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The prediction of antenatal and postnatal depression in a sample of Western Australian women

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Running head: ANTENATAL AND POSTNATAL DEPRESSION

The Prediction of Antenatal and Postnatal Depression in a Sample of Western Australian Women

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USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

Statement of Confidentiality

Ethical clearance was granted from Edith Cowan University and King Edward Memorial Hospital Ethics' Committees. The confidentiality and privacy of the participants were protected at all times, including all correspondence between myself, research supervisors, and other colleagues. All raw data included in the thesis were scrutinised for information that could render the participant identifiable.

Abstract

In Australia, the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987) has been increasingly used to screen for antenatal depression prior to its evaluation on a sample of Australian pregnant women. Also, the identification of predictors associated with antenatal depression has been neglected relative to the research focus on postpartum depression. An aim of the study was to evaluate the antenatal screening properties of the EPDS against diagnoses of major depression with the Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998). The aims were also to develop predictive models of risk factors associated with antenatal depression as measured by: (a) diagnosis of major depression (MINI); (b) depressive symptoms (EPDS $\geq$ 9); (c) depression false positive results (EPDS $\geq$ 9, but no MINI diagnosis of major depression); and (d) depression level (EPDS total score) in the antenatal and early postnatal period. The study was prospective in design, with 200 women enrolled from Western Australia's largest public maternity hospital. An EPDS $\geq$ 12 was identified to be optimum for the clinical screening of major depression at 32 weeks of pregnancy. The results from the different regression analyses showed that the strongest predictors of antenatal depression were: depression earlier in pregnancy, anxiety, stress, daily hassles, expectations of support, personality traits, and history variables. The findings were in support of routine screening for depression and anxiety during pregnancy, the effects of stress on mood, and the lesser importance of antenatal compared to postnatal variables in accounting for postpartum depression level.

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Submitted: 31st October 2007

Declaration

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Chapter 1

Introduction

Depression is a significant public health problem in Australia, and internationally. Unipolar major depression was ranked as the fourth leading cause of burden among all diseases in the year 2000, and has been projected to become the second leading cause of burden in the year 2020 worldwide by the World Health Organisation based on a trend analysis conducted in 47 countries between the years of 1950 to 1990 (Murray & Lopez, 1997; World Health Organisation, 2001). In Australia, the National Survey of Mental Health and Well-being documents that the one-year prevalence rate of major depression in the adult population is 5.1%, affecting twice as many women as men (Andrews, Hall, Teesson & Henderson, 1999), particularly during the reproductive stage of life from 15 to 45 years (Weissman & Olfson, 1995). Both antenatal and postnatal depression are defined as episodes of unipolar major depression, with onset for the former occurring during any trimester of pregnancy, which may remit prior to childbirth or progress into the postpartum period (Bennett, Einarson, Taddio, Koren & Einarson, 2004). This period from conception, to pregnancy and within the first 12 months after delivery is referred to as the perinatal period (Austin, 2004).

The postnatal period has been recognised as a time of increased vulnerability for women to develop depression (O'Hara, Schlechte, Lewis & Varner, 1991), with prevalence estimates of 10% to 15% in Australia (Astbury, Brown, Lumley & Small, 1994; Dennerstein, Lehert & Riphagen, 1989; Stamp & Crowther, 1993). Consequently, the high prevalence of postnatal depression has been the impetus for numerous studies to be conducted exploring its associated factors and course (Affonso et al., 1991; Glazier, Elgar, Goel & Holzapfel, 2004; O'Hara & Swain,

1996). In contrast, research on antenatal depression has lagged behind. However, the importance of extending the study of depression into pregnancy can also be argued on the basis of its high prevalence, which has been found to be comparable, if not higher than that of postnatal depression (Bennett et al., 2004; Cooper, Campbell, Day, Kennerley & Bond, 1988; Eberhard-Gran, Tambs, Opjordsmoen, Skrondal & Eskild, 2004; Evans, Heron, Francomb, Oke & Golding, 2001; Green & Murray, 1994). Furthermore, the onset of postnatal depression has been found to occur antenatally for a significant proportion of women (Gotlib, Whiffen, Mount, Milne & Cordy, 1989). There is also a high recurrence rate of antenatal depression (Green & Murray, 1994; Marcus, Flynn, Blow & Barry, 2003), with estimates by one Australian study that 42.1% of mothers with antenatal depression developed a recurrence of depression in the first postpartum year (Matthey, Barnett, Ungerer & Waters, 2000). Importantly, the presence of antenatal depression constitutes one of the strongest risk factors for postnatal depression (Beck, 2001; O'Hara & Swain, 1996).

The maternal impacts of antenatal depression are generally less understood, though it has been found to affect maternal health behaviours such as an increased frequency in smoking, alcohol consumption and low weight gain during pregnancy, including poor attendance at antenatal clinics (Zuckerman, Amaro, Bauchner & Cabral, 1989). These behaviours, in turn increase the risk of poorer pregnancy outcomes for the developing foetus, including premature labour and lower infant birth weight, which are considered to be the strongest indicators of infant mortality (Marcus et al., 2003). Significant impacts have also been found for the responsiveness of the baby including inconsolability and excessive crying, with the results from some studies showing antenatal depression to be a predictor of

children's behavioural problems up to eight to nine years of age (Bonari et al., 2004; Luoma, et al., 2001).

The continued impetus into the study of postnatal depression has arisen from the documented impacts not only for the mother, but the family system, particularly on infant development and the opportunity afforded by preventative and early intervention efforts. Postnatal depression for the mother has been associated with the onset of prolonged emotional difficulties up to four years after childbirth (Kumar & Robson, 1984), comorbidity with anxiety symptoms or an anxiety disorder (Matthey, Barnett, Howie & Kavanagh, 2003; Stuart, Couser, Schilder, O'Hara & Gorman, 1998; Sutter-Dallay, Giaconne-Marcesche, Glatigny-Dallay & Verdoux, 2004), and an increase risk of recurrent depression (Cooper & Murray, 1995). A marked deterioration in the marital relationship after childbirth has been found for women with postnatal depression (Cox, Connor & Kendall, 1982) and adverse effects on the partner's mental health (Boath, Pryce & Cox, 1998), including an increased prevalence of depression in partners (Areias, Kumar, Barros & Figueiredo, 1996; Ballard, Davis, Cullen, Mohan & Dean, 1994; O'Hara, 1985). The postpartum period is a crucial time for infant development and the effects of postnatal depression has been implicated in delaying mother-infant attachment, and impeding the emotional, cognitive, social and behavioural development of children in infancy and up to 11 years of age (Grace, Evindar & Stewart, 2003; Hay et al., 2001; Murray, 1992; Sinclair & Murray, 1998).

In 1992, the Commonwealth government in collaboration with the state/territory governments launched the National Mental Health Strategy (1993-1998), a framework for mental health care reform that aimed at improving the lives of Australians affected by psychological disorders, with an emphasis on preventative

intervention, lessening the impact of mental illness, and assuring the rights of those affected. The significance of depression in the community was recognised in the Second Mental Health Strategy (1998-2003) as a National Health Priority Area based largely on the high prevalence of depression and its associated impact and cost to the Australian community. *Beyondblue* was established in the year 2000 to progress the government's national depression initiative over four years across seven States and Territories with the aim of establishing routine screening for antenatal and postnatal depression, and within each state and territory to develop a state based intervention for perinatal depression that focused on early intervention and prevention (beyondblue, 2005). The current study, with its emphasis on antenatal depression was independent, though formulated and conducted under the framework of Western Australia's contribution to *beyondblue.*

The purpose of screening is to identify individuals most at risk of maladjustment, with the expectation that preventative and early intervention efforts can be directed to minimise problem development. The findings from studies have indicated that primary care health professionals fail to diagnose 50% of those with depression, those most at risk tend not to seek help, and the use of self-report measures of depression can improve detection (Marcus, Flynn, Blow & Barry, 2003; Neilsen & Williams, 1980). Evidence has been provided that recognising and intervening in the development of perinatal depression can contribute to better psychosocial outcomes for the mother (Elliot, Leverton, Sanjack & Turner, 2000; Shields et al., 1997; Wickberg & Hwang, 1996). In studies that have screened women based on antenatal risk factors, it has been shown that interventions comprising of supportive, cognitive-behavioural and interpersonal therapy have been efficacious in reducing depressive symptoms, albeit in the short-term (Cooper,

Murray, Wilson & Romaniuk, 2003; Milgrom, Negri, Gemmill, McNeil & Martin, 2005). The problem that remains is the degree of screening accuracy by which self-report measures of depression are able to correctly identify women who are depressed, and their associated risk factors.

The Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987) was originally developed to screen for depressive symptoms in postpartum women as it was found that self-report measures of depression included somatic symptoms typically experienced by postpartum women, but did not necessarily contribute to the clinical presentation of depression in this population. The EPDS has been validated for postpartum use in a number of countries (Benvenuti, Ferrara, Niccolai, Valoriani & Cox, 1999; Berle, Aarre, Mykletun, Dahl & Holsten, 2003; Garcia-Esteve, Ascaso, Ojuel & Navarro, 2003; Guedeney & Fermanian, 1998; Lee et al., 1998; Pop, Komproe & van Son, 1992; Uwakwe, 2003), including Australia (Boyce, Stubbs & Todd, 1993). It however, has only received empirical validation for antenatal use in the United Kingdom on a sample of 100 British women over a decade ago (Murray & Cox, 1996). It remains to be evaluated whether similar results will be obtained for an Australian sample.

The disparity in clinical practice and research is that the EPDS, as a self-report measure of depressive symptoms should be validated on a sample for which it is to be used. There are possible differences arising from the composition of the sample such as results from studies showing cultural variations in the EPDS cut-off score for screening women who are at risk (e.g., Barnett, Matthey & Gyaneshwar, 1999; Guedeney & Fermanian, 1998; Lee et al., 1998; Matthey, Henshaw, Elliot & Barnett, 2006), generational effects such as the trend towards increasing age of first pregnancy which has been shown to heighten the risk of depression (Astbury et al.,

1994; Dennerstein et al., 1989), and local differences in the implementation of the EPDS across hospitals (e.g., differences in administration during the antenatal period and by different health staff). In Australia alone, the *beyondblue* Postnatal Depression (PND) Program has implemented the routine screening of depression using the EPDS across seven States and Territories during pregnancy and after childbirth. The validation of the EPDS has not occurred on an Australian sample of antenatal women, although clinically its use has been widely reported and warranted in the context of the rising prevalence of depression in the community generally (Murray & Lopez, 1997).

There are similarities in the risk factors of antenatal and postnatal depression, particularly relating to indices of social disadvantage and the importance of psychosocial factors, including a prior history of depression, perceived levels of social support, marital dissatisfaction, coping, anxiety, stress, major life events and daily stressors (Affonso et al., 1991; Verkerk, Pop, Van Son & Van Heck; 2003). However, what remains unclear are the relative importance of these various risk factors for antenatal depression, and their relationship with postnatal depression. Of particular clinical utility is the inclusion of psychosocial risk factors, which are potentially modifiable and from an early intervention perspective have the most impact should they be identified early in pregnancy. The *beyondblue* PND Program has developed a screening protocol that is based on a wide range of psychosocial risk factors for perinatal depressive symptoms. The Depression Anxiety and Stress Scales (DASS; Lovibond & Lovibond, 1995a) also enables the contribution of these three affective states to be assessed in the one scale.

The research findings into the risk factors for perinatal depression have been discrepant depending on whether a self-report measure of depression (i.e., EPDS) or

a clinical diagnosis of major depression has been used (Campbell & Cohn, 1991; O'Hara & Swain, 1996). Consequently, there is a need to assess the risk factors of antenatal depression as measured by both a self-report measure of depressive symptoms and a diagnosis of major depression. In previous studies, it has been shown that women who are distressed, but do not necessarily meet the criteria for a diagnosis of major depression nevertheless experience significant social morbidity (Klinkman, Coyne, Gallo & Schwenk, 1998). The false positive rate associated with the use of the EPDS has been reported (women who have elevated EPDS scores, but do not meet a diagnosis of major depression) (Peindl, Wisner & Hanusa, 2004). For effective clinical management, it would be useful to identify the risk factors associated with this subgroup of women who experience distress.

Aims of the Present Study

The first aim of this study was to conduct an antenatal validation of the EPDS against diagnoses of major depression based on a structured diagnostic interview. The antenatal validation will contribute to the perinatal field by providing a recommendation for an optimum EPDS cut-off score for the screening of depressive symptoms in Western Australian women.

The second aim of the study was to determine the strongest predictors from a range of psychosocial variables assessed in the *beyondblue* screening protocol and other measures of affective functioning, particularly of perceived anxiety and stress in the prediction of antenatal depression. In order to address a significant limitation of previous studies, the risk factors will be assessed for both the EPDS as a measure of depressive symptoms and a clinical diagnosis of major depression. This will contribute to knowledge in the perinatal field by identifying a range of psychosocial

risk factors that can be targeted for prevention and early intervention efforts during pregnancy.

The third aim was to identify the risk factors associated with an antenatal false positive result (women with elevated EPDS scores who do not meet a criteria for major depression). This will enable better treatment planning of women who experience significant social morbidity. The fourth aim was to identify the strongest predictors of postpartum depression level using antenatal factors only, postnatal factors, and then the best set of antenatal and postnatal factors. This will allow for the continuity or discourse of risk factors from the antenatal to postnatal period to be assessed.

Chapter Two

Literature Review

The impact of antenatal and postnatal depression is significant and wide ranging, not only for its effects on the mother, but the unborn foetus, developing infant and family system (Bowen & Muhajarine, 2006; Williamson & McCutcheon, 2004). The opportunity for screening and prevention however, is also at its greatest during pregnancy due to women's inevitable contact with obstetric services (Austin, 2003). Postnatal depression has been recognised as a significant public health concern, though this has not yet extended to the recognition of depression in pregnancy.

There has been a number of hypotheses put forth to explain the lack of recognition for the study of depression in pregnancy. These include: (a) popular culture supporting the belief that pregnancy was protective against depression (Bonari et al., 2004); (b) the medical focus on maternal and foetal physical wellbeing (Bowen & Muhajarine, 2006); (c) the misattribution of depressive symptoms to the normal sequelae of pregnancy by women themselves and health professionals (Kelly, Russo & Katon, 2001); (d) the finding that women with depressive symptoms during pregnancy were unlikely to have sought formal treatment (Marcus et al., 2003); (e) the less documented outcomes of antenatal depression compared to postnatal depression (Zuckerman et al., 1989); (f) the presumed lower prevalence of antenatal depression (Cox et al., 1982); and (g) importantly the under-recognition of major nosologic systems for the classification of mental disorders such as the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 2000), which only include the course specifier for major depression with "postpartum onset", thereby neglecting its recognition during pregnancy. The

need to increase the recognition of antenatal depression within the perinatal framework has been strongly evidenced by findings, which highlight its links with poorer pregnancy outcomes (Bonari et al., 2004) and also that antenatal depression presents as one of the strongest risk factors for postnatal depression (Beck, 2001; O'Hara & Swain, 1996).

Antenatal and Postnatal Depression

Onset

Both antenatal and postnatal depression are classified as episodes of unipolar major depression, though with differences in onset. Bennet et al. (2004) in their meta-analysis of 21 studies highlighted that the onset of antenatal depression most commonly occurred in the second and third trimester of pregnancy. However, the authors cautioned that this conclusion might be premature, as few studies had sampled women in their first trimester. They hypothesised that some women did not seek obstetric services until they were further progressed in their pregnancy or those with depressive symptoms may have delayed their obstetric contact (Bennet et al., 2004). The onset of postnatal depression is diagnosed within four weeks of childbirth based on the DSM-IV-TR and within six weeks of childbirth according to the ICD-10. However, in research and clinical practice, it has been found that the onset of postnatal depression can occur within 12 months of childbirth and between 40% to 70% of cases develop in the first three months postpartum (Pope, Watts, Evans, McDonald & Henderson, 2000).

