2015) found insufficient evidence of the impact of self-reported sleep disruption during pregnancy on postpartum anxiety. However, a limited number of studies have shown that poor subjective sleep can contribute to more frequent anxiety symptoms in the postnatal period (Coo Calcagni et al., 2012; Swanson et al., 2011). Therefore, findings from the current study contribute to the literature by providing additional evidence of associations between aspects of sleep health and postnatal anxiety symptoms and highlighting the importance of considering multiple facets of sleep health to support postpartum wellbeing.

Interestingly, while short sleep duration and sleep quality were not associated with EPDS anxiety scores at 11-13 weeks postpartum, they were independently associated with scores on the full EPDS, which incorporates anxiety and depression symptoms. In addition, similar patterns of

association were identified between short sleep duration, sleep quality, sleep continuity/latency, sleep disruption (nightmares) and EPDS scores using both community and clinical cut-offs. The only exception was daytime sleepiness, which was independently associated with the community cut-off, indicative of less severe symptomatology.

Findings support previous studies, which have revealed a consistent and significant relationship between subjectively reported sleep disturbances perinatally and postnatal depression symptoms (Bhati & Richards, 2015; Goyal et al., 2009; Lawson et al., 2015). Ladyman et al. (2021) identified that depressive symptoms were consistently associated with different dimensions of sleep, supporting evidence of the bidirectional nature of sleep and depression. After adjusting for sociodemographic and obstetric factors, women with a higher prevalence of daytime sleepiness in pregnancy were more likely to have postnatal depression symptoms (Sarberg et al., 2016). Notably, poorer sleep quality has been associated with an increased risk of the symptoms of postnatal depression independently of other risk factors (Dørheim et al., 2009; Iranpour et al., 2016). Findings from the current study provide further evidence that multiple aspects of sleep health play an important role in postnatal anxiety and depression symptoms.

When the EPDS community cut-off was modelled separately for Māori and non-Māori women, independent associations between sleep health and postnatal distress symptoms were identified. For both Māori and non-Māori women, sleep quality, continuity and latency were associated with increased odds of elevated symptoms of mental distress. However, patterns of association varied whereby daytime sleepiness was significantly associated with mental distress for Māori but not non-Māori women. Likewise, short sleep duration was not associated with mental distress for Māori women but was for non-Māori women.

Previous research using *Moe Kura* found that Māori mothers had a higher probability of persistent depressive symptoms concurrent with many dimensions of poor sleep (Ladyman et al., 2021) and the prevalence of abnormal sleep duration and excessive daytime sleepiness in pregnancy was more common for Māori than non-Māori (Signal et al., 2014). In addition, a survey of 5,441 adults

found that Māori participants had higher mean scores on the ESS (Johns, 1991) than non-Māori and being Māori was an independent risk factor for an ESS score >10 indicative of excessive daytime sleepiness after adjusting for socioeconomic deprivation and other risk factors (Gander et al., 2005). In part, the difference in patterns of association for Māori and non-Māori women in the current study may be due to different numbers of women in each sample. However, it is well established that ethnic inequities in sleep exist in NZ with a range and complexity of risk factors (Lee & Sibley, 2019; Paine et al., 2005; Paine & Gander, 2016). Consistent poorer sleep health among Māori reflects inequities in the distribution of social determinants of health (Paine & Gander, 2013). Socioeconomic deprivation and unemployment have been linked to short sleep (Paine & Gander, 2016), and socioeconomic factors are independent risk factors for insomnia symptoms and excessive sleepiness (Paine et al., 2004, 2005).

Motherhood involves adapting to new responsibilities and routines, and maternal sleep is often fragmented, with women more vulnerable to disturbed, shortened, and reduced quality sleep (Hunter et al., 2009; Montgomery-Downs et al., 2010; Sivertsen et al., 2015). In the current study, sleep health did not appear to be a pathway linking birth experience and postnatal mental distress; however, the independent associations found between multiple measures of sleep health and mental distress highlighted the importance of multiple aspects of sleep health. This indicates that we need to do more than support postnatal women to simply get more sleep. Although sleep duration is important, we must also support women with other areas of sleep health, including sleep latency, continuity, and quality. Supporting women's sleep may be a useful preventative measure to decrease possible symptoms of mental distress and improve general mental and physical well-being. The results signal the importance of women's sleep health being routinely screened across the perinatal period and providing women with accurate and accessible sleep health information. In addition, as other research has shown, sleep interventions present practical, low-cost treatment options for symptoms of postnatal mental distress (Ladyman, 2020; Lawson et al., 2015).

Ethnicity was significantly independently associated with less severe mental distress symptoms (community EPDS cut-off) but not with more severe symptoms (EPDS clinical cut-off). Māori women had greater odds of less severe symptoms of postnatal distress after controlling for other risk factors, including antenatal depression and sleep. This was also found in late pregnancy using *Moe Kura* data, where Signal et al. (2017) found Māori women had a higher prevalence of antenatal depressive symptoms. Notably, Māori women in *Moe Kura* are younger and more likely to have multiple children, which was also independently associated with depressive symptoms.

Potential additional factors not measured in this study may also account for this association, thus increasing risks of postnatal mental distress. One likely factor is racism, which is an established determinant of poorer mental health outcomes (Paradies et al., 2015). Indigenous and minoritised ethnic groups are significantly more likely to experience racial discrimination than dominant ethnic groups (Talamaivao et al., 2020). Racism shares a deep relationship with, and is driven by, colonisation (Reid et al., 2019). The history of colonisation and marginalisation of Māori in NZ has led to significant ethnic inequities in health (P. Reid & Robson, 2007). Racism operates at multiple levels and is entrenched into societal systems and structures (P. Reid et al., 2019). Therefore, policies and interventions addressing racism in NZ are imperative for improving the risk of postnatal mental distress for Māori.

Previous international studies have indicated that lower SEP, financial hardship and unemployment are associated with an increased risk of postnatal depression (Miyake et al., 2011; Moraes et al., 2006; Rich-Edwards, 2006). When examining differences in mental distress by ethnicity, the broader societal context and wider social inequities between Māori and non-Māori must be considered. In this sample, Māori women were overrepresented in more deprived areas and experienced more life stress, thus highlighting (through no fault of their own) the unfair burden and additional risk Māori women face. Living at a disadvantage puts women at a higher risk of developing postnatal mental distress symptoms. Therefore, it is not ethnicity (a socio-political, not biological construct) per se that increases the risk, but environmental and social stressors and

the inequitable distribution of resources and racism experienced by Māori (P. Reid & Robson, 2007; Talamaivao et al., 2020)

During the perinatal period, Māori women's rights must be prioritised and met via financial resources, support and services designed by Māori for Māori. Policies and interventions in the perinatal period require significant attention to the structural factors underpinning existing inequities (Robson et al., 2007). In addition, culturally responsive care to support Māori needs to be part of a multifaceted approach to decrease the likelihood of postnatal mental distress. Antenatal and postnatal mental health support must be established by Māori and delivered in a way that works for Māori women and their whānau (family).

This study's most consistent independent association was between antenatal mental distress (measured in late pregnancy as an EPDS score≥13) and postnatal mental distress symptoms. Women who had experienced antenatal mental distress had up to six times greater odds of experiencing postnatal depression symptoms. When Māori and non-Māori were modelled separately using the EPDS community cut-off, antenatal depression was statistically significant for both ethnic groupings. This is consistent with prior literature that shows depressed mood and high anxiety levels during pregnancy are significant predictors of postnatal depression (Grigoriadis et al., 2019; O'Hara & Swain, 1996; E. Robertson et al., 2004). In addition, Matthey et al. (2003) found that those with anxiety disorders antenatally were at greater risk of a postnatal mood (anxiety or depressive) disorder.

In *Moe Kura,* Ladyman et al. (2021) demonstrated a large proportion of women experience high depressive symptoms during the perinatal period and the following years concurrently with aspects of poor sleep. They outlined the urgent need to advocate for quality primary care, ongoing management and early identification of women with poor sleep and symptoms of low mood . The current study adds to this by indicating how imperative it is that women are routinely assessed, monitored, and treated for mental distress during the antenatal period to potentially improve early postnatal outcomes. Women at higher risk of mental distress need to be identified, monitored and

provided with personalised interventions. For example, health professionals need to obtain full clinical histories keeping in mind some women may be reluctant to disclose symptoms (Chew-Graham et al., 2009). Targeted support is required to address barriers, such as the lack of information, support and resources, that Māori women experience in accessing pregnancy care (Makowharemahihi et al., 2014). There is an additional need for health promotion to reduce stigma relating to perinatal mental distress and the importance of antenatal mental well-being. However, critically there is a social responsibility and an obligation to look beyond the individual. While ensuring access and education is important, there needs to be recognition of addressing the wider social determinants of maternal mental health (Compton & Shim, 2015; Resnik, 2007).

4.8.1 Strengths and Limitations

A strength of this study was the large sample size and study design informed by Kaupapa Māori epidemiological principles, which resulted in a high proportion of Māori participants (Paine et al., 2013). The pattern of socioeconomic deprivation, age and parity of this sample of Māori and non-Māori mothers was also comparable to that of the NZ population. These similarities support the generalisability of the findings to the broader NZ population. Another strength of this study was that it considered a range of determinants, including age, SEP, parity and a significant known risk factor, antenatal depression.

Although self-reporting has limitations, women completed questionnaires in their own time and environments. This may have allowed women to express themselves more honestly, mitigating social desirability (van de Mortel, 2008) due to anonymity. In addition, it has been reported that the cultural and societal expectations women may carry as mothers can make it more challenging to acknowledge mental distress (Barber, 2009). Despite frequent contact with healthcare professionals, women can be reluctant to disclose their symptoms (Chew-Graham et al., 2009; Dennis & Chung-Lee, 2006). Conversely, there is the possibility that at the 4-6 week telephone survey women may have been hesitant to disclose symptoms. This mental health check-in could also have impacted the results at 11-13 weeks postpartum, yielding better mental health outcomes.

A further consideration is that the *Moe Kura* study was advertised as investigating sleep in the perinatal period. Consequently, women who had sleep concerns, which could have been related to mental distress symptoms, may have been more likely to participate (Signal et al., 2017). In addition, the primary focus of the *Moe Kura* study was not birth experience per se.

Birth experience was measured via three 6-point Likert-type scales. These scales are useful for collecting information on participants' attitudes (Visser et al., 2000), so were a practical and pragmatic choice in this study. Likert-type scales are ordinal with no even distribution between points, and do have limitations in how they collect responses and how responses can be analysed (Willits et al., 2016). Central choices tend to get the most responses, so as a 6-point scale, the scale did eliminate the 'midpoint' option due to having two central ratings (Chyung et al., 2017). Respondents tend to agree with statements shown in a phenomenon called acquiescence bias (Baxter et al., 2015). Moreover, a type of social desirability bias (Chyung et al., 2017) could be attributed here where respondents chose an option they perceived to be more socially accepted, such as in this scale 'challenging but manageable'.

Question comprehension and semantics must be considered in relation to the Likert scales used, such as the phrase 'never again', which may imply women may be planning to have subsequent children, which may not be the case. There were also no questions on birth experiences that explored the importance of culture or cultural birthing practices. The two questions related to birth experience, 'informed' and ' listened to', were again based on a 6-item response scale; however, they did not have a mid-point description. Hence, there was a lack of consistency within the format of the questions.

The gold standard for assessing psychological distress is a structured clinical interview, however this was not within the original scope of *Moe Kura* and was not viable in this study due to resourcing restraints. The EPDS is a well-accepted, reliable screening tool and has been validated in many populations (Cox et al., 2014). However, it has not been validated for Māori women, which must be considered when interpreting the current study's findings. Cultural validation ensures it is

suitable and sensitive when used with different populations and establishes appropriate scoring cut-offs (Matthey et al., 2006; Smith-Nielsen et al., 2018).

This study also used Buysse's (2014) 'sleep health' definition, highlighting the need for a wider sleep assessment beyond sleep duration. Positively, this sleep framework illustrated some important independent associations between multiple aspects of sleep health and postnatal mental distress. However, there were inconsistencies across sleep quality measures at the 4-6 weeks and 11-13 weeks postnatal time points (quality over 24 hours versus seven days). Furthermore, the sleep ratings and the measures of postnatal mental distress were measured concurrently in this study, which could have also impacted results. Additionally, this study only used subjective measures of sleep health. Some studies have shown that subjective self-reported sleep measures are less accurate in the perinatal period than objective measures (van de Mortel, 2008).

Postnatal women with depression symptoms have reported poorer sleep quality, sleep disturbance and daytime dysfunction than women without depression symptoms (Huang et al., 2004). Disturbed sleep in the perinatal period is a risk factor for depression symptoms (Lawson et al., 2015; Okun, 2015) and sleep disturbance is also one of the key symptoms of depression (Nutt et al., 2008). Consideration must be given to the reciprocal and bidirectional relationship between sleep and postnatal depression symptoms (Ladyman et al., 2021; Lawson et al., 2015), as these relationships were only examined in one direction.

A strength of this study was analysing more than one postnatal timepoint, i.e. 4-6 weeks and 11-13 weeks postpartum. However, birth experience data were only collected retrospectively at 11-13 weeks postpartum, which may have introduced recall bias. Measuring birth experience at different time points, such as closer to the birth, would be worthwhile. An Australasian review of studies found women's mood can be better in the first year following birth, and symptoms have been found to increase for some in subsequent years (Schmied et al., 2013). The influence of birth experience is not only confined to the postnatal period but can also have an enduring impact (Forssén, 2012;

Rijnders et al., 2008; Simkin, 1991). Therefore, investigating relationships between birth experience and mental distress at later time points would strengthen this study.

Many studies do not control for prior mental distress despite it being a significant risk factor relating to postnatal mental distress. In this study, the full EPDS measured in pregnancy controlled for prior mental distress instead of a question around diagnosis. This removed the bias of those who may have experienced barriers or reduced access to professional help or prior mental distress support. However, the anxiety subscale could have been included in models, which may have strengthened this study in measuring the influence of prenatal anxiety.

All fully adjusted models demonstrated sufficient goodness of fit but accounted for less than 25% of variance. Thus, indicating other factors are likely to be involved. While models adjusted for a range of covariates based on literature, risk factors relating to birth experience and postnatal mental distress, including social support, stressful life events and obstetric factors, were not included in regression analyses due to limited statistical power. These may represent important factors that could not be examined. Moreover, pathways in postnatal mental distress are complex, and results may be influenced by unmeasured factors not captured in the questionnaires, such as social exclusion and discrimination (J. Allen et al., 2014; Compton & Shim, 2015; Marmot & Wilkinson, 2005).

4.8.2 Recommendations for Future Research

Future research informed by the current study includes validating the EPDS for Māori women. At 4-6 weeks postpartum, the full EPDS was not measured; it would be worth further investigating if birth experience also increased the odds of depression symptoms at this timepoint. The relationship between birth experience and anxiety is likely to be bidirectional, and further investigation into this relationship would also be worthwhile. Alternative measures including clinical assessment could also be employed to investigate postnatal anxiety alongside other validated scales such as the Hamilton Anxiety Scale, the General anxiety scale (GAD-7) or the

Hospital Anxiety and Depression Scale (Hamilton, 1959; Spitzer et al., 2006; Zigmond & Snaith, 1983).

If replicating this study, it would be ideal to use an assessment tool for birth experience, capturing more of the multidimensional complexity of the experience. For example, the Mackey Childbirth Satisfaction Rating Scale or the Childbirth Experience Questionnaire (CEQ) (Dencker et al., 2010; P. Goodman et al., 2004), although these tools have not been validated in NZ. In addition, further questions on birth experience that explored the importance of culture and cultural birthing practices would benefit future research.

Sleep disruption in the form of nightmares was associated with increased odds of postnatal mental distress, which could be examined further with birth trauma and postnatal PTSD. This study investigated sleep health (Buysse, 2014) which does not include disordered sleep associated with adverse health outcomes in the perinatal period (Okun & O'Brien, 2018). In addition, sleep-disordered breathing and restless legs can disrupt sleep continuity and quality (Pavlova & Latreille, 2019) and could be further investigated in relation to birth experience. Longitudinal research is also warranted to investigate the impact of treating sleep health issues in early postpartum and how this influences mental distress symptoms in later postpartum.

4.8.3 Summary

In conclusion, findings from this study highlight the importance of supporting women who have a negative birth experience as part of a comprehensive approach to supporting postpartum mental health. While sleep did not appear to be the primary pathway linking birth experience to postpartum mental distress, findings indicate the importance of supporting multiple aspects of women's sleep health to support maternal wellbeing. They signal the need for further research into birth experience, sleep and postnatal mental distress over time and the prevalence and impact of a women's birth experience in NZ. In addition, a broader enquiry into social determinants of postnatal mental distress is warranted.

CHAPTER 5 QUALITATIVE STUDY FINDINGS AND DISCUSSION: NZ WOMEN'S PERSPECTIVES OF THEIR LABOUR AND BIRTH EXPERIENCE

This chapter presents findings from the qualitative study (Section 3.6). A description of the sample characteristics is followed by the qualitative content analysis results of women's perspectives of their birth experience in NZ and four identified themes. These themes are then discussed in relation to the current literature on birth experience.