Assessment

The assessment of antenatal and postnatal depression is similar to that of depression occurring at other times in the lifespan. Hence, a diagnosis of depression includes core symptoms of either depressed mood and/or a loss of interest in usual

activities for a two-week period, with at least four accompanying symptoms of significant change in weight or appetite, sleep, psychomotor activity, fatigue or loss of energy, feelings of worthlessness or guilt, deceased ability to think clearly, or thoughts of death or suicide (DSM-IV-TR, American Psychiatric Association, 2000). Standardised interviews that assess for antenatal and postnatal depression typically include modifications to items pertaining to appetite, weight and sleep to ensure these symptoms are differentiated from clinical depression compared to changes expected of pregnancy and postpartum adjustment (Affonso, Lovett, Paul & Sheptak, 1990).

The range of standardised interviews that are used to diagnose major depression during the antenatal and postnatal period include the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978) based on Research Diagnostic Criteria (RDC; Spitzer, Endicott & Robins, 1978), the Structured Clinical Interview for DSM Diagnosis (SCID; Spitzer, Williams, Gibbon & First, 1992), the Standardised Psychiatric Interview (SPI; Goldberg, Cooper, Eastwood, Kedward & Shepherd, 1970), and the Composite International Diagnostic Interview (CIDI; World Health Organisation, 1990). Diagnostic criteria specify that symptoms of depression must be present for a minimum amount of time (e.g., at least a week for RDC) and with endorsement of disrupted role functioning in women's occupational, social and/or interpersonal relationships.

A diagnosis of antenatal or postnatal depression has been compounded by the symptom overlap between the normative physiological changes of pregnancy and postpartum adjustment with depressive symptoms. For example, Hopkins, Campbell and Marcus (1989) demonstrated that somatic symptoms such as sleep disturbance and loss of sexual interest were commonly experienced with postpartum women who

were depressed and non-depressed ($N = 49$). These results were replicated with a larger sample ($N = 1,033$) by Campbell and Cohn (1991) who showed the lack of specificity with somatic symptoms such as decreased appetite, increased fatigue or sleep disturbance among postpartum women who were depressed and non-depressed. The authors indicated that cognitive and affective symptoms of depression such as loss of energy, difficulty concentrating and loss of interest in the usual activities showed better discriminant validity among postpartum women who were depressed and non-depressed (Campbell & Cohn, 1991).

In contrast to diagnostic assessment, studies in the perinatal field have typically included self-report measures of depression that are based on the number and severity of symptoms endorsed (e.g., Evans, Heron, Francombe, Oke & Golding, 2001). Cut-off scores on these self-report scales are used to identify women with probable depressive symptoms who require further diagnostic assessment. The symptoms assessed in these self-report measures of depression do not necessarily correspond to a diagnosis of major depression due to the potential heterogeneity of symptoms that can be measured. Nevertheless, the use of above cut-off scores in self-report measures of depression is still indicative of a significant degree of social morbidity experienced by women (Klinkman et al., 1998). Those primarily used in the perinatal research include the EPDS, the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock & Erbaugh, 1961), the General Health Questionnaire (GHQ; Goldberg & Williams, 1988), the Depression Adjective Checklist (DACL; Lubin, 1965), and the Symptom Checklist (SCL-90R; Derogatis, 1983). Further, only a moderate level of concordance has been observed between self-report measures of depression and standardised diagnostic interviews (Campbell & Cohn, 1991). For example, prevalence rates based on self-report measures of depression tend to be

higher than those obtained from diagnostic assessments of depression. Also, differences have been found in the risk factors of depression depending on whether self-report measures of depression or diagnostic interviews of major depression have been employed (O'Hara & Swain, 1996).

Clinical Presentation

The symptom profiles of antenatal and postnatal depression are similar to episodes of depression occurring at other times in the lifespan, though differences have emerged for severity, symptom frequencies and their associated risk factors (O'Hara, Zekoski, Philipps & Wright, 1990). There is stronger evidence to suggest that episodes of postnatal depression are mild in severity when compared with depression occurring at other times (Whiffen & Gotlib, 1993). Whiffen and Gotlib (1993) assessed women who met criteria for a diagnosis of depression in the postpartum period and found they more frequently scored in the mild range of severity on the BDI than non-postnatal women who scored in the moderate range. The authors did not find rates of major and minor depression diagnoses to differ significantly between the two groups, though results from other studies have suggested an elevation of minor depression in the postpartum period (Terry, Mayocchi & Hynes, 1996). There has been less reported suicidal ideation in the perinatal period when compared with depression at other times, though a higher incidence of reported feelings of guilt, particularly about the mother's inability to care for her child and heightened levels of fatigue (Pope et al., 2000). Differences have also been found in the risk factors for antenatal and postnatal depression, which relate to the changing demands of pregnancy and parenthood (Affonso et al., 1991).

Prevalence

Various factors affect the differences observed in the prevalence of antenatal and postnatal depression across studies. These include the method of assessment (e.g., self-report measures versus diagnostic interviews), the cut-off score used to define probable depression for self-report measures, time interval sampled (e.g., trimester of pregnancy or weeks postpartum), type of design (e.g., prospective or retrospective), method of recruitment (e.g., enhanced or random sampling for women with probable depression), and the characteristics of the sample (e.g., hospital or community based, heterogeneity of sample demographics and psychosocial risk factors) (Bennett, Einarson, Taddio, Koren & Einarson, 2004; O'Hara & Swain, 1996).

The prevalence of antenatal depression has been found to be at least comparable, if not higher than postnatal depression (Bennett et al., 2004; Cooper et al., 1988; Evans et al., 2001; Gotlib et al., 1989; Green and Murray, 1994; Josefsson, Berg, Nordin & Sydsjö, 2001). A pivotal study, the Avon Longitudinal Study of Parents and Children, which involved 9,028 women in England reported the prevalence of depressive symptoms as indexed by EPDS $\geq$ 13 to be 11.8% at 18 weeks gestation, 13.6% at 32 weeks gestation, 9.2% at eight weeks postpartum, and 8.1% at eight months postpartum (Evans et al., 2001). This study was significant in highlighting that depressed mood was more common during pregnancy than after childbirth, and indicative of higher levels of distress among pregnant women than previously recognised. The findings from another significant study, the Cambridge Prenatal Screening Study involving 1,272 women also found rates of antenatal depression (12% at 35 weeks of pregnancy) to be at least comparable to postnatal depression (14% at six weeks postpartum) using the EPDS (Green & Murray, 1994).

Bennett et al.'s (2004) meta-analysis examined the prevalence rates of antenatal depression from 1986 to 2002 based on 21 studies from 13 countries and reported prevalence rates of 7.4%, 12.8% and 12% for the first, second and third trimesters of pregnancy, respectively. These high rates of prevalence underscore the importance of extending the study of depression into the antenatal period and not solely the postpartum period.

O'Hara and Swain's (1996) meta-analysis consisted of 59 studies conducted worldwide (N = 12, 810) and reported a higher prevalence of postnatal depression of 14% from studies that had utilised self-report measures compared to 12% from those based on diagnostic interviews. O'Hara and Swain (1996) found that the length of the postpartum period under evaluation and the method of assessment constituted the two most important factors affecting prevalence estimates across studies. Specifically, higher prevalence estimates were reported when shorter postpartum periods were studied, and when self-report measures of depression instead of diagnostic interviews were utilised (O'Hara & Swain, 1996).

Course and Recurrence

Studies that have examined the recurrence of depression in the antenatal period are limited. However, one large community study conducted by Marcus et al. (2003) found that 42.6% (n = 398) of their sample with a lifetime history of major depression (n = 958) had exhibited depressive symptoms at 25 weeks of pregnancy. These rates of recurrence were retrospectively measured and limited to a single assessment during pregnancy. More longitudinal, prospective designs are required for firmer conclusions to be drawn about the recurrence of antenatal depression during the index pregnancy or with subsequent pregnancies.

However, it is known that a substantial proportion of women with antenatal depression will later develop postnatal depression (Gotlib et al., 1989; Green & Murray, 1994). Green and Murray (1994) in their longitudinal study found that 42% of women with elevated depressive symptoms on the EPDS at 35 weeks of pregnancy also reported elevated depressive symptoms at six weeks postpartum. Gotlib et al. (1989) confirmed these findings by showing that one-third of their sample who met diagnostic criteria for major depression during pregnancy were also diagnosed with depression in the postpartum. Whether these women experienced depressive symptoms for a portion of time during their pregnancy, or entire pregnancy remains to be investigated using prospective designs with repeated measurements during pregnancy. For a significant proportion of women, it is clear that antenatal depression can extend into the postpartum period. Women who experience recurrent depression are at increased risk for a poorer prognosis (Rubertsson, Waldenström, Wickberg, Rådestad & Hildingsson, 2005).

Peindl et al. (2004) analysed the recurrence of postnatal depression using a double-blind, randomised clinical trial. They reported a high recurrence rate of 40% (n = 20) for major depression within the first postpartum year, with onset for 26% (n = 13) of women occurring in the first 20 weeks postpartum after delivery. The strength of Peindl et al.'s (2004) study was that depression during the index pregnancy was controlled, however the results were only generalisable to women with a previous history of postpartum depression as only high risk women were sampled. Together, the results of these studies indicate that the recurrence for antenatal depression, and in particular for postnatal depression is high to warrant further study into its risk factors to prevent long-term negative sequelae.

Diathesis-Stress Vulnerability Framework

The context of pregnancy, childbirth and the early postpartum period represent developmental phases in the major life event of becoming a mother. There is a multitude of associated emotional, social role, relational, psychological, physical and biological changes during this life transition. The study of risk factors for antenatal and postnatal depression is consistent with a diathesis-stress framework (O'Hara et al., 1991). The diathesis refers broadly to a predispositional factor or set of factors whether biological or psychological (e.g., cognitive, interpersonal variables) that predisposes an individual to developing a disorder. The stress refers to the environmental event (stressor) that is perceived by an individual as threatening to their wellbeing and exceeding their capacity to cope. The main proposition of a diathesis-stress framework or its variants (e.g., stress-coping models) is that the development of a disorder such as depression requires an interaction of both diathesis and stress (Ingram & Luxton, 2005). According to this framework, pregnancy or childbirth is viewed as a major life event or psychosocial stressor that interacts with an individual's vulnerability to predict depression (Boyce, 2003). Unlike most other types of major life events (e.g., death, divorce, job loss) pregnancy and childbirth when conceptualised as a stressor can be studied prospectively given its discrete timing.

Numerous investigators have tested the diathesis-stress model in understanding the aetiology of postnatal depression, and have highlighted the importance of various diathesis-stress relationships (Gotlib et al., 1991; O'Hara et al., 1991). In O'Hara et al.'s (1991) case control study of childbearing and non-childbearing women, it was demonstrated that the interaction between women's depression vulnerability, particularly a past history of depression and dysphoric

mood during pregnancy, with the occurrence of stressful life events associated with childbearing (obstetric complications) and early childcare stressors contributed significantly to the development of postpartum depression. Their diathesis-stress model accounted for 50% of the variance in postpartum depression level and 40% of the variance in postpartum depression diagnosis (O'Hara et al., 1991).

Grazioli and Terry (2000) tested a diathesis-stress component in two cognitive theories of depression for new postpartum mothers. In support of a cognitive vulnerability and stress model, it was found that dysfunctional attitudes concerning new motherhood, combined with high levels of parental stress associated with the new tasks of motherhood increased women's vulnerability to postpartum depression. Other investigators have also acknowledged the importance of cognitive variables and coping resources in the diathesis-stress interaction (Affonso et al., 1991; Terry, Mayocchi & Hynes, 1996). Diathesis-stress models have great utility for the conceptualisation of risk factors and their role in the aetiology of perinatal depression. However, the interrelationships between risk factors, particularly those measuring the diathesis-stress interaction that is implicated in diathesis stress models have been infrequently studied (e.g., O'Hara et al., 1984).

Risk Factors

Risk factors refer to those conditions and/or characteristics that are associated with an individual's likelihood of developing a particular disorder relative to another individual selected randomly from the general population (Pope et al., 2000). The identification of risk factors associated with antenatal and postnatal depression does not imply a causative relationship. It does however, assist towards identifying those women who are at higher risk of perinatal depression and the associated factors, which may be targeted for prevention and early intervention efforts to reduce long-

term negative sequelae. Of importance would be the focus on psychosocial risk factors such as perceived anxiety and stress, social support, and expectations of coping with the baby that may be more amenable to treatment rather than static factors such as demographic variables and history of depression, which would more readily contribute towards the screening of women most at risk.

The research into the risk factors of antenatal depression has lagged behind to that of postnatal depression. The focus has been on the identification of factors in the antenatal period that have contributed towards the prediction of depression in the postpartum period rather than to antenatal depression as a significant health problem in its own right. The delineation of factors, which are associated with antenatal depression and its continuity or discourse with postnatal depression, would make an important contribution towards clarifying the aetiology of both disorders.

Socio-demographic Variables

The importance of socio-demographic variables in the prediction of antenatal and postnatal depression have been mixed in findings (Affonso et al., 1991; Da Costa, Larouche, Dristsa & Brender, 2000; Gotlib et al., 1989; Murray, Cox, Chapman & Jones, 1995). Da Costa et al. (2000) in their prospective study did not find a relationship with maternal age, income, years of education and parity among women with depressed mood only in pregnancy compared to those who were only depressed in the postpartum and a control group who were not depressed during either period. These findings were consistent with Affonso et al.'s (1991) prospective study, which showed that age and years of education did not contribute significantly to depressive symptoms across each trimester of pregnancy with the inclusion of psychosocial variables.

Both these studies were limited in generalisability as they consisted of homogenous samples of women who were predominantly from a middle-class background, well educated, and were married or in a stable relationship. Population based studies that have included large samples and women from a heterogenous background have found younger age (e.g., less than 25 years), being single, and particularly indices of lower socio-economic status (e.g., family income, unemployment, education) to be more consistently associated with antenatal depression than parity (Field, Hernandez-Reif & Diego, 2006; Glazier et al., 2004; Green & Murray, 1994; Rubertsson, Waldenström & Wickberg, 2003; Rubertsson, et al., 2005).

Similarly, indicators of low socio-economic status such as maternal unemployment following maternity leave, unemployment in the head of the household or lower paternal occupational level (Campbell & Cohn, 1991; Warner, Appleby, Whitton & Faragher, 1996), lower occupational status and lower income (Bernazzani, Saucier, David & Borgeat, 1997), including lower levels of education (Tammentie, Tarkka, Åstedt-Kurki & Paavilainen, 2002) are most consistently associated with postnatal depression. O'Hara and Swain's (1996) meta-analysis reported a small effect size ($r = 0.2$) between less family income and lower occupational status with postnatal depression. This has also been confirmed by the findings of Beck's (2001) meta-analysis of eight studies, which examined the risk factor of socio-economic status ($r = 0.19 - 0.22$) with postnatal depression. It can be concluded that the effects of low socio-economic status has a stronger relationship with the occurrence of both antenatal and postnatal depression than other socio-demographic variables such as parity and age, though overall the effects are low relative to the importance of other psychosocial variables.

Maternal Physical Health and Obstetric Factors

The contribution of maternal physical health problems to the prediction of antenatal depression is tentative due to the scarcity of studies that have assessed this factor. Green and Murray (1994) reported that self-ratings of physical wellbeing during each trimester of pregnancy significantly distinguished among mothers with depressive symptoms in pregnancy compared to those without depression in either the antenatal or postnatal period. Rubertsson et al. (2005) found that physical health problems such as headaches, back pain, stomach aches and nausea identified early in pregnancy constituted a main risk factor to the prediction of antenatal depressive symptoms. The authors identified that maternal physical health in combination with social disadvantage, social isolation, and stressful life events were linked to the onset of depressive symptoms during pregnancy, which persisted to the postpartum period. Despite Rubertsson et al.'s (2005) use of a national cohort ($N = 2,674$) in their study, they did not assess for the importance of a history of depression or other psychiatric problems, and hence whether the effects of maternal physical health will hold in significance with antenatal depression requires further study.