5.1 Description of Participants

Of the 1085 participants in the *Moe Kura* 11-13 week postpartum questionnaire, 100 women (9.21%) provided comments in the "Comments welcome" text box after the question, "Overall, how was your experience of labour and birth?. This qualitative sample included 13 Māori women (3.39% of Māori *Moe Kura* participants at the 11-13 week postpartum data collection wave) and 87 non-Māori women (12.39% of non-Māori *Moe Kura* participants at the 11-13 week postpartum data collection wave).

5.1.1 Maternal Age

The mean age of Māori in the qualitative study sample (M = 32.08 years, SD = 5.36) was significantly older than the mean age of Māori women in the full *Moe Kura* cohort (M = 28.41 years, SD = 6.32, $t(394)$=-2.065; p = .040). For non-Māori, there was no significant difference in the qualitative study mean age (M = 32.08, SD = 5.21) compared to the full *Moe Kura* cohort (M = 32.85 years, SD = 4.91), $t(642)$=1.244; p = .214).

Māori women in the full *Moe Kura* cohort were significantly younger (M = 28.41 years, SD = 6.32) than the non-Māori (M = 32.08 years, SD = 5.21) t (668) = -9.71; p < .001. However, in this qualitative study, there was no significant age difference between Māori (M = 32.08 years, SD = 5.36) and non-Māori (M = 32.85 years, SD = 4.91), t (98) = -524; p = .602 (see also Table 42).

Table 42

Proportion of Women by Age in the Qualitative Study Sample

Age	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*P*
			5.43	5	.366
<20	0.00 (0.00-0.00)	1.15 (0.12-5.25)			
20 - 24	15.38 (3.34-40.90)	5.75(2.23-12.14)			
25 - 29	7.69 (0.84-30.71)	14.94 (8.64-23.53)			
30 - 34	53.85 (28.29-77.89)	37.93 (28.26-48.39)			
35 - 39	7.69 (0.84-30.71)	31.03 (22.05-41.25)			
>40	15.38 (3.34-40.90)	9.20 (4.44-16.60)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 0 missing.

5.1.2 Socioeconomic Position

The distribution of area-level deprivation was not statistically significantly different by ethnicity (Table 43). However, most Māori women in the qualitative study lived in NZDep quintile 3, whereas a large proportion of non-Māori lived in areas with the least deprivation (quintiles 1 and 2). In contrast, in the full *Moe Kura* cohort, Māori women were over-represented in areas with the highest deprivation (quintile 5), and non-Māori women were over-represented in the areas of least deprivation (quintile 1), and this differed significantly by ethnicity.

Table 43

Proportion of Women by Area Deprivation Index (Categorised)

NZDep2006 quintiles	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			8.30	4	.081
1	15.38 (3.34-40.90)	36.78 (27.21-47.21)			
2	7.69 (0.84-30.71)	21.84 (14.17-31.35)			
3	53.85 (28.29-77.89)	19.54 (12.28-28.79)			
4	7.69 (0.84-30.71)	9.20 (4.44-16.60)			
5	15.38 (3.34-40.90)	12.64 (6.91-20.81)			

Note. χ^2 is the Pearson chi-square test. Boldface is significant at $p = .05$, 0 missing.

5.1.3 Parity

In this qualitative study, 33% of Māori and 44% of non-Māori women were pregnant with their first child (nulliparous), and the majority (67% of Māori; 56% of non-Māori) had given birth at

least once (multiparous). There was no significant difference in parity by ethnicity (Table 44) whereas in the *Moe Kura* cohort, a significantly larger proportion of Māori women (55%) had given birth at least once before the current pregnancy compared to non-Māori women (46%).

Table 44

Parity

Parity	Māori % (95% CI)	non-Māori % (95% CI)	χ^2	*df*	*p*
			0.448	1	.503
Nulliparous	33.33 (12.45-61.24)	43.53 (33.35-54.14)			
Multiparous	66.67 (38.76-87.55)	56.47 (45.86-66.65)			

Note. Parity measured at 35-37 week prenatal questionnaire, χ^2 is the Pearson chi-square test. Boldface is significant at p = .05, 3 cases (3%) missing.

5.2 Qualitative Study Results

Following qualitative content analysis, four themes were identified:

- Reactions to the birth experience 'expressing myself'.
- Appraisals of the birth experience 'into the unknown'.
- Aspects of the actual birth experience 'reality of experience'; and
- Impact on future labour and birth decisions and experiences, 'looking ahead.' (Figure 7 and Table 45).

Figure 7

Qualitative Study: Themes, Categories and Sub-Categories

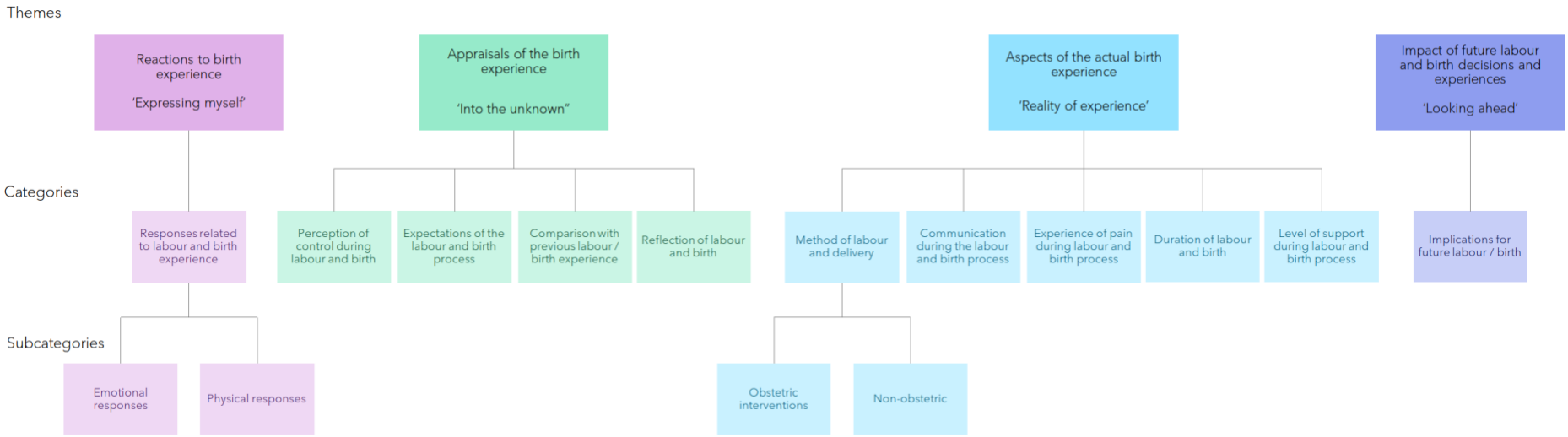


Table 45

Themes, Definitions and Code Examples of Qualitative Content Analysis

Theme/Category/Subcategory	Definition	Code example
Reactions to the birth experience. **'Expressing myself'**	Ways in which women emotionally expressed or reacted physically to their labour and birth experience.	
Responses related to the labour and birth experience. *Subcategories:* Emotional responses related to the labour and birth experience Physical responses related to the labour and birth experience	 How were they feeling? Description of emotions. Subjective psychological reaction to labour and birth, or description of experience. Personal reflection which may be culturally defined. Reaction of the woman's body to the situation. Including physiological function (excluding pain).	 Distress needing emergency caesarean (NMW) Tired, no energy (NMW)
Appraisals of the birth experience. **'Into the unknown'**	Women's expectations and the perception of influence the woman had over her labour and birth. Including reviewing and comparing the current birth and labour process.	
Reflection of labour and birth	Overall assessment or cognitive evaluation of labour and delivery.	Best experience of life (MW)
Perception of control during labour and birth	A woman's belief in her ability and capacity to influence her labour and birth. Relating to her environment, mode of birth, place of birth, obstetric intervention. Her self-efficacy in the situation.	Helpless and hopeless (NMW)
Expectations of the labour and birth process vs. what actually happened?	Preconceived ideas about how and what they wanted with their labour and birth. A belief or opinion of how the labour and birth experience would unfold. Comparison to what actually happened.	Faster than expected (MW)
Comparison with previous labour/birth experience	Consideration of the similarities and dissimilarities of prior labour and birth experiences.	Easiest of all births (MW)

Theme/Category/Subcategory	Definition	Code example
Aspects of the actual birth experience. **'Reality of experience'**	Actual characteristics of the labour and birth process. Whether needs were met on the woman's terms during the labour and birth process.	
Method of labour and delivery *Subcategories:* Obstetric interventions during labour and birth	Medical and diagnostic measures generally directed at safeguarding or improving the health of the woman or foetus. Recommended by medical professionals during delivery and birthing process. Could be required due to complications that arise or pain management.	Forceps and episiotomy (NMW)
Non-obstetric labour and birth descriptions	Woman's labour and delivery that did not involve medical/obstetric interventions. Women's descriptions of the process.	Standing, easy, no stitches (MW)
Experience of pain during labour and birth process	Intensity, duration, perception, description of pain (or lack of) as experienced.	Unimaginable pain, no epidural offered at maternity unit (NMW)
Duration of labour and birth	Length of delivery and timing/ speed of labour and delivery.	Easy and fast second baby (MW)
Communication during labour and birth process	Perception of effectiveness of verbal and non-verbal communication during labour and birth. Responsive to woman's needs and preferences.	Trying to break waters… fourth person didn't listen, scratched babies head (MW)
Level of support during labour and birth process	Perception of assistance provided, encouragement and rapport between the woman and others during labour and birth e.g., partners, support staff, medical staff.	Midwife's support made it bearable (NMW)
Impact on future labour and birth decisions and experiences. **'Looking ahead'**	How current labour and birth experience shapes future labour and birth expectations and reproductive decisions.	
Implications for future labour and birth	Significance of current labour and birth experience on decision making or perceptions/preferences around future reproduction and/ or future labour and birth experiences.	Would do it again (NMW)

Note. MW = Māori woman; NMW = non-Māori woman.

5.2.1 Theme: Reactions to the Birth Experience 'Expressing Myself'

This theme encompassed how a woman emotionally expressed or reacted physically to their birth experience. Similar numbers of Māori and non-Māori women conveyed their experience using a 'feeling' or a psychological reaction. Many used the adjective "very" and responses were concise. There were both positive responses such as "invigorating" and "happy" and negative descriptions such as "gruelling" and "distressing".

> "Scary, as had complications."
>
> *Non-Māori woman*
>
> "Very traumatic with babies (sic) heartbeat stopping at various times."
>
> *Non-Māori woman*

Some women conveyed a range of emotions, with negative and positive emotions coexisting:

> "Was pleased with how it progressed. Needed episiotomy so was disappointed…"
>
> *Māori woman*

In terms of physical and physiological descriptions, there were common statements about participants' bodies' reactions to contractions, and both Māori and non-Māori women mentioned tiredness and sleep.

> "Relentless contractions with no break in between."
>
> *Non-Māori woman*
>
> "Latent labour for 4 days, 3 days no sleep."
>
> *Māori woman*

5.2.2 Theme: Appraisals of the Birth Experience 'Into the Unknown'

Central to this theme was woman's expectations and perception of influence over their labour and birth. This included reviewing and comparing their current birth process to previous experiences and overall reflections.

Many non-Māori women described expectations of control. It was common to mention a desire or expectation they had for their birth, such as a water birth, not being in a hospital or wanting an epidural but not receiving one. Some mentioned they felt "unprepared". This included their perceived control around the process of labour, their bodies and coping.

> "Walking into an operating theatre was unexpectedly difficult."
>
> *Non-Māori woman*
>
> "Far more intense than I expected….not at all like the birth videos"
>
> *Non-Māori woman*
>
> "It was way better than I expected…"
>
> *Non-Māori woman*
>
> "I was disappointed at having to go into hospital."
>
> *Non-Māori woman*
>
> "Hadn't really thought through the implications/medicalness (sic) of the induction (had planned a water birth)."
>
> *Non-Māori woman*

There were positive descriptions of perceived control, with empowerment a common subject.

> "The birth was the best experience of my life, very empowering, and I felt in control at all times."
>
> *Māori woman*
>
> "Felt very empowered to relax and let my body progress labour."
>
> *Non-Māori woman*
>
> "Overall a positive and empowering experience."
>
> *Non-Māori woman*

When expectations were met or exceeded, women more positively perceived their labour and birth. A number of women who had given birth previously commented that they had certain expectations based on their previous experiences birth. Many women compared their current birth experience to previous experiences, and some provided this as context to their recent responses.

> "The anxiety pre-birth due to my first experience was huge."
>
> *Non-Māori woman*
>
> "Pretty awful. I had a panic attack bought about by memories of my first delivery."
>
> *Non-Māori woman*
>
> "…my first birth experience 15 days overdue was very difficult, THIS TIME round although I was induced, it all went according to what we hoped for, accupressure (sic) from my husband helped enormously?"
>
> *Non-Māori woman*

Some women described a seemingly negative experience becoming more positive on the arrival of a healthy baby or a 'good' outcome. There were several overall reflections and assessments that things were "fine" or a "sense of relief".

> "A long 22 hours later and my beautiful baby finally arrived safely... for that at least I'm thankful."
>
> *Māori woman*
>
> "Worse than I'd imagined but he is so worth it."
>
> *Non-Māori woman*
>
> "When baby arrived, pain just disappeared."
>
> *Non-Māori woman*
>
> "A little traumatic as it happened so quick, otherwise fine"
>
> *Non-Māori woman*
>
> "It was very painful! But you tend to forget it..."
>
> *Non-Māori woman*

Women also described the birth as a "healing" experience after past experiences, with both Māori and non-Māori women having positive reflections.

> "The birth was the best experience of my life….would never have a hospital birth again!"
>
> *Māori woman*
>
> "My first birth had been quite traumatic. This birth was an amazing healing experience- it could not have been better."
>
> *Non-Māori woman*

5.2.3 Theme: Aspects of the Actual Birth Experience 'Reality of Experience'

Within this theme, women detailed the actual characteristics of their labour and birth process and if, or how, their needs were met during labour and birth. This included communication, support, pain level and management, obstetric interventions and non-obstetric descriptions.

Some women gave comprehensive descriptions of the obstetric interventions in their labour and birth. Many mentioned epidurals and being induced, generally negatively, and a few described a cascade of interventions, with one leading to another. This was similar for both Māori and non-Māori women. Caesareans were also commonly remarked on by non-Māori women.

> "Very distressed that I ended up needing an emergency Csection (sic)."
>
> *Non-Māori woman*
>
> "I wanted an epidural but it went too fast so didn't get one. It was very painful!"
>
> *Non-Māori woman*
>
> "The planned Caesar (sic) was much more relaxed."
>
> *Non-Māori woman*
>
> "Actually having to be induced was horrible- I had assumed that I would go into labour naturally."
>
> *Non-Māori woman*

Within non-obstetric descriptions, waterbirths, natural births and home births were viewed favourably. A number of women mentioned the baby being posterior or breech, resulting in a challenging birth experience.

> "The labour was fine but birthing was difficult as baby was in a posterior position and difficult to push."
>
> *Non-Māori woman*
>
> "First water birth, felt very empowered to relax and let my body progress labour."
>
> *Non-Māori woman*
>
> "Totally unprepared for a home birth in our lounge".
>
> *Non-Māori woman*

Duration of the labour and birth process was frequently mentioned. Long labours were more commonly viewed as "harder" than faster labours, which were seen as "easier" for both Māori and non-Māori women. Several women mentioned the lack of sleep and labour being "long and tiring".

> "Actual labour all day and pushed for 1 hour."
>
> *Māori woman*
>
> "I am very lucky with my labours, they seem to be swift."
>
> *Māori woman*

The experience of pain was more commonly mentioned by non-Māori women, with a couple noting that they felt "proud" of not requiring pain relief or that the pain was "manageable". However, there were overwhelmingly more negative associations with pain, many describing it as "unbearable" and difficult to cope with. Many women spoke of failed epidurals and the inaccessibility of effective pain relief.

> "Two epidurals did not work as they were intended, so quite painful"
>
> *Māori woman*
>
> ".. the anaesthetist failed to give an epidural."

Māori woman

"Unimaginable pain, no epidural offered at maternity unit."

Non-Māori woman

"Felt helpless and hopeless as I did not cope well with the pain."

Non-Māori woman

"Contractions were unbelievably painful, never experienced that kind of pain.."

Non-Māori woman

Both Māori and non-Māori women described the responsiveness and effectiveness of communication during labour and birth, however, more so proportionally by Māori women. Waiting for an obstetrician, not being listened to, or not understanding the implications of interventions were among Māori women's concerns. However, there were also positive comments about feeling informed about options.

"4 different people tried breaking my waters…the fourth did not listen"

Māori woman

"Compared to my first birth…I felt a lot more informed about options available."

Māori woman

"After a month of excessive swelling…climbing BP, and protein in my urine…I was finally admitted to hospital to be reviewed by an obstetrician."

Māori woman

"Staff were friendly and helpful and explained the procedure very well."

Non-Māori woman

"May have considered it far worse if it hadn't been for the exceptional support from the hospital midwives."

Non-Māori woman

Māori and non-Māori women spoke equally of support during their labour and birth and its importance. Many specifically mentioned their partner, midwife or hospital staff as supportive and

that they had good care. However, there were also negative comments about a lack of emotional support.

> "Brilliant help of two midwives."
> *Māori woman*
>
> "My midwife was young, rapport not great."
>
> *Non-Māori woman*
>
> "I wanted the breast crawl…but the primary care midwife rushed me"
>
> *Non-Māori woman*
>
> "Empowering experience to go through with my partner"
>
> *Non-Māori woman*
>
> "Midwife and hospital staff made it all bearable."
>
> *Non-Māori woman*
>
> "Supported to follow my instincts."
>
> *Non-Māori woman*

5.2.4 Theme: Impact on Future Labour and Birth Decisions and Experiences 'Looking Ahead'

Pivotal to this theme was how the recent birth experience shapes future labour and birth expectations and reproductive decisions. There were more positive than negative comments around future labour and births. Some women commented that they would do it again and wanted more babies; others felt they didn't want to go through it again. Some commented on the mode of birth, stating that they would have another caesarean if necessary, or they wouldn't want to have an induction again. Proportionally more Māori women commented on implications for the future.

> "Would never have a hospital birth again!"
>
> *Māori woman*
>
> "Didn't plan another child but would if the opportunity arose."
>
> *Māori woman*
>
> "Very happy to have vaginal birth as we are planning to have 4 children."

Māori woman

"Don't want to do it that way again, won't be induced again, and really don't want a csection (sic)."

Non-Māori woman

5.3 Qualitative Study Discussion: NZ Women's Perspectives of Their Labour and Birth Experience

This qualitative study aimed to explore birth experiences of Māori and non-Māori women. A strength of this research was the exploration of women's descriptions, emphasising their voices. It uncovered positive and negative perceptions and experiences that coalesced into the four identified themes outlined in section 5.2. Aspects of these themes have been reported previously, however this study provides a unique broader perspective on women's birth experiences in NZ.

Within the theme 'expressing myself,' women shared positive and negative examples of their labour and birth experiences, often expressing vulnerability and diverse emotions. Women conveyed their experiences concisely, often in a few words. This may, in part, be due to the size of the comment box. Consistent with other studies, these findings demonstrate that negative and positive feelings exist and co-exist within women during their birth experiences (C. T. Beck, 2004; C. T. Beck & Driscoll, 2005). The adjective "very" was used frequently, indicating that women often wished to emphasise their emotions and felt them to a high degree or extent. This also suggests the significance of the emotions felt during their experience and the importance of labour and birth.

Emotions and hormones are particularly interconnected during birth, impacting how a woman feels and behaves (Dixon et al., 2013). Women also mentioned physical and physiological descriptions of their bodies and how they responded. This interaction between emotions and physical aspects of labour is important when understanding women's birth experiences. Promoting women's psychological needs during labour may enhance the physical labour processes and positively influence women's experiences. Conversely, acknowledging and supporting women's physical and physiological needs may encourage a more favourable experience.

Despite the comments' brevity, in the theme appraising the birth experience 'into the unknown', many women communicated a sense of resilience and strength. One interpretation of these findings is that women experienced personal growth and that positive birth experiences are also essential to examine for practical and policy implications in reducing the risk of negative experiences (Ayers & Sawyer, 2019). When describing negative experiences, there was often an acknowledgement of the appreciation of a safe delivery, a healthy baby, and a perceived good outcome. Women were often philosophical, with some women minimising their pain and distress.

In contemporary western societies, views of childbirth and motherhood tend to prioritise infant wellbeing and the importance of maternal responsibility (Lupton, 2011). Society constructs preconceived notions of the birth experience, predominantly encouraging the idea that birth is a joyful and fulfilling event, with success being a healthy baby (C. T. Beck, 2004). These preconceived notions and ideology of motherhood can strongly influence women, making it difficult for negative feelings and dissatisfaction around motherhood to be expressed (Choi et al., 2005; Oakley, 2018). These societal expectations may lead women to minimise their needs or feelings (Brown et al., 1997). Some comments in this study tended to support the notion that although the experience was negative or traumatic, the safe delivery of their babies was worth it. It must be contemplated that the costs of this societal expectation for some women may be negative implications for their wellbeing. A 'successful' outcome of a healthy baby should not justify or negate a negative birth experience and any toll on the woman (C. T. Beck, 2004). Birth is a profoundly life-changing event; a woman can feel both tremendous joy and pain, psychologically, physically and emotionally (C. T. Beck & Driscoll, 2005). This qualitative study supports the need to encourage the normalisation of the complexities and both the negative and positive aspects of the birth experience so that women can equally appreciate a healthy baby and their well-being.

The theme 'into the unknown' also centred around pre-determined expectations of the birth experience and women's sense of control. These aspects are echoed in the literature as factors influencing the evaluation of the birth experience (Green & Baston, 2003; Hauck et al., 2007;

Hildingsson, 2015). It is recognised that the interactions between expectations and experience can influence a woman's perception of her birth (Ayers & Pickering, 2005; Fenwick et al., 2005; Hauck et al., 2007; Heaman et al., 1992; Webb et al., 2021). There were many examples from this qualitative study on expectations; some women found their birth experience worse than expected and some much better. Many women acknowledged that their expectations were different from reality. Women also had expectations of where and how they would give birth, such as being disappointed at going to a hospital or not having a waterbirth. These results suggest that understanding women's birth preferences and expectations and assisting them in fulfilling them can increase positive perceptions of birth (Green et al., 1990; Tumblin & Simkin, 2001; Webb et al., 2021).

The concept of a 'birth plan' is often seen as helpful in clarifying and setting expectations (Lothian, 2006), however some studies have shown that birth plans are not always effective and can provide unrealistic expectations (Divall et al., 2017; Lundgren et al., 2003; Stevenson et al., 2016). This is supported in the current study by comments mentioning plans around birth that were not fulfilled, not feeling prepared and the implications of birth. Instead of setting rigid expectations, a birth plan needs to be responsive and fluid and should be seen as just one tool in communicating preferences and options. Maternity providers must partner with women to ensure realistic expectations are outlined, understood and discussed.

The current qualitative study found that prior labour and birth tended to alter expectations, and many comparisons were made to previous experiences. Research has been mixed regarding whether having a previous birth experience is associated with having a more positive or negative experience (Green et al., 1990; Waldenström, 1999). In this study, prior expectations and delivery experiences of birth shaped the recent experience. Comments illustrated this by noting anxiety and panic after previous deliveries, contrasted with more positive reflections despite prior negative experiences. One woman described her current birth as a restorative "healing" experience after a

traumatic birth, thus illustrating the power and redemptive nature of a subsequent positive experience.

These results reflect those of other studies, which have found that subsequent childbirth following a traumatic or negative birth can either heal or re-traumatise (C. T. Beck & Watson, 2010; Cheyney, 2008). Thus, women who have had a negative birth experience require maternity practitioners to listen to concerns, reduce uncertainty and provide robust information. In addition, supporting women to feel in control of their current birth choices with strong healthcare relationships and support is essential in facilitating a more positive subsequent birth experience (Greenfield et al., 2019).

The theme 'into the unknown' incorporated women's comments around control of their bodies and coping mechanisms, together with the labour process and environment. For instance, several women positively described feeling fulfilled and empowered when in control. Control is conceptualised in many ways; often described in the psychological literature as the 'locus of control'. A person perceives what happens to them to be within their control (internal) as opposed to being in the hands of another party or external forces (Green & Baston, 2003; Rotter, 1966). This is closely linked to self-efficacy, the belief that one can accomplish an activity (Bandura, 1977). A previous NZ longitudinal study showed that women's positive perceptions of their coping strategies and self-efficacy were linked to a positive birth experience (Berentson-Shaw et al., 2009). Feeling in control has consistently been associated with a positive psychological outcome and satisfaction at birth (K. Cook & Loomis, 2012; Gibbins & Thomson, 2001; P. Goodman et al., 2004; Henriksen et al., 2017). Consistent with the literature, this qualitative study indicates that control can be defined and experienced differently for individual women. Healthcare and lead maternity carers should maximise the sense of control (internal and external) for women during their labour and birth, allowing them as much autonomy as possible with decisions made collaboratively.

Concerning the theme 'reality of the experience', communication was influential in many women's assessment of their birth experience. A number of Māori women particularly shared their

communication experiences during their labour and birth. Perspectives included poor communication as not being listened to, delays in being reviewed by an obstetrician, and positive comments about feeling informed. One participant commented on many medical professionals attempting to break her waters and not listening to her. Another commented that she felt more informed about her options for this birth compared to a previous delivery. Although positive, this alluded to the fact that this had not been the case in an earlier birth. These results align with the literature on communication with health providers for Māori and add to the current knowledge in this area.

Māori are consistently and significantly less likely than non-Māori to feel listened to by health professionals, and fewer Māori report that they feel their health concerns are explained in a way they understand entirely (Health Quality & Safety Commission, 2017). In a study looking at child hospitalisations, Māori whānau (families) were more likely than non-Māori to experience inadequate information and communication problems. They reported feeling alienated within the hospital setting and less deserving of care (Arlidge et al., 2008). A systematic review of qualitative research also identified that the health system could be seen as hostile and alienating for many Māori (Graham & Masters-Awatere, 2020). In their qualitative study of young Māori women's births, Stevenson et al. (2016) found systemic issues, specifically a lack of communication between clinical care providers and participants, led to negative birthing experiences.

To understand differences in how labour and birth are experienced, it must be recognised that women are situated within their broader societal context (Chapter 2). Concerning Māori women's experiences within the birthing and maternity systems, this context reflects the colonial patriarchal system's abuse and mistreatment of Māori women (Pihama, 2001). Currently, the Waitangi Tribunal is hearing a claim known as Mana Wāhine to address the prejudices and systemic discrimination of Māori women as a result of Treaty breaches by the Crown (Manatū Wāhine Ministry for Women, 2019). These breaches include historical and contemporary damage done to Māori women by colonisation which has restricted their economic, social and spiritual wellbeing.

Birth in NZ is embedded in a dominant western framework, which means Māori women can feel marginalisation, isolation and discrimination. The disempowering effects of colonialism in NZ are ongoing and continue to be lived, experienced and resisted by Māori women within the maternity system (Simmonds, 2016).

Spirituality, language and the land, among other aspects have been found to be important to Māori (Simmonds, 2016). Interventions to improve communication are sometimes primarily focused on increasing te reo Māori (Māori language) use. However, the inequities associated with poor communication are broader, reflecting unfair and unequal power imbalances (Curtis et al., 2019) and the dynamics between Māori women and their maternity practitioners. Racial discrimination and unfair treatment because of ethnicity have the highest self-reported prevalence for Māori in the NZ health system (Harris et al., 2006), contributing to health inequities for Māori (Robson et al., 2007). There is a long history of Māori women experiencing racism during pregnancy and birth and adverse outcomes (Bécares & Atatoa-Carr, 2016; Thayer et al., 2019; Thayer & Kuzawa, 2015). Lead maternity carers and the broader maternity healthcare system must facilitate environments that support Māori women. As such, there is the recognition that it is not only an awareness of language and the importance of cultural competency for individual practitioners; it is the cultural safety at organisational levels that will achieve more equitable care (Curtis et al., 2019; Papps & Ramsden, 1996). This unfair distribution of social determinants of health, including institutional racism and bias of healthcare providers, must be addressed, including policies and practices, education and broader structural reform (Curtis et al., 2019).

As well as communication, the level and quality of support, including involvement in decision-making, were significant factors commented on by Māori and non-Māori women. Previous qualitative research in NZ, investigating first-time mothers' perspectives of relationships with midwives and doctors, found that personal, caring relationships optimised birth satisfaction (Howarth et al., 2012). Women's gratitude for the support and assistance of others was evident. Some women expressed they were emotionally comforted by receiving encouragement during

their labour. Still, comments around lack of support and poor rapport with clinicians were also provided. Negative responses included a lack of connection, feeling rushed by a midwife, and not receiving desired post-birth care. This was contrasted by comments commending carers, with several women commenting that their experience would have been worse if it had not been for their support.

These findings compare with prior studies that have noted support as one of the most powerful, direct influences on birth experience, including the behaviour and attitude of caregivers (Henriksen et al., 2017; Hodnett, 2002). Midwife and partner emotional support has also been associated with positive childbirth experiences (Karlström et al., 2015; Nilsson et al., 2013; Oweis, 2009; Stevenson et al., 2016; Tarkka & Paunonen, 1996; Waldenström, 1999). An Australian study (*n* = 1,366) showed that women felt more satisfied with their birth when they felt they had an active input in decision-making. In contrast, when caregivers were rated as less helpful, there was increased dissatisfaction (Brown & Lumley, 1998a). Qualitative research by Stevenson et al. (2020) found that Māori commonly cited that maternity healthcare practitioners lacked concern for cultural practices and an absence of support and kindness. When Māori women felt respected and had access to adequate support, they reported a positive experience. Connection with providers was also important, and Māori women felt isolated when there were minimal opportunities to establish relationships with maternity providers (Stevenson et al., 2020).

This was demonstrated in the current study by several Māori and non-Māori women's comments which referred to broader support, helping make the experience more tolerable and positive. This included support from hospital staff, midwives and partners. An interpretation of these findings is the importance of a more comprehensive support system coming together to help all women through their labour and birth process. Extending beyond the nuclear family unit, the Māori collective concept of 'whānau' can be viewed as a group of people coming together for a common purpose (Lawson-Te Aho et al., 2010). Whānau support is critically important, especially in Māori well-being (Durie, 2006; Lawson-Te Aho et al., 2010). Within other areas of healthcare, a systems

approach incorporating primary and secondary healthcare providers and working cohesively with whānau has been seen to improve outcomes (Lawrenson et al., 2016). The concept of 'whānau' is beneficial for thinking about the role of support people and the provision of space in the maternity environment.

Maternity health services need to be orientated towards empowering women to control who supports them through their birth experience. For some women this may be having the support of whānau, for others it may not. Regardless, the system must be responsive to women's unique support needs. For some Māori women it may be important' to access holistic support from whānau throughout the perinatal period. Whānau have been found to provide significant emotional and practical support, and knowledge to Māori breastfeeding women (Reinfelds, 2015). To alleviate power imbalances, the maternity system needs to form an inclusive, compatible and culturally responsive partnership with whānau (Stevenson et al., 2020). This could include whānau being encouraged and welcomed at antenatal visits, with culturally responsive provisions for delivery spaces and space for whānau to stay in maternity units or hospitals postnatally. As the health care system benefits from the care and support that whānau provide, whānau also require support and adequate resourcing in this role (T. Walker et al., 2008). Financial, social, or transport support for whānau needs to be available to reduce barriers to supporting women during the perinatal period.

Along with support, the place of birth has previously been identified as an important aspect of women's experience of childbirth (Cheyney, 2008; Grigg et al., 2014; Maude & Foureur, 2007); this was also reflected in the current study. There were several comments on the place of birth regarding having a home, hospital or waterbirth. These findings highlight the importance of where and how a woman delivers as important to the labour and birth perspectives of NZ women.

There can be differences between rural and urban women in maternity practitioners and birthing environment options. Inequities in the health of Māori and non-Māori also exist rurally; not only do a higher proportion of Māori live in rural areas, but rural Māori are also more likely to live with

financial hardship than rural non-Māori (Ministry of Health, 2012). Rural birthing centres are constantly threatened with funding and midwifery shortages, including a lack of Māori midwives (A. Cook, 2018; Leaman, 2017; Tantau, 2020). However, rural and Māori communities have fought to keep their centres open. Allowing women to give birth in primary birthing units close to home is an important option for women, particularly allowing connection to whānau. They also allow for more accessible inclusion and adoption of more traditional Māori birthing practices and customs (Gardner, 2018). Access to maternity services is a significant issue, and policies and funding must ensure that rural communities have the same access to maternity care as urban communities. Therefore, wider social and health policies need to ensure that both Māori and non-Māori women have autonomy, choice and access to where and how they wish to birth, including traditional and cultural birthing practices (Tikao, 2013).

Often connected to birthplace, discourse around the experience of obstetric interventions was commonly reported. Māori and non-Māori women described negative experiences with inductions, failed epidurals, caesarean sections, delays and being let down by medical professionals. Many women in this qualitative study had certain expectations around receiving interventions, and in some cases, these expectations not being realised left women feeling disappointed or unhappy about their experience. A few women assumed they would go into labour naturally and did not, and many mentioned having an induction negatively.

These results support the idea that obstetric interventions are particularly important when there are expectations or plans that are unmet. These findings are consistent with other studies where obstetric complications have impacted birth experiences (Henriksen et al., 2017). An increase in interventions has been shown in the literature to increase the perception of a more unsatisfying and negative birth (Carquillat et al., 2016; Waldenström et al., 2004); however, interestingly, research has found that this influence is not as significant as the support and behaviour of caregivers (Hodnett, 2002). Similarly, support was identified as incredibly important in this current qualitative study.

Linked to interventions, labour pain is unique, situational, and a normal physiological process. It appeared a key consideration for women in this study. It was common for women to describe contractions as a unique experience in childbirth. As in other studies, mixed feelings, both positive and negative, of labour pain were expressed (Oweis, 2009; Waldenström et al., 1996; Whitburn et al., 2019). Many found their pain levels "unbearable", however women reflected more positivity if pain management was adequate. There was an interconnectedness between pain and other factors, including obstetric interventions, duration of labour, pain expectations and control of pain management. Pain is modifiable by other factors, and studies have shown that strong emotional support can decrease relative pain experiences (Waldenström et al., 2004). Lower expectations of pain can also lower the pain levels experienced (Aksoy et al., 2016). Many women in the current study accepted pain as a natural part of childbirth and found it manageable. In contrast, others felt let down by expectations that pain relief would work effectively. Some were surprised at their pain levels and their lack of ability to cope.