Johnstone, Boyce, Hickey, Morris-Yates and Harris's (2001) Australian study of 490 women at eight weeks postpartum demonstrated that obstetric factors such as pregnancy complications and the mode of delivery did not contribute significantly to postnatal depression, as measured by the EPDS ≥ 13. Other studies that have also used the EPDS have yielded consistent results (Tammentie et al., 2002; Warner et al., 1996). In contrast, Campbell and Cohn (1991) in their sample of 1,033 women at six to eight weeks postpartum found that women diagnosed with postnatal depression were more likely to report minor pregnancy or delivery complications.

O'Hara and Swain's (1996) meta-analysis reported a small effect size between obstetric complications and postnatal depression ($r = 0.13$), with a weaker association found in studies, which had used a clinical diagnosis of depression compared to a self-report measure of depression. This difference was observed regardless of when depression was measured during the postpartum period. The results from other studies indicated that women's perception or subjective experience of pregnancy and delivery constituted a more important factor in postnatal depression than the obstetrical event (Righetti-Veltema, Conne-Perréard, Bousquet & Manzano, 1998). It would appear that obstetric factors play a minimal role in the prediction of postnatal depression, though the results have been inconsistent due largely to the different types of measures employed and the exclusion of other key risk factors.

Major Life Events, Daily Stressors and Perceived Stress

Stress is best conceptualised as a multidimensional construct. Lazarus and Folkman's (1984) transactional model of stress distinguishes between stress-provoking factors (e.g., life events, daily hassles), stress-mediating or moderating factors (e.g., social support), and stress resulting factors (e.g., perceived distress). The contribution of major life events that can precede or occur during pregnancy such as separation, unemployment, physical illness, and bereavement have been found to predict antenatal depression (Bernazzani, et al., 1997; Glazier et al., 2004; Rubbertsson et al., 2003; Rubertsson et al., 2005). The results from these studies highlight that the contribution of negative major life events to antenatal depression has tended to be small. For example, Bernazzani et al. (1997) reported that only 11% of the unique variance of antenatal depressive symptoms was attributable to life events. Further, these studies have been limited in their measurement of life events,

which have been retrospectively measured at one assessment point during pregnancy. This can increase the potential of biased recall by women with depressive symptoms.

The utility of life event measures has been criticised for its insufficient occurrence during pregnancy to ensure its adequate assessment. The measurement of major life events does not take into consideration the effects of chronic stress or daily hassles, which are proximal measures of stress and have been linked to the occurrence of antenatal depression. A small study (N =100) by Da Costa et al. (2000) has shown that daily hassles in areas of work, health, family, friends and the environment were the most significant factor, contributing 17% to the unique variance of depressed mood during pregnancy. These findings are consistent with a much larger study (N = 810) conducted by Field et al. (2006). These two studies however, did not include the contribution of both specific life events and daily hassles for a more accurate assessment of stress-provoking events related to depression during pregnancy.

O'Hara and Swain's (1996) meta-analysis of 15 studies reported a strong relationship between life events during pregnancy and postnatal depression (r = 0.29). The strength of this relationship was confirmed by Beck (2001) in her meta-analysis of 16 studies, which examined life stress with postnatal depression (r = 0.38 – 0.40). Eberhard-Gran, Eskild, Tambs, Samuelsen and Opjordsmoen (2002) found in their population based study that both postpartum and non-postpartum women with depression reported significantly more negative/stressful life events during the last 12 months. The findings from other studies have reported the importance of childcare related stressors such as problems feeding the baby in the prediction of postnatal depression (Honey, Morgan & Bennett, 2003; O'Hara, 1986).

In O'Hara et al.'s (1991) case-control study, the importance of stressful life events during pregnancy, childcare related stressors since delivery, and peripartum stressful events were reported to predict diagnoses of major depression for childbearing women at nine weeks postpartum compared to non-childbearing women. There is also evidence that everyday stressors or daily hassles are linked with the occurrence of postnatal depression (Hall, Kotch, Browne & Rayens, 1996; Powell & Drotar, 1992), particularly those involving interpersonal conflicts or tensions having the most impact on daily mood (Bolger, DeLongis, Kessler & Schilling, 1989). These findings highlight the importance of stress, as conceptualised by major life events, daily hassles and perceived stress in the prediction of antenatal and postnatal depression. It would be important to assess each of these dimensions in studies of perinatal depression.

Marital Relationship

The state of the marital relationship has been consistently found to be a risk factor for postnatal depression. Beck's (2001) meta-analysis of 14 studies reported a moderate effect size between marital adjustment and postnatal depression ($r = 0.39$). In O'Hara and Swain's (1996) meta-analysis, it was highlighted that the strength of the relationship between marital adjustment and postnatal depression varied according to the assessment method. A stronger association between the marital relationship and the incidence of postnatal depression was demonstrated when marital satisfaction was assessed by standardised self-report measures such as the Dyadic Adjustment Scale (DYAS; Spanier, 1976) than by interviews or global rating scales (e.g., five-point rating scale). The findings from other studies have reported that postnatal depression can develop in women with marital difficulties occurring after delivery (Cox et al., 1982; Eberhard-Gran et al., 2002), and also in women with

lower levels of marital satisfaction during pregnancy (Gotlib, Whiffen, Wallace & Mount, 1991).

Social Support

Women's perceived levels of social support, particularly from their partner has been identified as a consistent risk factor for antenatal depression (Affonso et al., 1991; Demyttenaere, Lenaerts, Nijs, & Van Assche, 1995; Glazier et al., 2004; Green & Murray, 1994; O'Hara, 1986; Rubertsson et al., 2003; Rubertsson et al., 2005). The importance of social support has been recognised as a protective or mediating factor against stress, and these effects have also been demonstrated during pregnancy (Glazier et al., 2004). Glazier et al. (2004) used structural equation modelling to demonstrate that perceived levels of social support from the partner, friends or family mediated the effects between stress and emotional distress, so that women who reported lower levels of social support in the face of negative life events and partner conflict reported higher levels of depression and anxiety than those with high support during pregnancy.

Rubertsson et al. (2003) identified a lack of support, particularly from the partner during pregnancy as the most significant risk factor for antenatal depressive symptoms in both primiparous and multiparous women. For multiparous women, it was the anticipation of having no support from persons other than the partner that emerged as most significant, which was likely to be related to women's greater awareness of the needs for social support during the perinatal period. Rubertsson et al. (2005) extended their earlier study (Rubertsson et al., 2003) by showing that women who reported depressive symptoms in both the antenatal and postnatal period had similar risk factors to those that reported depressive symptoms in the postnatal

period only, though their symptoms were amplified and they reported less support from their partner and other persons.

In a small study (n = 50), Demyttenaere et al. (1995) highlighted the importance of women's coping style, which was conceptualised as a personality trait in mediating reports of social support. An interaction was found between women with higher support seeking from family and friends, who were more satisfied with the support received from their partner compared to those with a lower support seeking style, who sought less support from family and friends and also evaluated the support from their partner as less satisfactory (Demyttenaere et al., 1995). Whether it is perceived social support or the actual level of support received that is predictive of antenatal and postnatal depression has not been widely studied. However, it is not the actual size of the support network that is predictive of women's depression level, but the perception of the quality of support received that is important (Collins, Dunkel-Schetter, Lobel & Scrimshaw, 1993). Cutrona and Troutman (1986) reported that ratings of social support made by someone other than the target individual were more predictive of postpartum depression, which suggests the potential of biased recall among women with depressive symptoms.

Social support also has an impact on postpartum adjustment and has been measured by women's available support networks and her perceived levels of practical and emotional support. O'Hara and Swain's (1996) meta-analysis obtained a strong effect size between overall low social support and postnatal depression (r = -0.30), and a moderate effect size between low support from the baby's father and postnatal depression (r = -0.25). These findings are consistent with Beck's (2001) meta-analysis of 27 studies that yielded a moderate relationship between social support and postnatal depression (r = 0.36 – 0.41). In Webster, Linnane, Dibley and

Pritchard's (2000) Australian study of 574 women, it was found that low support from family and friends during pregnancy was significantly associated with postnatal depression, as assessed by the EPDS $\geq$ 13 at four months postpartum.