One comment from a Māori woman described that an anaesthetist failed to give her an epidural, among other delays in care, yet another Māori woman stated two epidurals did not work. Māori women consistently have the lowest epidural rates of all ethnicities in NZ; in 2017, this was 18% compared to 29% for European/other (Ministry of Health, 2019a). Although individual choice in decision-making around pain relief during birth is important, inequity between Māori and non-Māori in access and treatment of pain exists (Mcgavock et al., 2012). This is echoed in international literature showing inequities in pain relief in childbirth for Indigenous women (Altman et al., 2019; Attanasio & Hardeman, 2019; Riddell et al., 2016). Nelson (2006) reviewed the literature on ethnic inequities in pain relief during childbirth and found the provision of an epidural is influenced by clinician attitudes, inaccurate assessment by a clinician of different ethnicity, and low availability of clinicians of indigenous ethnicities. These qualitative findings show that pain is an influencing factor in the birth experience, and practitioner bias (whether unconscious or implicit), including structural racism, may impact the ability of Māori women to receive equitable pain relief.

Interconnected with pain, birth duration was a key element of birth experience that Māori and non-Māori women commented on. Women generally described shorter labours more positively and longer labours, often including a lack of progression, more negatively. These included comments about exhaustion and lack of sleep. Prolonged labour has had conflicting results in studies about birth experience and an increased risk of a negative experience (Dencker et al., 2010; Gaudernack et al., 2020; Hosseini Tabaghdehi et al., 2020; Kempe & Vikström-Bolin, 2020; Nystedt et al., 2014). This could be due to other aspects of the experience associated with longer labours and birth, such as interventions and complications. Translating the findings from the qualitative study into action, maternity carers need to assist women in setting realistic expectations before labour regarding its length, particularly when combined with obstetric interventions that can slow delivery. Preparing for labour as a demanding physical and psychological event should also be included in antenatal education and support.

Future implications of the current birth experience within the theme 'looking ahead' were noted. Several Māori women particularly mentioned future reproductive decisions regarding having additional children. A negative birth experience has been associated with delaying subsequent children and not having further children (Fenech & Thomson, 2014; Shorey et al., 2018). In agreement with Rilby et al. (2012), who found that women with more positive birth experiences desired to give birth again, this qualitative study suggests that a positive experience can positively influence women's future reproductive decisions.

The impact on future decisions around preferences on where and how to birth was also commonly raised in this study, for instance, not wanting an induction or a hospital birth or another caesarean section. Pang et al. (2008) discovered that a significant proportion of women changed their preferred mode of delivery post their first birth experience. Additionally, a negative birth experience has been associated with an increased likelihood of a maternal request for a caesarean section in subsequent births (Brodrick, 2014; Pang et al., 2008; Waldenström et al., 2004). The

findings in this qualitative study tended to support a contrasting notion, in that several women commented that they did not want another caesarean section.

Impacts of the recent birth experience on longer-term decisions and outcomes cannot be underestimated. In particular, a negative birth experience can have a long-lasting, lifelong impact (Forssén, 2012). Rijnders et al. (2008) found that a quarter of women negatively recalled their experience three years after birth. Similarly, Simkin (1991) found that women remember elements of their birth experience with clarity and accuracy decades later. Therefore, the influence of the birth experience is not confined to just the postnatal period and can be enduring. The implication for practice is that women's birth experience must be recognised as important. Women should be routinely encouraged to review, debrief, and discuss their experiences with maternity carers or healthcare professionals. Women should be offered appropriate interventions to reflect on their perceptions with additional psychological support should they require it.

5.3.1 Strengths and Limitations

This study had some limitations. Despite the large sample size of *Moe Kura*, only a small subset of women commented on their birth experience. Providing a text comment was optional for women over and above the Likert scale rating. This study was a content analysis of secondary data, so there was no control over who completed the free-text comments and thus the size of the dataset. *Moe Kura* was not explicitly designed to collect qualitative data, nor was the primary focus birth experience, so initiatives were not employed at the outset to collect in-depth experiential data.

There is likely a range of reasons, including facilitators and barriers that women experienced, which could have led to whether they felt comfortable sharing their comments. The average age in the qualitative sample was older than the wider *Moe Kura* cohort average. One interpretation is that older women may have felt more confident and could speak or reflect on their experiences. Likewise, women from middle to higher socio-economic groups were more likely to comment; it is possible that they too felt more able to speak, sharing their experiences with fewer barriers to doing so. Most respondents in this qualitative study had given birth at least once. The expectations,

emotions and thoughts on labour and birth of those with a prior experience may differ from those experiencing birth for the first time (Hauck et al., 2007; Rilby et al., 2012). Perhaps women experiencing birth for the first time may be less sure about what to expect and what a 'normal' birth experience may be. A prior birth may enable a woman to reflect and compare their experiences.

A smaller proportion of Māori than non-Māori women provided text comments. The Māori qualitative sample was older and less deprived than the full Māori cohort and the general population of Māori women giving birth. Younger Māori women and those living in the most deprived areas were underrepresented. There may be several barriers limiting these Māori women's participation. A systematic review identified mistrust and consequent fear of participation, stigma, and competing demands as common factors limiting minority groups' research participation (George et al., 2014). Māori women may have felt their comments would be less valued or valid, or they may have felt their experiences would be judged or discriminated against. Alternatively, they may have lacked confidence, had competing demands, or chosen not to comment. The question asking for a comment on birth experience could have been perceived as less culturally responsive to Māori.

Although this qualitative *Moe Kura* sub-set of women was smaller, meaning some women's perspectives were not captured, there were some common threads on aspects of birth experiences for women, which, as illustrated, have been shown in previous literature. However, the demographic considerations of the women who commented must be kept in mind when interpreting these results. Future qualitative research on birth experience needs to ensure that younger Māori and those in higher deprivation areas are supported to engage and participate. Participation could be increased by providing equitable access to information and reducing barriers (transport, social or financial). E Hine was a qualitative Kaupapa Māori research project focused on the health outcomes of young Māori mothers and their infants. This strength-based research collaborated with Māori health providers, elders as well as young Māori mothers, building

trusting relationships with women with ongoing consultation focussing on respect and dignity in a culturally safe way (Lawton et al., 2013). This supported continuing research participation and engagement and prioritised the perspectives of these women.

Women commented on their birth experience in the 11–13-weeks postnatal questionnaire, so their insights were not documented immediately post-birth. This may have provided time to process the experience and their emotions. However, recall of the experience was also potentially influenced by the challenges and experiences of having a new-born. It does mean that experiences were salient enough that women chose to share and describe them after time had passed.

In qualitative content research, there is never a single meaning in the text; instead, it is the researcher's interpretation of the probable meaning (Schreier, 2013). The text cannot be viewed in isolation, and context is considered when presenting interpretations (Schreier, 2013). In the current study, content analysis was well-suited to the available data, and patterns were identified to enhance understanding of women's perspectives on the multifaceted phenomenon of birth experience (Byrne, 2001; Elo & Kyngäs, 2008). Using the inductive approach, taking data at face value, without imposing preconceived theoretical perspectives was advantageous. As there are higher levels of abstraction and interpretation, a challenge with content analysis can be demonstrating credibility (Graneheim et al., 2017). However, as described in Chapter 3, a systematic, iterative and transparent process (including inter-coder reliability) was undertaken to increase the trustworthiness and rigour of results (Byrne, 2001; Graneheim & Lundman, 2004). Reflexivity was enhanced by personal reflections being documented throughout the process.

A strength was the use of unobtrusive text comments to determine patterns of experience. Women were under no obligation to comment on their birth experience and, as the data were collected via a free text box, there were no confines concerning what the comments could or should focus on. In addition, as there were no interviews, there was less of a need to consider any power imbalance between an expert researcher and participants in interview situations (Braun & Clarke, 2013).

The small free-text box in the questionnaire may have influenced what and how much information women provided, but there was still richness and significance to the data. It contained situational and contextual components despite the limitations of how the data were collected. In the literature, there is some caution that free-text responses (restricted by space) produce data that can lack context and are rarely rich enough to generate robust insights (LaDonna et al., 2018). However, they can enhance quantitative findings and contribute to inspiring new research questions.

5.3.2 Recommendations for Future Research

Findings suggest that more in-depth qualitative research on birth experience in NZ is warranted. Future initiatives should provide a safe space for women to participate and share their perspectives, voices, and stories. To build on the research in this area, additional qualitative research informed by Kaupapa Māori principles would improve Māori participation and retention by working alongside Māori communities and supporting the research process. Qualitative interviews, focus groups, or more comprehensive open-ended response questionnaires would be valuable to explore perspectives more in-depth, allowing for more detailed insights (McGrath et al., 2019). Further research is also recommended to investigate potential interventions that could mitigate the more negative aspects of the birth experience.

5.3.3 Summary

Despite a small sub-set of *Moe Kura* women providing comments, this study described birth experience patterns for Māori and non-Māori women. Thus, it has contributed to the body of knowledge on birth experience and informed further research to better understand the birth experience. Positive and negative aspects of labour and birth can coexist, and there is a continuum of perspectives, thus confirming the complexity and diversity of the experience. Understanding the factors contributing to women's birth experiences is essential to inform responsive practice and interventions to support NZ women across the perinatal period. Maternity services need to be responsive to both Māori and non-Māori women's perspectives and needs, informing and engaging women in discussions around their values, expectations, preferences, and decision-making.

5.3.4 Personal Reflections on the Research Process

The subjective nature of qualitative research requires that the researcher explores their views and recognises their position within the research. This is done to ensure the methodical rigour of the study (Bengtsson, 2016). Therefore, throughout this qualitative study, I kept notes reflecting on and exploring my thoughts, feelings, and assumptions about the data.

I was struck by the power of the participants' voices from just a few words or sentences in the text box. Although they were brief, there was a richness to many of the comments and weight of significance in the meaning I felt they carried. At times, there was a sense that there was much left unsaid behind the words and so much more to investigate and explore further.

Knowing how challenging and busy life is as a new mother, I feel incredibly grateful to those women who chose to take the time on an extensive questionnaire to share their experiences so openly. Little did they know a novice researcher, years later, would spend hours analysing and coding their insights. I could not help but ponder where the women were now and the implications of their birth experience through the years and almost ten years down the track.

I naively underestimated the complexity of the process of conducting content analysis and the time and effort required to analyse the comments. However, the iterative nature of the process did mean that I got to know each comment well, with my interpretations of some comments changing over time. Reflecting and discussing with my supervisor and gaining inter-coder agreement was also a methodical process where I gained a real insight into the rigour required and the highly systematic nature of qualitative content analysis.

Conducting this study led me to reflect upon my position in NZ society and highlighted my Pākehā identity and socioeconomic circumstances. After a negative birth experience, I paid to have obstetric care during my second birth and labour. I am aware of my privilege in having the means to do so, how this altered my expectations and the additional support I received. I also reflected on

why and how specific comments sat with me longer than others, particularly those similar to my own experience and the comments I felt were socially unjust.

CHAPTER 6 MIXED METHODS RESULTS AND DISCUSSION

This chapter summarises the key quantitative (Chapter 4) and qualitative (Chapter 5) findings and integrates these results to address the overarching mixed methods research question of this thesis (Section 2.4). Practical implications and contribution of the mixed methods findings are discussed, followed by limitations and strengths of the mixed methods study, recommendations for future research and concluding comments.

6.1 Summary of Quantitative Results

6.1.1 For Māori and Non-Māori Women, What is the Prevalence of Positive or Negative Labour and Birth Experience?

Based on a composite measure of self-reported birth experience, approximately two-thirds of Māori (69%) and non-Māori (66%) women in this study positively rated their overall labour and birth experience (Section 4.2).

Recognising the importance of considering these results within the broader societal context (Section 3.3), although there was no statistically significant difference in the prevalence of positive or negative birth experiences between Māori and non-Māori women, there were differences in social and obstetric factors between ethnic groups. Māori women were over-represented in areas with highest socioeconomic deprivation (Section 4.1.2), and a smaller proportion of Māori women (44%) reported their partner relationship (a proxy measure of social support) as happy compared with non-Māori women (56%) (Section 4.1.3). In addition, Māori women experienced more stressful life events in the preceding 12 months than non-Māori (Section 4.1.3).

Māori women were more likely to have a hospital-based midwife or team, whereas non-Māori women were more likely to have a specialist obstetrician or have a hospital high-risk team. A larger proportion of Māori women gave birth in a place they had not planned (13%) and received no obstetric intervention (61%) compared to non-Māori women (7% and 47%, respectively).

However, a larger proportion of non-Māori reported complications with birth (31%) than Māori women (22%) (Section 4.1.5).

6.1.2 For Māori and Non-Māori Women, What is the Relationship Between Labour and Birth Experience and Postnatal Mental Distress Symptoms at 4–6 Weeks and 11-13 Weeks Post-Birth?

Symptoms of postnatal distress were measured using the EPDS anxiety subscale at 4-6 weeks and 11-13 weeks postpartum and the full EPDS (incorporating anxiety and depression symptoms) at 11-13 postpartum. There was evidence of ethnic inequities in mental health outcomes, with a larger proportion of Māori women reporting postnatal mental distress symptoms. While descriptive statistics indicated that at 4-6 weeks postpartum there was no statistically significant difference in EPDS anxiety subscale scores for Māori (8%) and non-Māori (6%) women, there was a significant difference at 11-13 weeks, with 11% of Māori and 7% of non-Māori women showing elevated anxiety symptoms. When using both the community (≥10) and clinical (≥13) EPDS cut-offs, there were significant differences between Māori (community 21%, clinical 11%) and non-Māori (community 15%, clinical 7%) women with depressive symptoms.

Univariate analyses (chi-squares) conducted separately for Māori and non-Māori women investigated crude associations between birth experience and postnatal mental distress symptoms (Section 4.6). At 4-6 weeks postpartum, there was a significant association between the dichotomised (positive/negative) composite measure of birth experience and anxiety symptoms (elevated EPDS anxiety subscale scores) for both Māori and non-Māori women. However, at 11-13 weeks postpartum, dichotomised birth experience was not associated with anxiety symptoms for Māori women but was for non-Māori women. Furthermore, at this timepoint, there was no significant association between birth experience and postnatal mental distress (full EPDS) for the community (≥10) and clinical (≥13) cut-offs for both Māori and non-Māori women.

Results from multivariable hierarchical logistic regression models (including ethnicity as a covariate; Section 4.7) showed that a negative birth experience was independently associated with

increased odds of anxiety symptoms at 4-6 weeks postpartum, after adjusting for demographic factors and antenatal mental distress. However, at 11-13 weeks postpartum, negative birth experience was no longer associated with anxiety symptoms after adjusting for antenatal mental distress. At 11-13 weeks postpartum, birth experience was not associated with elevated mental distress symptoms when the EPDS community cut-off (≥10) was modelled.

In contrast, associations were identified between negative birth experience and greater odds of elevated EPDS scores using the clinical cut-off (≥13), indicating more severe mental distress levels. This association was found in unadjusted models and remained after adjusting for demographic variables; however, additional adjustment for antenatal mental distress fully attenuated the association (Section 4.7).

Overall, these results indicate that for both Māori and non-Māori women, a negative birth experience is associated with a higher likelihood of elevated anxiety symptoms in the early postnatal period; however, there is a possible dissipation of this relationship over time. Results also suggest that labour and birth experience may be associated with more severe anxiety and depression symptoms. Thus, birth experience may be an important risk factor for developing more severe postnatal mental distress. In this study, antenatal mental distress was also consistently associated with postnatal mental distress symptoms.

6.1.3 For Māori and Non-Māori Women, Does Sleep Health Play a Contributory Role in the Relationship Between Labour and Birth Experience and the Symptoms of Postnatal Mental Distress?

In hierarchical regression models, additional adjustment for sleep did not generally attenuate relationships between birth experience and postnatal mental distress. Thus, sleep health may not be a primary pathway through which negative birth experience contributes to anxiety symptoms or postnatal mental distress at measured postpartum time points (Section 4.7).

However, these models did show that multiple aspects of sleep health were independently associated with mental distress symptoms at 11-13 weeks postpartum. For all women (models

with ethnicity as a covariate), facets of sleep health that were independently associated with increased odds of anxiety symptoms were difficulty falling and staying asleep, daytime sleepiness, and disturbed sleep due to nightmares; and facets of sleep health associated with mental distress (EPDS clinical cut-off) were short sleep duration, sleep quality, difficulty falling and staying asleep, and disturbed sleep due to nightmares. Findings from models run separately for Māori and non-Māori indicated that for Māori women sleep quality, difficulty falling and staying asleep, and daytime sleepiness were independently associated with postnatal mental distress (EPDS community cut-off). Whereas for non-Māori women, this was short sleep duration, sleep quality and difficulty falling and staying asleep.

While sleep health may not be a primary pathway linking birth experience and postnatal mental distress, these independent associations indicate the importance of multiple aspects of good sleep health for supporting maternal mental health. Good sleep health may, therefore, modify the risk of mental distress and serve as a protective factor at three months postpartum. Further research is warranted to better understand sleep and mental distress (using full EPDS) in early postpartum and whether these relationships change over time.