Similarly, Terry, Mayocchi and Hynes (1996) highlighted the importance of available family support and maternal self-esteem, particularly within the context of caring for a temperamentally difficult infant, as coping resources to protect against developing postnatal depression. In Bernazzani et al.'s (1997) study, a path analysis was conducted to explore a multifactorial model of postnatal depression. It was found that satisfaction with social support and conflicting interpersonal relationships during pregnancy had an indirect effect on the level of postnatal depression. Specifically, these factors were likely to exacerbate antenatal depression, thereby impacting on the level of postnatal depression (Bernazzani et al., 1997). The inclusion of social support, particularly from the partner relationship would be an important predictor in the relationship with antenatal and postnatal depression.

Antenatal Depression and History of Depression

The presence of depression in pregnancy constitutes one of the strongest risk factors for postnatal depression, and also that depression earlier in pregnancy is predictive of depression later in pregnancy (Affonso et al., 1991; Verkerk et al., 2003). In Verkerk et al.'s (2003) study, it was found that depressive symptomatology at 25 weeks of pregnancy, as measured by the EPDS $\geq$ 12 was associated with increased risk for a diagnosis of major or minor depression according to the RDC at 32 weeks of pregnancy. Affonso et al. (1991) reported that the initial level of depressive symptoms, as measured by the SCL-90 at 10 to 14 weeks of pregnancy was a stronger predictor of subsequent depression in the second and third trimester of

pregnancy than during the three postpartum assessments occurring up to 14 weeks after delivery.

Affonso et al. (1991) found that depression in pregnancy, as a predictor decreased in importance over the period of postpartum adjustment assessed. As the postpartum period evolved, other psychosocial factors increased in importance. In particular, women's negative thought patterns relating to their ability to manage the demands of pregnancy and motherhood were a consistent predictor of the severity of depressive symptoms. Affonso et al.'s (1991) study was limited in its generalisability as it only included married, primigravida women with no prior history of depression, and insufficient numbers to assess women with a diagnosis of major depression. Nevertheless, Affonso et al.'s (1991) use of a prospective longitudinal study enabled the assessment of changes in predictors over the course of pregnancy and postpartum adjustment. The findings clearly demonstrated that the changes in predictors were consistent with the different developmental tasks encountered by women during the perinatal period (e.g., changes in body function during pregnancy, assuming the parental role).

The interrelationships among predictors of depression in pregnancy have scarcely been examined. In Bernazzani et al.'s (1997) study, path analysis was performed to determine the direct and indirect effects of the level of depression symptoms in 213 women during the second trimester of pregnancy, as measured by the BDI. Bernazzani et al. (1997) found that five variables had a direct effect on the level of depression in pregnancy including lower internal locus of control, lower satisfaction regarding social support, conflicting interpersonal relationships, stressful life events, and personal psychiatric history, which accounted for 38% of the variance in the level of depression during pregnancy. In turn, it was reported that the

level of depression in pregnancy showed the strongest direct association with the level of depression in the postpartum period (Bernazzani et al., 1997).

In O'Hara and Swain's (1996) meta-analysis, it was reported that a strong relationship existed between a mother's psychiatric history and postnatal depression ($r = 0.27$), and also a strong relationship between depressed mood during pregnancy and postnatal depression ($r = 0.35$). These findings were consistent with Beck's (2001) meta-analysis, which showed that antenatal depression was one of the strongest predictors out of 13 significant predictors for postnatal depression ($r = 0.44 - 0.46$). Beck (2001) also confirmed a moderate effect size between a history of depression (i.e., prior to pregnancy) and postnatal depression ($r = 0.38 - 0.39$). Honey et al. (2003) conducted a longitudinal study of 223 women to evaluate a transactional model of stress-coping and postnatal depression. It was demonstrated that depression vulnerability, as measured by a prior history of depression and antenatal depressive symptoms at 34 weeks of pregnancy, together accounted for 23% of the variance in postnatal depression at six weeks postpartum (Honey et al., 2003).

Verkerk et al.'s (2003) population based prospective study in the Netherlands reported that a personal history of depression and/or depressive symptomatology during pregnancy were each independently related to the risk of postnatal depression at 12 months postpartum. Dennerstein et al. (1989) conducted an international collaborative study, which included a sample from Australia, the Netherlands and Italy and found that the strongest predictor of postnatal depression was the level of depressive symptoms during pregnancy. It is clear that antenatal depression can be recurrent during pregnancy and presents as one of the strongest risk factors for postnatal depression.

Comorbidity of Depression and Anxiety

The comorbidity of depression and anxiety during pregnancy has been increasingly studied, with findings from several studies documenting a strong concurrent association similar to that found in the general population (Heron et al., 2004; Sutter-Dallay et al., 2004). Heron et al. (2004) reported a strong association between depression and anxiety symptoms both in pregnancy and the postpartum period, ranging from $r = 0.74$ at 18 weeks gestation to $r = 0.77$ at eight months postpartum. Sutter-Dallay et al. (2004) found that women who were diagnosed with an anxiety disorder during pregnancy were four times more likely to have a co-occurring diagnosis of major depressive disorder than those with an anxiety diagnosis. The findings from studies which document the high comorbidity of depression and anxiety disorders in the general population indicate increased rates of disability associated with the presence of comorbidity than when either disorder occurs alone (Sartorius, Ustun, Lecrubier & Wittchen, 1996). The results of these studies highlight the importance of including anxiety as a predictor or correlate of depression in antenatal women.

The findings from some studies have shown that anxiety during pregnancy is predictive of postnatal depression (Beck, 2001; Heron et al., 2004; Sutter-Dallay et al., 2004). Beck's (2001) meta-analysis of four studies yielded a moderate effect size between prenatal anxiety and postnatal depression ($r = 0.41 - 0.45$). Sutter-Dallay et al. (2004) found that women who met diagnostic criteria for an anxiety disorder in the third trimester of pregnancy were 2.6 times more likely than those without an anxiety disorder to develop postnatal depression symptoms, as indexed by the EPDS ≥ 13 at six weeks postpartum. Heron et al. (2004) demonstrated the increased likelihood of women with anxiety symptoms at 18 weeks gestation, and particularly

at 32 weeks gestation for postnatal depression symptoms both at eight weeks and eight months postpartum, even after controlling for depressive symptoms in pregnancy.

The tripartite model proposed by Clark and Watson (1991) contribute towards clarifying the relationship between symptoms of depression and anxiety, particularly in relation to the comorbidity of these two disorders, and their association with stress. It is also consistent with the theoretical basis of the DASS, which discriminates between these three common affective states in the one scale. The tripartite model is an affect-based model, which states that depression and anxiety have both unique and common features (i.e., specific and non-specific factors). Depression is uniquely characterised by low positive affect and anhedonia, whereas anxiety is uniquely characterised by somatic tension and hyperarousal. Both depression and anxiety share a common dimension of general distress or negative affect. Stress is conceptualised as a common factor related to both depression and anxiety, though also with its own unique and shared variance to general distress. According to the model, measures of depression should ideally assess specific symptoms of anhedonia, as well as nonspecific symptoms related to negative affect, but not physiological arousal. Similarly, measures of anxiety should assess physiological arousal and negative affect, but not anhedonia. Findings from several studies are consistent with the propositions of the tripartite model (e.g., Watson, Clark et al., 1995; Watson, Weber et al., 1995).

Childhood Abuse

A history of childhood abuse has also been identified as a strong risk factor for postpartum depression (Buist, 1998; Buist & Janson, 2001), although this has not been widely studied most likely due to the sensitivity of the topic. Buist's (1998)

Australian study comprised of 56 women who were admitted to an inpatient mother-baby unit with a diagnosis of major depression or adjustment disorder when their infants were on average, 4.4 months old. Buist (1998) reported that women with a history of childhood abuse (n = 37; sexual, physical or emotional abuse) exhibited more severe depressive symptomatology, as measured by the BDI than women without abuse histories (n = 19). In the three-year follow-up study, Buist and Janson (2001) reported that women with a history of childhood sexual abuse had higher depression and anxiety scores, as well as more life stresses than those without an abuse history. The generalisability of these findings is tentative, as Buist's (1998) inpatient sample was biased towards more severe psychopathology and risk factors. It does, however highlight the need for further research into the role of childhood abuse in the development of perinatal depression, particularly in a community sample.

Personality Traits

There is increasing evidence to support the contention that vulnerable personality traits such as neuroticism or negative emotionality may be linked to postnatal depression (O'Hara & Swain, 1996; Lee, Yip, Leung & Chung, 2000). A negative cognitive style has also been associated with postnatal depression (Affonso et al., 1991; O'Hara, Rehm & Campbell, 1982), which is consistent with cognitive theories that suggest an individual's thinking processes contribute to the onset and maintenance of depression occurring at other times. Others highlight the importance of self-esteem as a protective factor against postnatal depression (Beck, 2001). Hall et al. (1996) in their study of 738 mothers of predominantly high-risk infants (e.g., infants with biomedical risk such as low birth weight and/or maternal social risk such as substance dependency) found that mothers with low self-esteem were 39 times

more likely than those with high self-esteem to report depressive symptoms at one to two months postpartum. Further, it was shown that self-esteem mediated the effects of everyday stressors and the quality of the primary intimate relationship on postnatal depression (Hall et al., 1996).

Da Costa et al. (2000) suggested that low mood during pregnancy was related to a higher level of daily hassles, together with personality characteristics of low self-confidence, not being easygoing and high emotional coping. However, depressed mood in the postpartum period was only predicted by depressed mood in pregnancy and maternal ratings of infant temperament, and not by daily hassles, personality characteristics or coping style (Da Costa et al., 2000). Given the small sample size, the differentiation of women who were only depressed in pregnancy compared to those who continued to be depressed in the postpartum could not be assessed. The inclusion of selected personality traits would be useful in assessing its association with antenatal and postnatal depression.

Relative Importance of the Various Risk Factors

Of the socio-demographic risk factors there is stronger evidence of the importance of lower socio-economic status with the onset of both antenatal and postnatal depression, as indicative of a range of social disadvantages faced by women and their families (Beck, 2001; Field et al., 2006). However, the relative importance of socio-demographic variables and that of maternal physical health during pregnancy and obstetric factors is low when compared to the influence of other risk factors. These primarily relate to the importance of psychosocial risk factors in association with the onset and maintenance of depressive symptoms from the antenatal to postnatal period (Affonso et al., 1991).

The psychosocial risk factors for postnatal depression are well established and include the contribution of stress as measured by major life events, daily stressors and perceived stress, lack of social support, particularly from the partner, a prior history of depression and anxiety (O'Hara & Swain, 1996). These psychosocial risk factors have been implicated in the onset of antenatal depression, though they have scarcely been investigated in combination to assess its relative contribution. The influence of the early childhood environment such as the experience of childhood abuse, and personality traits which are indicative of cognitive style and levels of coping have been less well established in the prediction of antenatal and postnatal depression (Buist & Janson, 2001; Da Costa et al., 2000).

Limitations of the Research on Risk Factors

There are a number of limitations of the research into the risk factors for both antenatal and postnatal depression. Austin and Lumley (2003) in their review conclude that the low prediction of antenatal screening measures for perinatal depression was related to the exclusion of key risk factor domains in some studies. They emphasised the inclusion of risk factors of personality characteristics, maternal history of depression and childhood abuse, and the significance of postnatal events such as the birth experience, postpartum blues, an unsettled baby, and lack of support when home with the baby in future studies (Austin & Lumley, 2003). It would therefore be important to assess a broad range of risk factors that have been identified in research as contributing to the prediction of perinatal depression.

The various risk factors have not been adequately sampled across the perinatal period, which can serve to clarify the aetiology of both antenatal and postnatal depression. The finding that depression during pregnancy and/or a prior history of depression is predictive of postnatal depression has important aetiological

significance in that it directly challenges the construct validity of postnatal depression (Da Costa et al., 2000; O'Hara, Neunaber & Zekoski, 1984). It is generally accepted that the aetiology of postnatal depression is multifactorial involving complex interactions among psychological factors, hormonal changes and social variables, though there has been much debate regarding its existence as a unique disorder (Whiffen, 1992). There are two schools of thought; one advocating the distinct diagnosis of postnatal depression and the other, its equivalence to depression occurring at other times including antenatal depression. The term "postnatal" implies that the onset of depression occurs after childbirth, rather than during pregnancy. There is increasing evidence to document that the population of women who develop depression after childbirth subsumes two distinct subgroups: those for whom depression is a new onset where childbirth represents a specific stressor and those for whom depression is a recurrent episode where childbirth is a non-specific stressor (Cooper & Murray, 1995). O'Hara (1986) examined changes in risk factors across the perinatal period, and suggested different aetiological factors to account for antenatal and postnatal depression, and this is consistent with findings from several other studies (Gotlib et al., 1989; Ross et al., 2004). Different causative relationships for depression in pregnancy and the postpartum period could be one explanation for the low success of studies to predict antenatally those women who will develop depression (Appleby, Gregoire, Platz, Prince & Kumar, 1994).

The relative importance of various predictors for antenatal depression can result from differences in the measures used to index depression, as ascertained by O'Hara and Swain's (1996) meta-analysis. It was reported that there were significant differences in risk factors across studies due to the use of self-report measures of depression versus a clinical diagnosis of major depression (O'Hara & Swain, 1996).

Hence, a shortcoming in some studies has been the inclusion of only one criterion measure of depression, namely a self-report measure of depression such as the EPDS.

Persons that meet diagnostic criteria for major depression can be missed on a self-report measure of depression, as a diagnostic interview allows the interviewer to probe more specifically for symptom relevant behaviours (Campbell & Cohn, 1991). A self-report measure of depression can also assess for a range of symptoms that are not specific to depression and it can be unclear whether it is depression or a general distress factor related to pregnancy and impending motherhood that is actually measured. For example, the EPDS is the most widely used self-report measure for depression in postpartum women. A factor analysis of the scale by Brouwers, van Baar and Pop (2001), however found that it consisted of a depressive symptoms subscale, but also an anxiety symptoms subscale. Hence, studies that have used the EPDS have also identified factors associated with anxiety in the measurement of depression. Both a self-report measure of depressive symptoms and a diagnostic interview for major depression is required to clarify differences in risk factors during the antenatal period.

Other limitations evident in perinatal studies have been the use of demographically and/or psychiatrically narrow samples such as only including women who are married, primiparous or do not have a history of depression (e.g., Affonso et al., 1991; Rubertsson et al., 2005). Given that a history of depression is one of the strongest risk factors for both antenatal and postnatal depression, negating such a characteristic in a sample limits the generalisability of the results to the community at large. There are an increasing number of studies, which utilise a prospective rather than retrospective design that is able to address concerns related to

biased recall by women with depressive symptoms (e.g., Affonso et al., 1991). In addition, prospective designs allow for stronger conclusions to be drawn regarding the directionality of influences. Studies that assess perinatal depression also require large samples due to the statistically low prevalence of the disorder, which ranges from 10% to 15%. Although the prevalence of perinatal depression is considered to be clinically significant, large samples or an enhanced recruitment strategy for women with depressive symptoms is required for statistical analysis and the adequacy of the conclusions drawn.

Screening and Treatment of Perinatal Depression

There are strong arguments for the universal screening of antenatal women who may at risk of perinatal depression. These include the substantial perinatal risks of untreated depression for the mother, the developing foetus and infant (Cooper & Murray, 1995; Bonari et al., 2004; Grace et al., 2003). Research findings also show that this vulnerable group tends not to seek help. In Marcus et al.'s (2003) large study (N = 3,472), it was reported that only 13.8% of women with antenatal depressive symptoms received treatment, while 86.2% had not received any counselling, psychotherapy or medical intervention. These findings by Marcus et al. (2003) indicated the underdiagnosis and undertreatment of women with depressive symptoms during pregnancy, which is consistent with results from other studies (Bowen & Muhajarine, 2006).