6.2 Summary of Qualitative Results

6.2.1 What Are Māori and Non-Māori Women's Perceptions, and How Do They Describe Their Labour and Birth Experience?

Women's perceptions of their birth experience were incorporated into four themes identified using qualitative content analysis (Section 5.2). In the first theme, 'expressing myself', women often highlighted the significance of their birth experience through emotional reactions, conveying their experiences using positive and negative psychological or physiological descriptions. Responses were often concise, and emotions could coexist, with many commenting on lack of sleep. The second theme, 'into the unknown', captured women's appraisals of their birth experience. Women commented on their expectations, perception of control and influence over their experience. Prior birth experiences were often compared, noting similarities and dissimilarities, to their recent

experience. Within the theme, 'reality of experience', aspects of the actual birth experience were included. Many women described how birth characteristics were influenced by how those caring for and supporting them made them feel. It also included pain levels/management, delivery method and obstetric interventions. In the final theme, 'looking ahead', the impact of the recent experience on future labour and birth and reproductive decisions was identified. Again, many women noted positive and negative implications and the enduring effect of their birth experience.

The qualitative analysis identified a complex interconnectedness between themes. Māori and non-Māori women commented on the level and quality of support, including involvement in decision-making, as significant factors. While there were many similarities between Māori and non-Māori women's descriptions of their experiences, there were also some slight differences in the patterning of experiential data. Communication, labour duration and future reproductive implications were raised particularly by Māori women, with some comments describing negative experiences based on communication and obstetric interventions. Whereas for non-Māori women, perceptions around expectations, control, and pain were more prominent in comments, notably contrasts between expectation and reality of their birth experience.

For many Māori and non-Māori women, positive and negative perspectives of labour and birth appeared to exist and coexist, and there was a continuum of views. The results also provided insights into women's birth experience within diverse social contexts. Many women in this study perceived their experience as positive, empowering and enlightening, thus highlighting the benefits of a positive birth experience in a woman's life. Strength and resilience were also heard in the voices of some women who experienced a more negative time. Many women put their baby's wellbeing ahead of their own and accepted a more negative experience. Whereas for other women, their birth experiences were described as traumatic and distressing, highlighting suffering and negative descriptions of their support and care. The qualitative findings highlighted the significance, individuality and multidimensional nature of the birth experience.

6.3 Mixed Methods Results

6.3.1 What are Māori and Non-Māori Women's Experiences of Labour and Birth in Aotearoa/New Zealand, and What is the Relationship Between Labour and Birth Experience, Maternal Sleep, and Postnatal Mental Distress Symptoms, Based on a Combination of Quantitative and Qualitative Data?

It was evident from the quantitative study that although many Māori and non-Māori women in the sample had a positive birth experience, approximately one-third did not. This indicates that a substantial number of NZ women may have a negative experience. Prevalence of positive and negative experiences was similar for Māori and non-Māori women. It was also clear from the qualitative study that labour and birth is a significant, individual experience and that both positive and negative aspects exist and can co-exist.

Figure 8 summarises the integrated results relating to the mixed methods research question. Several quantitative and qualitative findings converged to shed light on Māori and non-Māori women's birth experiences. In addition, unique quantitative and qualitative study results also provided additional coverage (Morgan, 2014), which enhanced the understanding of birth experience, sleep and postnatal mental distress for Māori and non-Māori women.

Convergent findings indicated that both positive and negative experiences of birth experience exist in NZ. Labour and birth are complex multidimensional phenomena, as seen in the qualitative analysis of women's perceptions of their experience and the multiple themes.

The qualitative study results added women's voices of their birth experience to the quantitative results and confirmed how individual and subjective the experience is. A positive birth experience can be an empowering, positive and life-changing experience. In addition, a sense of resilience was illustrated in the comments of many women who had a more negative experience. Women often put their baby's wellbeing ahead of their own, perhaps reflecting society's expectations and the prioritisation of babies over mothers (H. Walker, 2022). Within the qualitative themes identified, many similarities between Māori and non-Māori women's experiences were seen in descriptions.

Support, communication, expectations, pain, perceived level of control, delivery method, obstetric interventions, and labour duration were important aspects of the birth experience. However, differences in patterning were also identified particularly regarding communication, labour duration and future implications for Māori, with expectations, control, and pain being more prominent for non-Māori women.

Quantitative results highlighted the significance and potentially enduring impact of the birth experience. Associations were found between negative birth experience and early postnatal mental distress (anxiety symptoms), independent of demographic factors and antenatal mental distress, and later postnatally with more severe postnatal mental distress (when demographics were adjusted for). Additionally, the qualitative comments confirmed the implications of prior birth experiences and the recent experience's impact on future labour, births, and reproductive decisions.

The quantitative birth experience variable was a composite variable including questions on "feeling informed" and "listened to", and qualitative results provided further evidence that communication and education were important for a more positive experience for Māori and non-Māori women. Inequities related to pregnancy and birth were seen in the quantitative study, with Māori women being less likely to receive an obstetric intervention, having a specialist obstetrician LMC, and a larger proportion of Māori women giving birth in a place they had not planned. In the qualitative findings, a number of comments by Māori raised inadequate communication and access to obstetric interventions, which concurs with Māori women having fewer obstetric interventions in the quantitative study.

Quantitative results provided additional coverage concerning social inequities. Māori women were overrepresented in areas of low SEP and were more likely to experience deprivation at the individual level. They were more likely to have experienced more stressful life events and have less social support. Thus, Māori women were disproportionately impacted by social determinants of

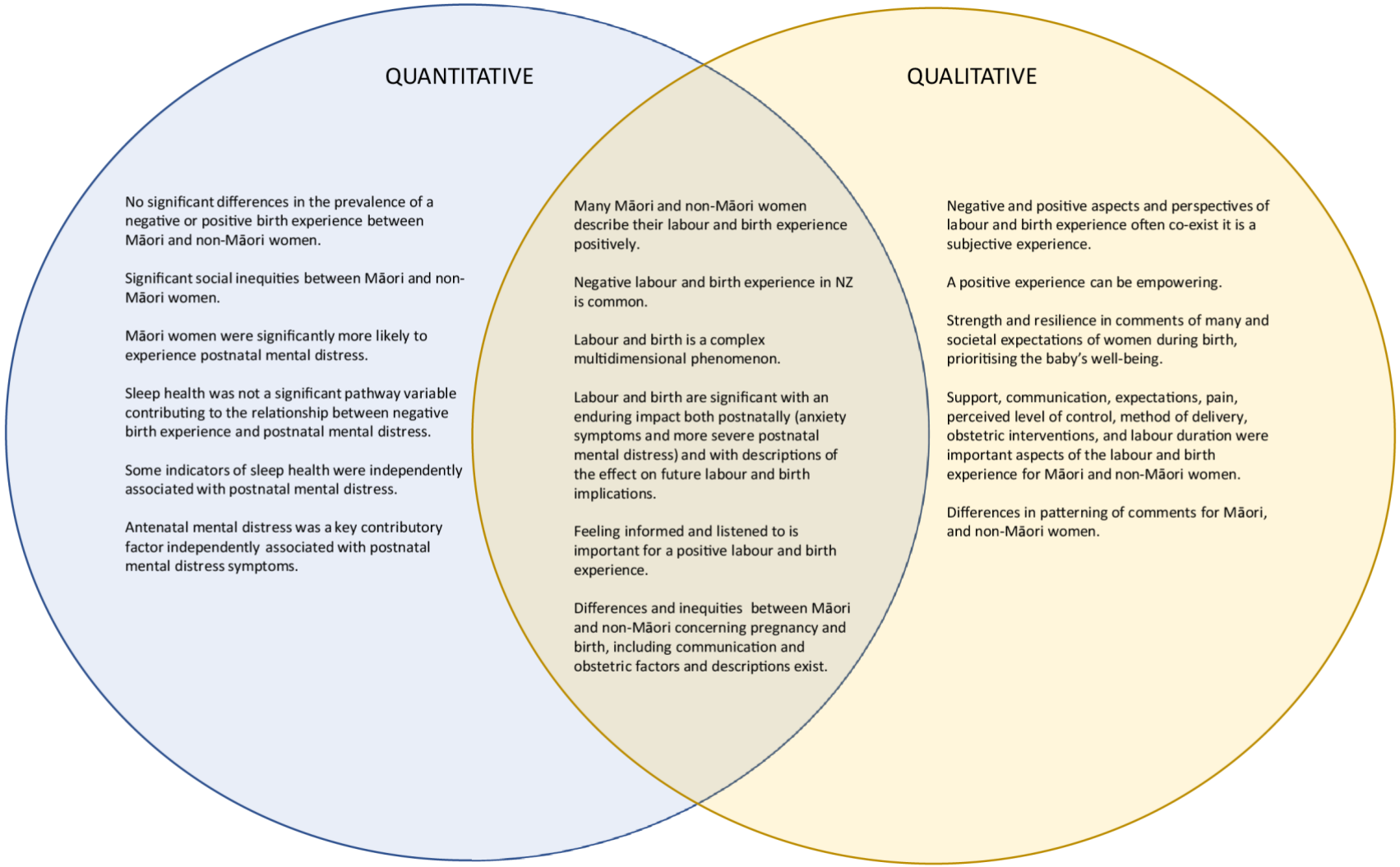
poor mental health. Māori women were also more likely to have elevated scores on the EPDS signalling postnatal mental distress.

Sleep health did not appear to be a primary pathway linking negative birth experience to postnatal mental distress at any time points measured. However, multiple facets of sleep health were independently associated with postnatal mental distress symptoms (after adjusting for all covariates), thus reinforcing the importance of postnatally supporting all aspects of women's sleep health. In addition, antenatal mental distress was a key contributory factor independently associated with postnatal distress symptoms, illustrating the importance of antenatal screening and support.

In summary, although many Māori and non-Māori women report a positive labour and birth experience, findings from the current study indicate that up to a third of women in NZ may have a negative experience, which can have a lasting impact. There was no significant difference in the prevalence of positive and negative birth experiences based on the composite measure of birth experience, reported by Māori and non-Māori women in this study. However, there was evidence of ethnic inequities in aspects of labour and birth, such as obstetric interventions, maternity care and social determinants of mental health (socioeconomic deprivation) and mental distress for Māori women compared to non-Māori women. There was an independent relationship between a negative birth experience and an increased likelihood of postnatal mental distress (anxiety symptoms) in the early postnatal period. Women's comments also indicated implications of positive and negative labour and birth experiences for future labour, birth, and reproductive decisions. Maternal sleep did not appear to contribute to the relationship between a negative birth experience and postnatal mental distress; however, independent associations indicated the importance of sleep health for good mental health at three months postnatally irrespective of labour and birth experience.

Figure 8

Quantitative, Qualitative and Convergent Mixed Methods Results



6.4 Mixed Methods Findings: Informing Action

The mixed methods results demonstrate that a negative birth experience is common and can have an enduring impact postnatally and implications on future labour and birth decisions. They also highlight inequities concerning labour and birth between Māori and non-Māori women in NZ. Many complex factors are responsible for these inequities, including systematic disadvantages within the health system experienced by Māori (P. Reid & Robson, 2007) and inequities in wider determinants of health, including systematic racism, which must be addressed at multiple levels (Sections 4.8 and 5.3) (Curtis et al., 2019; Jones, 2000).

Findings support taking action to reduce the likelihood of having a negative experience and optimising opportunities to have a positive experience through aspects of the labour and birth experience that are important to women. The importance of feeling listened to and informed was identified in both the quantitative study and qualitative themes (section 5.2), indicating that actionable practices to foster a more positive birth experience include ensuring good communication by strengthening relationships with maternity providers and health professionals and providing resources to facilitate supportive whānau environments (Stevenson et al., 2016). Building rapport and providing a culturally safe birthing environment may help address accessibility and power imbalances which can contribute to discrimination (Lawton et al., 2013; Stevenson et al., 2020). In addition, the maternity system must empower women to have autonomy in decision-making, setting realistic expectations with equitable access to obstetric interventions and pain relief. The mixed methods findings also support the need to invest in social policy with an equity focus and a commitment to women during the perinatal period, including meeting obligations of te Tiriti/the Treaty and ensuring social and economic resources are distributed equitably across society (PMMRC, 2021; H. Walker, 2022).

Associations between labour and birth experience and anxiety symptoms in early postpartum demonstrated the importance of considering a broader view of postnatal mental distress. Providing

support and resources for women with a negative labour and birth experience may reduce the risk of postnatal anxiety symptoms and the future impact on reproductive and birthing decisions. This highlights the importance of including a routine assessment and debrief of labour and birth experience in follow-up postnatal care. In addition, findings indicate it would be beneficial to identify, monitor and support women who have experienced a negative birth with a referral for psychological interventions where required.

Due to its relationship with postnatal mental distress, multi-faceted sleep health is also important to consider during the perinatal period. Therefore, maternity providers should routinely inquire about all aspects of sleep, not only duration, and provide women with education and support to improve their sleep health (Ladyman & Signal, 2018). Antenatal mental distress was also independently associated with postnatal mental distress, reinforcing the need for formal policies for routine screening for perinatal distress. Routine screening may also assist in identifying women with an increased risk of a negative birth experience.

The mixed methods findings have important implications for maternal practitioners and psychology practice. Labour and birth experience and the relationship with postnatal mental distress are significant, enduring, and influenced by complex multi-layered factors, including social determinants of health. Thus, this highlights the need for integrated perinatal psychological screening and individual assessment with a broader inquiry into psychological vulnerabilities and social circumstances. In addition, policies need to be prioritised and implemented that invest in culturally safe support and psychological resources for women during the perinatal period.

6.5 Contribution of This Research

Maternal mental health is one of the foundations of strong whānau, community and society, and birth experience has implications that extend beyond a woman and her baby (H. Walker, 2022). The quantitative study contributes to the limited research in NZ on the prevalence and significance of a positive or negative labour and birth experience for Māori and non-Māori women. Additionally,

to the best of the researcher's knowledge, it is the first in NZ to examine relationships between birth experience, sleep health, and postnatal mental distress. Findings support the importance of a broader approach to assessing and understanding postnatal mental distress to include anxiety alongside depression symptoms. These results also signal the importance of women being routinely screened for antenatal mental distress and sleep problems during the perinatal period and being provided with appropriate psychological support and accurate and accessible sleep health information.

The qualitative study explored labour and birth experience perspectives of Māori and non-Māori women. It makes a unique contribution to the literature by increasing the understanding of how attitudes, actions and the system are crucial to how a woman perceives her experience. The qualitative findings highlight and align with what is reported in the quantitative literature but with greater depth of experiential description, including aspects of birth experience important to women in NZ, differences in experiences, and the enduring implications and impact of the birth experience. They demonstrate that routine debriefing and assessment should be included in postnatal care, including psychological interventions when required.

The mixed methods study design provided a novel aspect to this research, enabling a depth and breadth of understanding of birth experience for women in NZ. Thus, it has contributed to the body of knowledge on birth experience and informed additional research to further understand the birth experience. In addition, the findings add to previous research on inequities and discrimination against Māori women within the maternity system and how these need to be addressed using a multi-layered approach.

6.6 Strengths and Limitations

As outlined in Sections 4.8.1 and 5.3.1, the quantitative and qualitative studies had several strengths and limitations. Likewise, the mixed methods study also had strengths and limitations.

Strengths included the novel, mixed methods investigation of birth experience and postnatal mental distress in NZ. The unique study design of *Moe Kura* also enabled this mixed method study to be conducted with a focus on the experience of Māori and non-Māori women. Utilising concurrent quantitative and qualitative research methods provided both breadth and depth of information, thus, resulting in a comprehensive picture of labour and birth experience for women that was greater than the sum of the quantitative and qualitative parts (Creswell & Plano Clark, 2018). Labour and birth are multidimensional phenomena, and the mechanisms involved in the relationships between birth experience, sleep, and postnatal mental distress are complex. Therefore, limitations of this mixed methods study include that multiple factors potentially involved were not measured in *Moe Kura* and therefore could not be investigated. Using a mixed methods methodology produced a considerable body of findings. However, the timeframe and size constraints of a master's thesis resulted in additional challenges and limitations in the reporting of findings' depth, analysis, and integration.

6.7 Future Research

To build on findings, recommendations for future research for the quantitative and qualitative studies are outlined in Sections 4.8.2 and 5.3.2. These include a validation study of the EPDS for use with Māori women to identify reliability, validity, and potential adaptions. In addition, further quantitative research with sufficient statistical power to examine relationships between Māori and non-Māori birth experiences and postnatal mental distress and a study to investigate potential interventions that could mitigate negative aspects of the experience are recommended. Additional research on sleep health in the antenatal period and the impact on birth experience, as well as sleep interventions and their impact on birth experience, would also be useful.

To extend the qualitative research, more in-depth research on labour and birth experience in NZ with a broader enquiry into the social determinants of postnatal mental distress is needed. For example, labour and birth experience and the impacts of institutional racism need to be investigated in NZ, and a mixed methods methodology would give a comprehensive view. Mixed

methods research could also be utilised to examine partners' birth experiences, mental health, and the impact on their transition to parenthood.

6.8 Conclusion

In NZ, labour and birth is a significant, subjective experience for Māori and non-Māori women, with lasting implications on mental health and future birth and reproductive decisions. A large number of women have a positive birth experience, but there is also a concerning number who do not. Some key things related to this are the importance of women feeling listened to, informed, and supported and having access to culturally safe and responsive services and obstetric interventions when required. Good sleep health is also important for postnatal mental health but is perhaps not the primary pathway linking birth experience to postnatal mental distress.

There are ethnic inequities in social determinants of maternal mental health that require big-picture change. To tackle these inequities, the structural factors that underpin the unfair treatment of Māori women must be addressed, including institutional racism. There is also evidence of differences in experience and how Māori and non-Māori feel they are treated during their labour and birth. These could be addressed by considering how our maternity system works for Māori women and implementing te Tiriti-led maternity service provision. A comprehensive, equity-based, multidimensional social determinants of health approach is required to ensure all women live in a society conducive to achieving equitable maternal outcomes that support wellbeing throughout the perinatal period.

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Appendix 1: Sleep and Pregnancy Questionnaire

Sleep and Health during Pregnancy

THIS QUESTIONNAIRE SHOULD BE COMPLETED WHEN YOU ARE 35-37 WEEKS PREGNANT

1. What is your date of birth? ..... / ..... / .....
(day) (month) (year)

2. When is your baby due? ..... / ..... / .....
(day) (month) (year)

3. How many weeks pregnant are you now? ..... weeks

4. Write your NHI number here if you know it:
(This is your National Health Index number – your midwife or doctor will have this).

5. Which ethnic group do you belong to? *Mark the space or spaces which apply to you.*

- ❍ New Zealand European
- ❍ Māori
- ❍ Samoan
- ❍ Cook Island Māori
- ❍ Tongan
- ❍ Niuean
- ❍ Chinese
- ❍ Indian
- ❍ Other such as DUTCH, JAPANESE, TOKELAUAN. Please state:

.....

6. Where do you usually live?

Street number ..... Flat number .....

Street name .....

Suburb or rural locality ..... Post Code .....

City, town or district .....

Telephone number ..... Cell phone number .....

7. In the last 12 months what was your households total income, before tax or anything else was taken out of it?

1 ❍ Loss
2 ❍ Zero income
3 ❍ $1 - $5,000
4 ❍ $5,001 - $10,000
5 ❍ $10,001 - $15,000
6 ❍ $15,001 - $20,000
7 ❍ $20,001 - $25,000
8 ❍ $25,001 - $30,000
9 ❍ $30,001 - $35,000
10 ❍ $35,001 - $40,000
11 ❍ $40,001 - $45,000
12 ❍ $45,001 - $50,000
13 ❍ $50,001 - $70,000
14 ❍ $70,001 – $100,000
15 ❍ $100,001 - $150,000
16 ❍ $150,001 or more
17 ❍ don't know

Please go to next page ☞

Paid Work (These questions refer to your work in the **last month**)

8. Do you currently work for pay, profit or income?

1 ❍ Yes, one paid job 2 ❍ Yes, more than one paid job

0 ❍ No *Comments welcome →*

If you answered 'No' please go to question 12, if 'Yes' go to question 9.

9. On average, how many HOURS A WEEK did you work for pay, profit or income? Just think about the LAST MONTH.

Please write how many hours a week here →..... hours a week

10. In the LAST MONTH did you work for pay, profit or income for at least 3 hours between midnight and 5am?

1 ❍ Yes 0 ❍ No *(please go to question 12)*

11. In the LAST MONTH what is the total number of nights that you worked for at least 3 hours between midnight and 5am? *Please write how many nights here →*..... nights

12. Return to work

1 ❍ I have no plans to return to work

2 ❍ I plan to return to work but have no date in mind

3 ❍ I expect to be back at work when my baby is ..... *(write baby's age)*

Support & dependents

13. How many people normally live in your home? .....

14. How many of these people need looking after by you (not counting you)**?**.....

What are their ages? .....

15. Support for you at home

Do you live with anyone you can count on to help you with:

Financial support 1 ❍ Yes 0 ❍ No

If YES, who? (e.g. partner, friend, parent).....

Emotional support (e.g. someone who listens or is 'there' for you) 1 ❍ Yes 0 ❍ No

If YES, who? (e.g. partner, friend, parent).....

Advice (e.g. can give information or guidance about pregnancy, birth and parenting) 1 ❍ Yes 0 ❍ No

If YES, who? (e.g. partner, friend, parent).....

Concrete/Practical support (e.g. baby care, housework, cooking) 1 ❍ Yes 0 ❍ No

If YES, who? (e.g. partner, friend, parent).....

Please go to next page ☞

16. Support for you – outside of home

Are there other people, not living with you, who you can count on to help with:

Financial support 1 ○ Yes 0 ○ No

If YES, who? (e.g. partner, friend, parent).....

Emotional support (e.g. someone who listens or is 'there' for you) 1 ○ Yes 0 ○ No

If YES, who? (e.g. partner, friend, parent).....

Advice (e.g. can give information or guidance about pregnancy, birth and parenting) 1 ○ Yes 0 ○ No

If YES, who? (e.g. partner, friend, parent).....

Concrete/Practical support (e.g. baby care, housework, cooking) 1 ○ Yes 0 ○ No

If YES, who? (e.g. partner, friend, parent).....

Pregnancy can affect how we feel about relationships. We are interested to know how you feel about your relationship with your partner right now. We understand that this may not be how you usually feel. If you do not have a partner please go to Question 19.

17. If you have a partner, how is your relationship with them at the moment?

Please circle one number

Perfectly Happy 0 1 2 3 4 5 6 7 Extremely Unhappy **OR** 8 ○ Not applicable

18. How supportive of this pregnancy is your partner?: *Please circle one number*

Completely supportive 0 1 2 3 4 5 6 7 Not at all supportive **OR** 8 ○ Not applicable

19. How often is a private motor vehicle (not counting motorbikes) available for your use?

	NO DAYS							EVERY DAY
Circle the number of days a week	0	1	2	3	4	5	6	7

Sleep – before this pregnancy

20. <u>Before this pregnancy</u>, how many hours sleep did you usually get in 24 hours, including naps?

Please write the number of hours here ..... hours

21. <u>Before this pregnancy</u>, how often did you get a good night's sleep?

	NO NIGHTS							EVERY NIGHT
Circle the number of nights	0	1	2	3	4	5	6	7

Please go to next page ☞

22. Before this pregnancy, has anyone told you that during sleep you do any of the following things? *Please circle how often*

	NO NIGHTS							EVERY NIGHT
Loud snoring	0	1	2	3	4	5	6	7
Long pauses between breaths while asleep	0	1	2	3	4	5	6	7
Legs twitching or jerking while you sleep	0	1	2	3	4	5	6	7

Sleep – during this pregnancy

23. How many hours sleep do you usually get in 24 hours, including naps?
(Just think about the last week).

Please write the number of hours here ..... hours

24. In the last week, how often did you get a good night's sleep?

	NO NIGHTS							EVERY NIGHT
Circle the number of days	0	1	2	3	4	5	6	7

25. On how many days in the last week did you have a daytime nap?

	NO NIGHTS							EVERY NIGHT
Circle the number of days	0	1	2	3	4	5	6	7

26. How long on average, per day, do you spend outside (really outside) exposed to daylight?

..... hours ..... minutes

27. On how many nights in the last week did the following things disturb your sleep?
Please circle one number in every row.

	NO NIGHTS							EVERY NIGHT
Circle the number of nights								
Going to the bathroom	0	1	2	3	4	5	6	7
Pain in back/neck/joints	0	1	2	3	4	5	6	7
Dreams	0	1	2	3	4	5	6	7
Nightmares	0	1	2	3	4	5	6	7
Heartburn	0	1	2	3	4	5	6	7
Nasal congestion (blocked nose)	0	1	2	3	4	5	6	7
Leg cramps	0	1	2	3	4	5	6	7
Contractions	0	1	2	3	4	5	6	7
Feeling too hot or cold	0	1	2	3	4	5	6	7
Thinking or worrying about things	0	1	2	3	4	5	6	7
Baby moving around (baby kicking)	0	1	2	3	4	5	6	7
Other children	0	1	2	3	4	5	6	7

Please go to next page ☞

Circle the number of nights	NO NIGHTS							EVERY NIGHT
Just can't get comfortable	0	1	2	3	4	5	6	7
Just can't get to sleep	0	1	2	3	4	5	6	7
Disturbed by partner (e.g. snoring)	0	1	2	3	4	5	6	7
Other	0	1	2	3	4	5	6	7

If you circled '**Other**', what were the other things that disturbed your sleep?

28. During sleep in the <u>LAST WEEK</u>, has anyone told you that you did any of the following?
Please circle how often.

Circle the number of nights	NO NIGHTS							EVERY NIGHT
Loud snoring	0	1	2	3	4	5	6	7
Long pauses between breaths while asleep	0	1	2	3	4	5	6	7
Legs twitching or jerking while you sleep	0	1	2	3	4	5	6	7

29. Do you ever experience an urge to move your legs (usually accompanied by unpleasant sensations)?

1 ❍ Yes 0 ❍ No – *if "No" please go to question 31.*

30. If you answered "Yes" in question 29, is this: *Tick all that apply to you.*

1 ❍ Worse at night?

2 ❍ More noticeable when you rest?

3 ❍ Relieved by movement?

31. How often in the <u>last week</u> did you:

Please circle one number in every row	NO NIGHTS							EVERY NIGHT
Have difficulty getting to sleep	0	1	2	3	4	5	6	7
Wake up during your sleep period	0	1	2	3	4	5	6	7
Wake up too early at the end of a sleep period	0	1	2	3	4	5	6	7
Feel rested upon awakening at the end of a sleep period	0	1	2	3	4	5	6	7
Sleep poorly	0	1	2	3	4	5	6	7
Feel sleepy during the day	0	1	2	3	4	5	6	7
Struggle to stay awake during the day	0	1	2	3	4	5	6	7
Feel irritable during the day	0	1	2	3	4	5	6	7
Feel tired or fatigued during the day	0	1	2	3	4	5	6	7
Feel satisfied with the quality of your sleep	0	1	2	3	4	5	6	7

Please go to next page ☞

Please circle one number in every row	NO NIGHTS							EVERY NIGHT
Feel alert and energetic during the day	0	1	2	3	4	5	6	7
Get too much sleep	0	1	2	3	4	5	6	7
Get too little sleep	0	1	2	3	4	5	6	7
Take a nap at a scheduled time	0	1	2	3	4	5	6	7
Fall asleep at an unscheduled time	0	1	2	3	4	5	6	7
Use a prescription sleeping pill to help you get to sleep	0	1	2	3	4	5	6	7
Use any pain medication to help you get to sleep (e.g. Panadol)	0	1	2	3	4	5	6	7
Take or use anything else to help you sleep	0	1	2	3	4	5	6	7

If so, what did you take or use:

32. How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? *This refers to your usual way of life in recent times.*

PLEASE TICK ONE CIRCLE ON EACH LINE

	would never doze	slight chance	moderate chance	high chance
Sitting and reading	0 ❍	1 ❍	2 ❍	3 ❍
Watching TV	0 ❍	1 ❍	2 ❍	3 ❍
Sitting inactive in a public place (e.g. movies, meeting)	0 ❍	1 ❍	2 ❍	3 ❍
As a passenger in a car for an hour without a break	0 ❍	1 ❍	2 ❍	3 ❍
Lying down in the afternoon when circumstances permit	0 ❍	1 ❍	2 ❍	3 ❍
Sitting and talking to someone	0 ❍	1 ❍	2 ❍	3 ❍
Sitting quietly after a lunch without alcohol	0 ❍	1 ❍	2 ❍	3 ❍
In a car, while stopped for a few minutes in traffic	0 ❍	1 ❍	2 ❍	3 ❍

PLEASE MAKE SURE YOU HAVE TICKED ONE BOX ON EACH LINE

Feelings in pregnancy

33. Please tick the answer which comes closest to how you have felt IN THE LAST 7 DAYS, not just how you feel today.

I have been able to laugh and see the funny side of things.

0 ❍ As much as I always could
1 ❍ Not quite so much now
2 ❍ Definitely not so much now
3 ❍ Not at all

I have looked forward with enjoyment to things.

0 ❍ As much as I ever did
1 ❍ Rather less than I used to
2 ❍ Definitely less than I used to
3 ❍ Hardly at all

Please go to next page ☞

I have blamed myself unnecessarily when things went wrong.

3❍Yes, most of the time
2❍Yes, some of the time
1❍Not very often
0❍No, never

I have been anxious or worried for no good reason.

0❍No, not at all
1❍Hardly ever
2❍Yes, sometimes
3❍Yes, very often

I have felt scared or panicky for no very good reason.

3❍Yes, quite a lot
2❍Yes, sometimes
1❍No, not much
0❍No, not at all

Things have been getting on top of me.

3❍Yes, most of the time I haven't been able to cope at all
2❍Yes, sometimes I haven't been coping as well as usual
1❍No, most of the time I have coped quite well
0❍No, I have been coping as well as ever

I have been so unhappy that I have had difficulty sleeping.

3❍Yes, most of the time
2❍Yes, sometimes
1❍Not very often
0❍No, not at all

I have felt sad or miserable.

3❍Yes, most of the time
2❍Yes, quite often
1❍Not very often
0❍No, not at all

I have been so unhappy that I have been crying.

3❍Yes, most of the time
2❍Yes, quite often
1❍Only occasionally
0❍No, never

The thought of harming myself has occurred to me.

3❍Yes, quite often
2❍Sometimes
1❍Hardly ever
0❍Never

Please go to next page ☞

34. The following are statements about worrying. Please read each statement and indicate how true each one is in describing your general/usual experience of worrying.
Please tick the one option that most likely applies to you for each statement

When I worry, it interferes with my day-to-day functioning (e.g. stops me getting my work done, organising myself or my activities).

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

When I think I should be finished worrying about something, I find myself worrying about the same thing, over and over.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

My worrying leads me to feel down and depressed.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

When I worry, it interferes with my ability to make decisions or solve problems.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I feel tense and anxious when I worry.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I worry that bad things or events are certain to happen.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I often worry about not being able to stop myself from worrying.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

As a consequence of my worrying, I tend to feel emotional unease or discomfort.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

This pregnancy and birth

35. Who is providing professional health care for you in this pregnancy?

○ Independent (self-employed) midwife/team
○ Hospital based midwife/team
○ Hospital high risk team
○ Specialist Obstetrician
○ Shared care (e.g. midwife & obstetrician, midwife & GP)
○ No one
○ Other *(who)*_____

36. What was your weight before this pregnancy? ..... kgs **OR** ..... stones ..... lbs

37. What is your height? .....cms **OR** .....feet .....inches

38. When you got pregnant, were you trying to get pregnant?

1 ○ Yes 0 ○ No

39. Did you require the assistance of reproductive technology to become pregnant this time?

(e.g. IVF, GIFT, ICSI) 1 ○ Yes 0 ○ No

Please go to next page ☞

Mood

40. <u>Before this pregnancy</u> did you ever have a period of 2 weeks or more when you felt particularly miserable or depressed?

1❍ Yes 0❍ No – *go to question 41*

If so, did being depressed:

a) Interfere with your ability to get things done or your relationships with family and friends?
Circle one number

Not at all		Somewhat			Very much
0	1	2	3	4	5

b) Lead you to seek professional help?

1❍ Yes 0❍ No

41. Have you ever been told by a health professional you were depressed or needed antidepressants?

1❍ Yes 0❍ No

42. <u>During this pregnancy</u> have you been distressed by feelings of anxiety or depression for 2 weeks or more?

1❍ Yes 0❍ No– *go to question 43*

If so, did this distress:

a) Interfere with your ability to get things done or your relationships with family and friends?
Circle one number

Not at all		Somewhat			Very much
0	1	2	3	4	5

b) Lead you to seek professional help?

1❍ Yes 0❍ No

43. Before this pregnancy, have you ever had depression during pregnancy (antenatal depression) **or after having a baby** (postnatal depression)**?**

1❍ Yes 0❍ No

44. Has anyone in your family ever been told by a health professional that they have depression or another mental health problem?

1❍ Yes 0❍ No

If '**Yes**' who was that:.....

45. Has anyone in your family ever had antenatal or postnatal depression?

1❍ Yes 0❍ No

If '**Yes**" who was that: .....

Please go to next page ☞

Pregnancy history

46. How many times have you ever been pregnant, including this one? ..... times
Comments welcome →

If this is your <u>first pregnancy</u>, please go to Question 50. If you have been pregnant more than once please answer the following:

47. How many times have you given birth to a baby, alive or not, after at least 20 weeks of pregnancy?

Comments welcome →

48. Have any of your previous babies had significant health problems which were identified in pregnancy or at birth?

1 ○ Yes 0 ○ No *Comments welcome →*

49. Have you had a caesarean section in the past?

1 ○ Yes 0 ○ No

50. Are you currently having <u>any treatment or monitoring</u> for any of these conditions?
Please tick one circle on every line.

	Yes	No	Don't know/ can't remember
High blood pressure (including hypertension, pre-eclampsia, toxaemia, chronic hypertension)	1 ○	0 ○	2 ○
Pregnancy or pre-existing diabetes (gestational diabetes managed using dietary control, with or without insulin)	1 ○	0 ○	2 ○
Low iron or anaemia	1 ○	0 ○	2 ○
Abnormal vaginal bleeding	1 ○	0 ○	2 ○
Placenta/whenua low down near the cervix (placenta praevia/low lying placenta)	1 ○	0 ○	2 ○

Please go to next page ☞

51. Are you currently having <u>any treatment or monitoring</u> for any other conditions such as:
If 'No' please go to question 52

Other medical problem(s) – please specify (e.g.thyroid problem, severe back problem, severe carpal tunnel syndrome, any other medical condition):

Mental health problem(s) – please specify (e.g. depression, bipolar disorder, schizophrenia, or other mental health condition):

A diagnosed sleep disorder – please specify:

52. Please list any medicines you are currently taking.

Life events

53. This question is about things that may have happened during the last 12 months.
Tick all that apply to you - if none of these apply please go to question 54

- ❍ A close family member was very sick and had to go into hospital
- ❍ I broke up with, got separated or divorced from my partner
- ❍ I moved to a new address
- ❍ I was homeless
- ❍ My partner lost their job
- ❍ I lost my job even though I wanted to go on working
- ❍ I argued with my partner more than usual
- ❍ My partner said they did not want me to be pregnant
- ❍ I had a lot of bills I couldn't pay
- ❍ I was in a physical fight
- ❍ My partner or I went to jail
- ❍ Someone very close to me had a bad problem with drinking or drugs
- ❍ Someone very close to me died

Please go to next page ☞

54. Do you describe yourself as a: *Please tick the circle that applies to you*

3❍ regular smoker (I smoke one or more cigarettes per day)
2❍ occasional smoker (I do not smoke every day)
1❍ ex-smoker (I used to smoke but not any more)
0❍ non-smoker (I have never smoked regularly)

55. During this pregnancy how often do you drink alcohol? *Please tick the circle that applies to you*

0❍	1❍	2❍	3❍	4❍
Never	Less than once a week	Once every 3-7 days	Once every 2 days	Daily

56. On a typical drinking occasion (in this pregnancy), how many drinks do you have? (One drink equals a glass of beer or a glass of wine or a nip of spirits)? *Please tick the circle that applies to you*

0❍	1❍	2❍	3❍	4❍
None	Less than 2 drinks	2 to 4 drinks	5 to 6 drinks	More than 6 drinks

57. During this pregnancy how often do you use street or recreational drugs, including party pills?

Please tick the circle that applies to you

0❍	1❍	2❍	3❍	4❍
Never	Less than once a week	Once every 3 to 7 days	Once every 2 day	Daily

58. Date questionnaire completed ..... / ..... / .....
(day) (month) (year)

Please take a moment now to flick through every page of this survey and check that you have answered all the questions you meant to.

A $20 voucher, from the choice of three options, below will be posted to you when we receive this completed questionnaire. Please ensure you advise us if your address changes.

Please indicate the type of voucher you would prefer (tick one):

Petrol ☐ (MTA) Supermarket ☐ (New World) Department store ☐ (Farmers)

Return questionnaire to Sleep/Wake Research Centre, Massey University, PO Box 756, Wellington 6140.

Important note

If you feel concerned about *any* of the issues raised by completing this questionnaire, we suggest that you discuss these with your Lead Maternity Carer, doctor or other health professional.

The end – thank you.

Appendix 2: Six-Week Postpartum Questions

E Moe, Māmā – 4-6 weeks postpartum telephone survey

Participant ID: ___ ___ ___ ___ EDD: _____ / _____/_____

Date this survey **completed**: _____ / _____/_____

Time survey was **completed:** _____

EPDS score Q1: _____

What date was your baby born on?	
So their age now is...	
And where did you give birth?	
Three questions now about **your** sleep in the last 24 hours:	
1. In the last 24 hours, how many 'sleep periods' have you had – so what that means is, in the last 24 hours, how many times have you gone to sleep – including naps. "	
2. So in total, how much sleep have you had in the last 24 hours?	
3. Quality of sleep: how would you rate the quality of your sleep in the last 24 hours? Note comments here:	0- very good 1- good 2- poor 3- very poor
Now we have three questions about how you have been feeling in the last 7 days – you have already answered questions like these in the first questionnaire. I will read you a statement and then ask you to choose from 4 response options.	
1. I have blamed myself unnecessarily when things went wrong.	3❍Yes, most of the time 2❍Yes, some of the time 1❍Not very often 0❍No, never
2. I have been anxious or worried for no good reason.	0❍No, not at all 1❍Hardly ever 2❍Yes, sometimes 3❍Yes, very often
3. I have felt scared or panicky for not very good reason.	3❍Yes, quite a lot 2❍Yes, sometimes 1❍No, not much 0❍No, not at all
Follow up required Y / N	**EPDS Total**

Is there anything else you would like to know about the study, or that you would like to tell us? *(Continue on back of sheet if required).*

E Moe, Māmā – Contact Log

Four to Six-weeks postpartum telephone survey questions

Participant ID: ___ ___ ___ ___

Name:.....

Home Phone: .....

Cell Phone: .....

Notes: .....

.....

.....

Intro self.

"You are enrolled in our study of sleep changes in pregnancy and after birth, and we have received the first questionnaire from you. Thank you. Do you have 3-4 minutes now to answer a few short questions?

CALLING RECORD

Date	Time	# Called	Code	Notes	Staff

CODES:

BU	busy (phone line busy)	CB	participant requested call back	WD	withdrew from study
CC	call completed	MV	moved	WN	wrong number
MM	left message on machine	NA	no answer	NT	see notes
MP	left message with person	NE	no English	WR	will return by (time)
PB	participant called back	OT	other (explain)	SC	subject called
CT	Call terminated				

Appendix 3: Postnatal Sleep and Health Questionnaire

ID:_____

Postnatal Sleep and Health

PLEASE COMPLETE THIS QUESTIONNAIRE WHEN YOUR BABY IS 12 WEEKS OLD

1. What is your date of birth? ..... / ..... / .....
(day) (month) (year)

2. When was your baby born? ..... / ..... / .....
(day) (month) (year)

3. Please write your NHI number here:
(This is your National Health Index number – your midwife or doctor will have this).

4. Which ethnic group do you belong to? *Mark the space or spaces which apply to you.*

- ❍ New Zealand European
- ❍ Māori
- ❍ Samoan
- ❍ Cook Island Māori
- ❍ Tongan
- ❍ Niuean
- ❍ Chinese
- ❍ Indian
- ❍ Other such as DUTCH, JAPANESE, TOKELAUAN. Please state:

.....

5. Which ethnic group does your baby belong to? *Mark the space or spaces which apply to you.*

- ❍ New Zealand European
- ❍ Māori
- ❍ Samoan
- ❍ Cook Island Māori
- ❍ Tongan
- ❍ Niuean
- ❍ Chinese
- ❍ Indian
- ❍ Other such as DUTCH, JAPANESE, TOKELAUAN. Please state:

.....

6. Where do you usually live?

Street number..... Flat Number.....

Street name .....

Suburb or rural locality..... Post Code .....

City, town or district .....

Telephone number..... Cellphone number.....

7. In the last 12 months what was your households total income, before tax or anything else was taken out of it?

1 ❍ Loss
2 ❍ Zero income
3 ❍ $1 - $5,000
4 ❍ $5,001 - $10,000
5 ❍ $10,001 - $15,000
6 ❍ $15,001 - $20,000
7 ❍ $20,001 - $25,000
8 ❍ $25,001 - $30,000
9 ❍ $30,001 - $35,000
10 ❍ $35,001 - $40,000
11 ❍ $40,001 - $45,000
12 ❍ $45,001 - $50,000
13 ❍ $50,001 - $70,000
14 ❍ $70,001 – $100,000
15 ❍ $100,001 - $150,000
16 ❍ $150,001 or more
17 ❍ don't know

Please go to next page ☞

Paid Work (These questions refer to your work in the **last month**)

8. Do you currently work for pay, profit or income?

1 ❍ Yes, one paid job 2 ❍ Yes, more than one paid job

0 ❍ No *Comments welcome* →

If you answered 'No' please go to question 12, if 'Yes' go to question 9.

9. On average, how many HOURS A WEEK did you work for pay, profit or income? Just think about the LAST MONTH.

Please write how many hours a week here →..... hours a week

10. In the LAST MONTH did you work for pay, profit or income for at least 3 hours between midnight and 5am?

1 ❍ Yes 0 ❍ No *(please go to question 12)*

11. In the LAST MONTH what is the total number of nights that you worked for at least 3 hours between midnight and 5am? *Please write how many nights here* →..... nights

12. If you are NOT currently working for pay, profit or income, are you taking paid parental leave?

1 ❍ Yes 0 ❍ No

13. Return to work

1 ❍ I have no plans to return to work

2 ❍ I plan to return to work but have no date in mind

3 ❍ I expect to be back at work when my baby is ..... *(write baby's age)*

Please go to next page ☞

Support & dependents

14. How many people normally live in your home? .....

15. How many of these people need looking after by you (not counting you)?

What are their ages? .....

16. Support for you at home

Do you live with anyone you can count on to help you with:

Financial support 1○ Yes 0○ No

If Yes, who? (e.g. partner, friend, parent).....

Emotional support (e.g. someone who listens or is 'there' for you) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

Advice (e.g. can give information or guidance about baby care and parenting) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

Concrete/Practical support (e.g. baby care, housework, cooking) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

17. Support for you – outside of home

Are there other people, not living with you, who you can count on to help with;

Financial support 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

Emotional support (e.g. someone who listens or is 'there' for you) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

Advice (e.g. can give information or guidance about baby care and parenting) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

Concrete/Practical support (e.g. baby care, housework, cooking) 1○ Yes 0○ No

If YES, who? (e.g. partner, friend, parent).....

18. If you have a partner do they currently work for pay, profit or income?

1○ Yes 0○ No **OR** 2○ Not applicable

If "Yes", have they been able to take time off work to be with you and the baby?

1○ Yes - how much time? .....

0○ No

Please go to next page ☞

Having a baby can affect how we feel about relationships. We are interested to know how you feel about your relationships with your partner right now. We understand that this may not be how you usually feel. If you do not have a partner please go to Question 20.

19. If you have a partner, how is your relationship with them at the moment?:
Please circle one number

Perfectly Happy 0 1 2 3 4 5 6 7 Extremely Unhappy **OR** 8 ○ Not applicable

20. How often is a motor vehicle (not counting motorbikes) available for your use?

Circle the number of days a week

NO DAYS 0 1 2 3 4 5 6 7 EVERY DAY

Birth

21. How old is your baby now? .....weeks

22. How many weeks pregnant were you when your baby was born? .....weeks

23. At what time was your baby born? .....pm / am (please write the time **and** circle pm or am)

24. What was your baby's birth weight? .....grams or ..... pounds/ounces

25. What was your baby's length at birth? .....cm

26. What was <u>your weight</u> when your baby was born?

.....kgs **OR** ..... stones ..... lbs ○ Don't know

27. If you experienced labour, how long was it for – from the time you started to experience regular contractions? .....hours

28. Where was your baby born? (e.g. at home, or name of maternity unit/hospital)

Is this where you planned to give birth? 1 ○ Yes 0 ○ No

If 'No', where did you plan to give birth? (e.g. at home, or name of maternity unit/hospital)

Please go to next page ☞

29. How was your baby born? *Tick all that apply*

❍ Induced (you had an "induction")

❍ Vaginally

❍ With the help of forceps or ventouse (vacuum)

❍ A planned caesarean (you were expecting to have a caesarean that day)

❍ An emergency, but pre-planned caesarean (you were expecting to have a caesarean on another day)

❍ An unexpected or emergency caesarean (you weren't expecting to have a caesarean)

30. Overall, how was your experience of labour and birth? *Please circle one number*

0	1	2	3	4	5
Great Better than I thought		Challenging but manageable		Terrible, never again Much worse than I thought	

Comments welcome:

Anaesthesia

31. Did you have an epidural (injection in the back) **during labour?**

0❍ No 1❍ Yes *Comments welcome:*

32. Did you have a general anaesthetic for the birth? *(You were given medicine to make you go to sleep for the birth – sometimes this happens for a caesarean section).*

0❍ No 1❍ Yes *Comments welcome:*

If "Yes" – was this planned: 1❍ No 0❍ Yes

33. Were there any complications during the birth?

0❍ No 1❍ Yes *Comments welcome:*

34. Did you bleed excessively at, or after birth?

0❍ No 1❍ Yes

Please go to next page ☞

35. Did you require a blood transfusion during or after birth?

0❍ No 1❍ Yes

36. If you gave birth in hospital, how long did you stay there after your baby was born?

.....hours **OR** .....nights

37. Did your baby have any illness in the first week of life that required assessment by a paediatrician or admission to the neonatal or special care baby unit?

0❍ No 1❍ Yes *Comments welcome:*

38. Was your baby born with any congenital abnormalities that required assessment by a paediatrician or admission to the neonatal or special care baby unit?

0❍ No 1❍ Yes *Comments welcome:*

39. Did you feel you knew enough about what was going on during your birth experience?

0	1	2	3	4	5
Not at all					Very much

40. Did you feel listened to during your labour and birth experience?

0	1	2	3	4	5
Not at all					Very much

Please go to next page ☞

Feeding your baby

41. How would you describe feeding your baby to start with?

Please circle one number

0	1	2	3	4	5
Easy - no problems					Very difficult - lots of problems

Comments welcome:

42. If feeding was difficult at the start, how long was it difficult for? ..... weeks

43. What was your baby's source of milk in the last 48 hours?

1 ❍ Baby has received breast milk only, in the last 48 hours
2 ❍ Baby has received some breast milk and some formula in the last 48 hours
3 ❍ Baby has received only infant formula in the last 48 hours
4 ❍ Other, in the last 48 hours – *please describe* →

44. Has your baby only ever received breast milk (no water, formula or other foods)?

1 ❍ Yes 0 ❍ No

45. Is this how you hoped to be feeding your baby?

1 ❍ Yes 0 ❍ No 2 ❍ Don't know

Comments welcome:

46. How is feeding going now? *Please circle*

0	1	2	3	4	5
Easy - no problems					Very difficult - lots of problems

Comments welcome:

Please go to next page ☞

47. Are you the only one who feeds your baby? 1 ❍ Yes 0 ❍ No

If "No", on how many days a week does someone else feed your baby?

Circle the number of days a week

1	2	3	4	5	6	7
Once a week						Daily

48. How many times has your baby fed in the last 24 hours?

Please circle one number

1	2	3	4	5	6	7	8	9	10 or more

49. How many times did you wake up last night to feed your baby?

Please circle one number

0	1	2	3	4	5 or more

50. How many times did you wake up for your baby last night for another reason?

Please circle one number

0	1	2	3	4	5 or more

51. How often do you have help at night with baby care, if you want it?

Please circle one number

NO NIGHTS							EVERY NIGHT
0	1	2	3	4	5	6	7

OR I could have help at night but I don't need it 8 ❍

Sleep – since you have had your baby

52. How many hours sleep, including naps, do you usually get in 24 hours?
(just think about the last week)

Please write the number of hours here ..... hours

53. In the last week, how often did you get a good night's sleep?

Circle the number of days

NO NIGHTS							EVERY NIGHT
0	1	2	3	4	5	6	7

54. How long on average, per day, do you spend outside (really outside) exposed to daylight?

..... hours ..... minutes

Please go to next page ☞

55. On how many nights in the last week did the following things disturb your sleep?

Please circle one number in every row.

	NO NIGHTS							EVERY NIGHT
Going to the bathroom	0	1	2	3	4	5	6	7
Pain in back/neck/joints	0	1	2	3	4	5	6	7
Dreams	0	1	2	3	4	5	6	7
Nightmares	0	1	2	3	4	5	6	7
Heartburn	0	1	2	3	4	5	6	7
Nasal congestion (blocked nose)	0	1	2	3	4	5	6	7
Leg cramps	0	1	2	3	4	5	6	7
Feeling too hot or cold	0	1	2	3	4	5	6	7
Thinking or worrying about things	0	1	2	3	4	5	6	7
Just can't get comfortable	0	1	2	3	4	5	6	7
Just can't get to sleep	0	1	2	3	4	5	6	7
Feeding baby	0	1	2	3	4	5	6	7
Breast leaking or uncomfortable	0	1	2	3	4	5	6	7
Other baby care	0	1	2	3	4	5	6	7
Other children	0	1	2	3	4	5	6	7
Disturbed by partner (e.g. snoring)	0	1	2	3	4	5	6	7
Other	0	1	2	3	4	5	6	7

56. During sleep in the LAST WEEK, has anyone told you that you did any of the following? Please circle how often .

Circle one number in every row	NO NIGHTS							EVERY NIGHT
Loud snoring	0	1	2	3	4	5	6	7
Long pauses between breaths while asleep	0	1	2	3	4	5	6	7
Legs twitching or jerking while you sleep	0	1	2	3	4	5	6	7

57. Do you ever experience an urge to move your legs (usually accompanied by unpleasant sensations)?

1 ❍ Yes 0 ❍ No – *if "No" please go to question 59*

58. If you answered "Yes" in Question 57, is this: *Tick all that apply to you*

1 ❍ worse at night?

2 ❍ more noticeable when you rest?

3 ❍ relieved by movement?

Please go to next page ☞

59. How often in the last week did you:

Please circle one number in every row.

	NO NIGHTS							EVERY NIGHT
Have difficulty getting to sleep	0	1	2	3	4	5	6	7
Wake up during your sleep period	0	1	2	3	4	5	6	7
Wake up too early at the end of a sleep period	0	1	2	3	4	5	6	7
Feel rested upon awakening at the end of a sleep period	0	1	2	3	4	5	6	7
Sleep poorly	0	1	2	3	4	5	6	7
Feel sleepy during the day	0	1	2	3	4	5	6	7
Struggle to stay awake during the day	0	1	2	3	4	5	6	7
Feel irritable during the day	0	1	2	3	4	5	6	7
Feel tired or fatigued during the day	0	1	2	3	4	5	6	7
Feel satisfied with the quality of your sleep	0	1	2	3	4	5	6	7
Feel alert and energetic during the day	0	1	2	3	4	5	6	7
Get too much sleep	0	1	2	3	4	5	6	7
Get too little sleep	0	1	2	3	4	5	6	7
Take a nap at a scheduled time	0	1	2	3	4	5	6	7
Fall asleep at an unscheduled time	0	1	2	3	4	5	6	7
Use a prescription sleeping pill to help you get to sleep	0	1	2	3	4	5	6	7
Use any pain medication to help you get to sleep (e.g. Panadol)	0	1	2	3	4	5	6	7
Take anything else to help you sleep	0	1	2	3	4	5	6	7

If so, what did you take to help you sleep:.....

60. How likely are you to doze off or fall asleep in the following situations, in contrast to feeling just tired? *This refers to your usual way of life in recent times.*

PLEASE TICK ONE CIRCLE ON EACH LINE

	would never doze	slight chance	moderate chance	high chance
Sitting and reading	0 ○	1 ○	2 ○	3 ○
Watching TV	0 ○	1 ○	2 ○	3 ○
Sitting inactive in a public place (e.g. movies, meeting)	0 ○	1 ○	2 ○	3 ○
As a passenger in a car for an hour without a break	0 ○	1 ○	2 ○	3 ○
Lying down in the afternoon when circumstances permit	0 ○	1 ○	2 ○	3 ○
Sitting and talking to someone	0 ○	1 ○	2 ○	3 ○
Sitting quietly after a lunch without alcohol	0 ○	1 ○	2 ○	3 ○
In a car, while stopped for a few minutes in traffic	0 ○	1 ○	2 ○	3 ○

PLEASE MAKE SURE YOU HAVE TICKED ONE BOX ON EACH LINE

Please go to next page ☞

General health and well-being

61. Are you currently having <u>any treatment or monitoring</u> for any of these conditions?
Please tick one circle on every line.

	Yes	No	Don't know/ can't remember
High blood pressure (hypertension)	1 ○	0 ○	2 ○
Pain as a result of the birth	1 ○	0 ○	2 ○
Breast infection (mastitis)	1 ○	0 ○	2 ○
Low iron or anaemia	1 ○	0 ○	2 ○
Birth related infection	1 ○	0 ○	2 ○
Urinary incontinence	1 ○	0 ○	2 ○
Faecal incontinence	1 ○	0 ○	2 ○

62. Are you currently having <u>any treatment or monitoring</u> for any other conditions such as:
If 'No' please go to question 63

Other medical problem(s) – please specify (e.g. diabetes, severe back problem, another medical condition):

Mental health problem(s) – please specify (e.g. depression or other mental health condition):

Diagnosed sleep disorder – please specify:

63. Please list any medicines you are currently taking.

64. During this most recent pregnancy were you distressed by feelings of anxiety or depression for 2 weeks or more?

1 ○ Yes 0 ○ No– *go to question 65*

If so, did this distress:

a) Interfere with your ability to get things done or your relationships with family and friends?
Please circle one number

0	1	2	3	4	5
Not at all		somewhat			very much

b) Lead you to seek professional help?

1 ○ Yes 0 ○ No

Please go to next page ☞

65. In the first week after your baby was born did you experience times of unexplained tears, feeling very up and then very down or feeling like you were on an emotional roller-coaster – sometimes called the "baby blues"?

1 ❍ Yes 0 ❍ No– *go to question 66*

If "Yes", how long did these feelings last? *Please circle one number*

0	1	2	3
Less than than a day	One to two days	Three days to a week	More than a week

Life events

66. This question is about things that may have happened <u>during the last 12 months</u>.
Tick all that apply to you - if none of these apply please go to question 67

- ❍ A close family member was very sick and had to go into hospital
- ❍ I broke up with, got separated or divorced from my partner
- ❍ I moved to a new address
- ❍ I was homeless
- ❍ My partner lost their job
- ❍ I lost my job even though I wanted to go on working
- ❍ I argued with my partner more than usual
- ❍ My partner said they did not want me to be pregnant
- ❍ I had a lot of bills I couldn't pay
- ❍ I was in a physical fight
- ❍ My partner or I went to jail
- ❍ Someone very close to me had a bad problem with drinking or drugs
- ❍ Someone very close to me died

Feelings since you have had your baby

67. Please tick the answer which comes closest to how you have felt <u>IN THE LAST 7 DAYS</u>, not just how you feel today.

I have been able to laugh and see the funny side of things.
0 ❍ As much as I always could
1 ❍ Not quite so much now
2 ❍ Definitely not so much now
3 ❍ Not at all

I have looked forward with enjoyment to things.
0 ❍ As much as I ever did
1 ❍ Rather less than I used to
2 ❍ Definitely less than I used to
3 ❍ Hardly at all

Please go to next page ☞

I have blamed myself unnecessarily when things went wrong.

3❍Yes, most of the time
2❍Yes, some of the time
1❍Not very often
0❍No, never

I have been anxious or worried for no good reason.

0❍No, not at all
1❍Hardly ever
2❍Yes, sometimes
3❍Yes, very often

I have felt scared or panicky for no very good reason.

3❍Yes, quite a lot
2❍Yes, sometimes
1❍No, not much
0❍No, not at all

Things have been getting on top of me.

3❍Yes, most of the time I haven't been able to cope at all
2❍Yes, sometimes I haven't been coping as well as usual
1❍No, most of the time I have coped quite well
0❍No, I have been coping as well as ever

I have been so unhappy that I have had difficulty sleeping.

3❍Yes, most of the time
2❍Yes, sometimes
1❍Not very often
0❍No, not at all

I have felt sad or miserable.

3❍Yes, most of the time
2❍Yes, quite often
1❍Not very often
0❍No, not at all

I have been so unhappy that I have been crying.

3❍Yes, most of the time
2❍Yes, quite often
1❍Only occasionally
0❍No, never

The thought of harming myself has occurred to me.

3❍Yes, quite often
2❍Sometimes
1❍Hardly ever
0❍Never

Please go to next page ☞

68. The following are statements about worrying. Please read each statement and indicate how true each one is in describing your general/usual experience of worrying.

Please tick the one option that most likely applies to you for each statement

When I worry, it interferes with my day-to-day functioning (e.g. stops me getting my work done, organising myself or my activities).

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

When I think I should be finished worrying about something, I find myself worrying about the same thing, over and over.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

My worrying leads me to feel down and depressed.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

When I worry, it interferes with my ability to make decisions or solve problems.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I feel tense and anxious when I worry.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I worry that bad things or events are certain to happen.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

I often worry about not being able to stop myself from worrying.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

As a consequence of my worrying, I tend to feel emotional unease or discomfort.

0 ○ Not true at all 1 ○ Somewhat true 2 ○ Moderately true 3 ○ Definitely true

Please go to next page ☞

Your baby

69. In general how often does your baby cry?

0	1	2	3	4	5
Never					Very often

70. When your baby has been upset and you do things to try and calm him/her down (like rocking, walking, showing toys), how often does he/she take more than 10 minutes to calm down?

Please circle one number

Never	Very rarely	Less than half the time	About half the time	More than half the time	Almost always	Always
1	2	3	4	5	6	7

71. When being held, how often does your baby:

Pull away or kick?

Please circle one number

Never	Very rarely	Less than half the time	About half the time	More than half the time	Almost always	Always
1	2	3	4	5	6	7

Seem to enjoy him/herself?

Please circle one number

Never	Very rarely	Less than half the time	About half the time	More than half the time	Almost always	Always
1	2	3	4	5	6	7

72. When going to bed, how often does your baby settle within 10 minutes?

Please circle one number

Never	Very rarely	Less than half the time	About half the time	More than half the time	Almost always	Always
1	2	3	4	5	6	7

73. When your baby is upset about something, how often does s/he stay upset for 20 minutes or longer?

Please circle one number

Never	Very rarely	Less than half the time	About half the time	More than half the time	Almost always	Always
1	2	3	4	5	6	7

Please go to next page ☞

Baby's health

74. Which of the following has your baby had during the LAST WEEK?
Tick all that apply (or go to question 75 if none apply)

- ❍ Fever (high temperature)
- ❍ Diarrhoea
- ❍ Vomiting
- ❍ Ear infection
- ❍ Colic
- ❍ Fussy or irritable
- ❍ Reflux
- ❍ Runny nose or cold
- ❍ Cough or wheeze
- ❍ Chest infection
- ❍ Asthma
- ❍ Food allergy
- ❍ Eczema (atopic dermatitis)
- ❍ None of these

75. Did your baby receive any of the following medicines in the last 2 weeks?
(Please do not include vitamins or minerals).

Antibiotics 1❍ Yes 0❍ No

Other prescription medicine 1❍ Yes 0❍ No
If "Yes" please write the name of the medicine(s) here:

Non-prescription medicine 1❍ Yes 0❍ No
If "Yes" please write the name of the medicine(s) here:

76. Has your baby received immunisation injections in the last 48-hours?
1❍ Yes 0❍ No

Baby's sleep in the last week

77. Where does your baby sleep *most* of the time during the DAY?

- In his/her own room 1❍
- In parents' room 2❍
- In sibling or other's room 3❍
- In another room of the house 4❍
- With you or another person e.g. being held or in a sling 5❍
- Moving around with you e.g. in a pram or basket 6❍
- Other – please state where: 7❍

Please go to next page ☞

78. Where does your baby sleep *most* of the time at NIGHT?

In his/her own room	1 ❍
In parents' room	2 ❍
In sibling or other's room	3 ❍
In another room of the house	4 ❍
Other – please state where:	5 ❍

79. What does your baby sleep in *most* of the time during the DAY?

Bassinet	1 ❍
Cot	2 ❍
Parents' bed	3 ❍
Infant seat	4 ❍
Being held or in a sling/front pack	5 ❍
In a pram or buggy	6 ❍
Other – please state what:	7 ❍

80. What does your baby sleep in *most* of the time at NIGHT?

Bassinet	1 ❍
Cot	2 ❍
Parents' bed	3 ❍
Infant seat	4 ❍
In a pram or buggy	5 ❍
Other – please state what:	6 ❍

81. In the last week did your baby start their night sleep in one location, and then move to another location during the night?

(For example, baby went to sleep in own cot, then moved to your bed and went to sleep again)**.**

1 ❍ Yes 0 ❍ No – *go to question 83*

If "Yes", on how many nights did they change their sleep location?

Circle the number of nights 1 2 3 4 5 6 7

Please go to next page ☞

82. If you answered "Yes" to question 81, why did your baby move sleep location during the night? *(Feel free to list more than one reason).*

83. How often does your baby go off to sleep with help from others?
(e.g. being fed, rocked or cuddled)

Circle one number	0	1	2	3
	Never	Rarely	Often	Always

84. In general do you consider your child's sleep as a problem?

2 ○ A very serious problem
1 ○ A small problem
0 ○ Not a problem at all

85. How many times does your baby usually wake up between 10pm and 6am?

0	1	2	3	4 or more
Not at all				times

86. What is the *longest* stretch of time that your baby is asleep during the night without waking up?

0	1	2	3	4	5
Less than 30 minutes	30 mins to 1 hour	1 to 2 hours	2 to 3 hours	3 to 4 hours	More than than 4 hour

87. What is the *longest* stretch of time that your baby usually sleeps during the day?

0	1	2	3	4	5
Less than 30 minutes	30 mins to 1 hour	1 to 2 hours	2 to 3 hours	3 to 4 hours	More than than 4 hour

88. How often do your baby's sleep patterns allow you to get a reasonable, total amount of sleep in 24 hours?

	NO DAYS						EVERY DAY
Circle the number of days	0	1	2	3	4	5	6	7

Please go to next page ☞

89. How often do your baby's daytime sleep patterns allow you to have a break?

	NO DAYS						EVERY DAY
Circle the number of days	0	1	2	3	4	5	6	7

90. How much do your baby's sleep patterns change from day to day?

0	1	2	3
Always the same	Change occasionally	Change often	Everyday is different

91. Date questionnaire completed ..... / ..... / .....
(day) (month) (year)

Please take a moment now to flick through every page of this survey and check that you have answered all the questions you meant to.

A $20 voucher, from the choice of three options, below will be posted to you when we receive this completed questionnaire. Please ensure you advise us if your address has changed.

Please indicate the type of voucher you would prefer (tick one):

Petrol ☐ (MTA) Supermarket ☐ (New World) Department store ☐ (Farmers)

Important note

If you feel concerned about *any* of the issues raised by completing this questionnaire, we suggest that you discuss these with your Lead Maternity Carer, doctor or other health professional.

The end. Thank you.

E Moe, Māmā, Maternal Sleep and Health in Aotearoa/New Zealand

For more information contact: mumsleep@massey.ac.nz **or visit** http://sleepwake.massey.ac.nz/
or freephone 0800MUMSLEEP (0800 686 7537) **or free text** SLEEP to 5222.

Return to: Sleep/Wake Research Centre, Massey University, PO Box 756, Wellington 6140

Appendix 4: Edinburgh Postnatal Depression Scale (EPDS): Phone Call Protocols for Elevated Scores

When phoning women, keep in mind they may find this information distressing.

35-37 Week Antenatal EPDS & 12 Week Postnatal

Criteria	Action
EPDS Score ≥ 13 & Q10= '0' or '1'	**Participant** 1. Call participant to inform of high/elevated score, which may indicate symptoms of depression. 2. Advise that they she should discuss this further with her LMC/GP. 3. Follow-up regarding consent to contact LMC. 4. Send letter to woman if requested EPDS_Letter to Participant_35_37wks.doc; EPDS_Letter to Participant_12 week post.doc EPDS_Letter to Participant_6 week post.doc **Midwife/LMC/GP** 1. If consent obtained, phone LMC to advise of elevated scores and that they may want to re-administer the EPDS and consider a referral for further evaluation/treatment: *If EPDS≥ 18 discuss possible referral to Maternal Mental Health Service. If they are unsure on the process they can consult with [maternal mental health clinicians/collaborators].* *If EPDS 13-17 consider referral to a PHO/NGO service, generally via their GP.* 2. Send Letter to Midwife/LMC/GP EPDS_Letter to LMC or GP.doc EPDS_Letter to LMC or GP_12 Week Post.doc
EPDS Score ≥ 13 & Q10= '2' or '3' OR Any EPDS score and Q10='2' or '3'	• Discuss with [psychiatrist] ↓ • Phone call to participant to inform of elevated score/risk on Q10. Advise that we highly recommend she should discuss this further with her LMC/GP and get consent to inform LMC/GP. ↓ • Phone LMC/GP to inform of elevated scores and potential risk. Advise that they may want to re-administer the EPDS and further assess. Also, consider a referral for further evaluation/treatment. Discuss possible referral to Maternal Mental Health Service and in any emergency/urgent situation the first point of contact 111 and/or Crisis Assessment Treatment Team. If they are unsure they can consult further with [maternal mental health clinicians/collaborators]. ↓ • Send letter to woman (discuss this first) & LMC/GP. *EPDS_Letter to LMC or GP_elevated risk Q10.doc*
Elevated score on Brief Measure of Worry Scale	If high scores are identified on this scale it should correlate with the EPDS score. ↓ Review any discrepancies in scores with [psychiatrist]
If the woman advises that she requires/may require acute assistance.	Provide CATT team number/Mental Health Crisis Line number (see Appendix 1). Let them know they may have to leave a message. ↓ Also inform Midwife

Emergency or urgent situation	Call 111

6-Week Phone call*

Criteria	Action
EPDS-3 ≥ 4	• Phone call to participant to inform of elevated score, which may indicate symptoms of depression. Advise that they she should discuss this further with her LMC/GP. ↓ Phone LMC (if consented) to advise of elevated scores and that they may want to re-administer the EPDS and consider a referral for further evaluation/treatment. If EPDS-3 >5 discuss possible referral to Maternal Mental Health Service. If they are unsure on the process they can consult with [psychiatrist]. If EPDS 4-5 consider referral to a PHO/NGO service. ↓ Send letter to woman & LMC/GP <<letter.doc>>.
If women advises that she requires acute/after hours assistance	Provide Mental Health line number or CATT team number. They may have to leave a message. Also inform LMC/GP.

* Note: At 6 week phone call woman are no longer under the care of LMC and may not be registered with a GP – discuss with woman how we may facilitate access to an appropriate service.

Adjusted EPDS-3 Scores

EPDS-3 scores	0	1	2	3	4	5	6	7	8	9
Adjusted EPDS-3 scores	0	3	7	10	13	17	20	23	27	30