The perinatal period, which encompasses pregnancy and up to the first 12 months after delivery is a high risk time for the emergence of depressive symptoms (Bennett et al., 2004; O'Hara & Swain, 1996). Accordingly, the antenatal period presents as an optimum time for both screening and intervention given that most pregnant women will seek antenatal care at some point during their pregnancy

(Bonari et al., 2004). Women are also more amenable to psychotherapy due to concerns of medication use on the developing foetus (Bowen & Muhajarine, 2006). Detected risk for perinatal depression can be addressed through the implementation of "secondary" or "selective" prevention with subgroups of women who are identified to be at higher risk (e.g., those with a history of depression) and "tertiary" or "indicated" prevention for women who have already been diagnosed with antenatal or postnatal depression to reduce its associated impacts (Pope et al., 2000). There is increasing evidence of the effectiveness and efficacy of preventative and treatment interventions for women who have been screened to be at high risk of perinatal depression (Cooper et al., 2003; Milgrom et al., 2005).

Cooper et al.'s (2003) randomised controlled trial included 193 women who screened positive on the EPDS from a total of 3,222 women. They found that all three individually delivered, eight week interventions of cognitive-behavioural therapy, psychodynamic therapy and non-directive counselling were significantly related to lower EPDS scores at 4.5 months postpartum follow-up compared to women who had received routine primary care. However, the treatment effects for the three groups were not maintained at longer postpartum follow-up periods of 9 and 18 months, and 5 years as measured by the EPDS, as well as on rates of depression diagnoses measured by the SCID, which were comparable to routine care.

In Australia, Milgrom et al. (2005) also demonstrated the efficacy of three types of psychological interventions compared with primary routine care through a randomised controlled trial of 192 women from a total of 4,148 who were initially screened with the EPDS and then met DSM-IV criteria for major depression. Group-based cognitive behaviour therapy, group and individual-based counselling across nine weeks were found to be clinically and statistically significant in lowering

depressive mood (mean of 7 point difference on the BDI) as compared with routine care. However, there was insufficient evidence to conclude the efficacy of one treatment modality over another, or whether the treatment effects were maintained at 12-month postpartum follow-up due to high attrition.

The findings from other studies have demonstrated the efficacy of interpersonal therapy compared to a waitlist control group (O'Hara, Stuart, Gorman & Wenzel, 2000) and to parenting education for a vulnerable group of recent immigrants (Spinelli & Endicott, 2003). The results from well-designed studies indicate that interventions, which target perinatal depression are effective in the short-term, particularly those involving cognitive-behavioural and interpersonal therapy and have demonstrated treatment effects almost double to that of the spontaneous remission rate for depression. However, treatment effects are not maintained over the longer term and require future studies to include long-term follow-up procedures.

Antenatal Screening of Postnatal Depression

The EPDS is the most widely used screening measure for depression associated with childbirth. The EPDS is a short, ten-item self-report scale that assesses depressive and cognitive anxiety symptoms. It excludes somatic symptoms typically associated with normative changes accompanying pregnancy and postpartum adjustment (Cox, et al., 1987). The popularity of the EPDS has resulted from its brevity, simple administration and scoring protocol, high face validity among childbearing women and cost effectiveness. It has been extensively validated for postpartum use in English speaking countries, including Australia (Boyce et al., 1993) and other culturally and linguistically diverse groups (e.g., Lee et al., 1998; Uwakwe, 2003).

Austin and Lumley (2003) evaluated the antenatal screening measures for postnatal depression in 16 studies, of which 12 studies included the EPDS. It was concluded that the antenatal screening measures reviewed were limited in predicting women who subsequently developed postnatal depression. Across the studies reviewed, it was reported that sensitivity ranged from 0.23 to 0.79 for the proportion of women correctly identified as depressed after childbirth. The specificity ranged from 0.43 to 0.93 for the proportion of women who were correctly identified as non-depressed after childbirth (Austin & Lumley, 2003). The poor prediction of antenatal screening measures to identify women with postnatal depression suggests there were women who were depressed only in the antenatal or postnatal period, and others had continuity of depression across both periods. Austin and Lumley (2003) accounted for the poor prediction of antenatal screening measures to methodological limitations such as the small sample sizes in studies, the lack of cross-validation with a second sample, different cut-off scores used for the EPDS in the postpartum period ranging from ≥ 10 to ≥ 15, and the importance of postnatal events in contributing to postnatal depressive symptomatology.

Antenatal Screening of Depression During Pregnancy

In Australia, the use of the EPDS has extended to the antenatal period without adequate validation on samples for which it is used. Murray and Cox's (1990) original validation of the EPDS used the SPI and RDC generated diagnoses of major and minor depression. Murray and Cox's (1990) validation of the EPDS demonstrated its utility for the antenatal period by reporting an EPDS ≥ 15 for identifying major depression and an EPDS ≥ 13 for identifying major and minor depression. However, Murray and Cox's (1990) antenatal validation of the EPDS was conducted on a sample of British women. It cannot be assumed that the scale's

validation on a sample of British women over a decade ago will generalise to a sample of Australian women.

Differences can arise from the cultural diversity in samples, which has led some authors to recommend different EPDS cut-offs for the screening of perinatal depression (Matthey et al., 2006). The demographic profile of mothers has changed over time, particularly in relation to the increasing age of first pregnancy, reduced parity and differences in marital status. There are changes in hospital practice surrounding the care for women, as well as for when the EPDS is administered. Historically, there has been an increasing trend toward the use of the EPDS for universal screening, beginning in pregnancy and not confined to postnatal screening. In Australia, the increasing use of the EPDS antenatally has occurred within the context of a national initiative *beyondblue*, which has implemented its routine screening across seven States and Territories in 43 different health services/regions. A national plan for the routine screening of perinatal depression necessitates the scale's validation on a sample of Western Australian women. Accordingly, an optimal EPDS cut-off score for antenatal screening of depression has yet to be determined for a sample of Western Australian pregnant women. This would be an important contribution to the perinatal field by providing a recommendation for EPDS screening during pregnancy.

Antenatal Depression False Positive Results

The false positive rate refers to the proportion of women who exceed the EPDS cut-off score, but do not meet the criteria for a diagnosis of major depression. Peindl et al. (2004) in their study of the recurrence of postnatal depression provided estimates of the false positive rate when the EPDS was evaluated against a structured diagnostic interview. It was found that an EPDS $\geq$ 10 identified all women with RDC

generated diagnoses of major depressive disorder during the first 20 weeks postpartum, though the false positive rate was 49%. The identification of risk factors associated with women who obtained a false positive result during pregnancy was not investigated. The determination of factors associated with a false positive result for antenatal women would be an important contribution for treatment planning and reducing significant morbidity among this subgroup of women.

In Gotlib, Lewinsohn and Seeley's (1995) study of 1,507 adolescents, it was reported those who obtained a depression false positive result were at increased risk for any psychological disorder in the 12-month follow-up compared to adolescents with a true negative result (i.e., below cut-off on a self-report measure of depression and with no diagnosis of major depressive disorder). Gotlib et al. (1995) found that adolescents with a depression false positive result did not differ significantly on measures of psychosocial impairment compared to those who obtained a true positive result (i.e., above cut-off on a self-report measure of depression and were diagnosed with major depression). Despite the limited generalisability of the adolescent sample with an antenatal sample, Gotlib et al.'s (1995) findings highlight those with a depression false positive result experienced significant morbidity. These results are also consistent with those from an adult primary care patient population (Klinkman et al., 1998).

Statement of the Problem

Perinatal depression is a significant mental health problem, with meta-analytic studies indicating the prevalence of antenatal depression at 7%, 13% and 12%, respectively for each trimester of pregnancy (Bennett et al., 2004) and for postnatal depression at 12% to 14% (O'Hara & Swain, 1996). Despite the comparable rates of antenatal and postnatal depression, there has been much less

recognition for the status of depression during pregnancy. There are substantial perinatal risks associated with mothers who are depressed during pregnancy, and the impacts of postnatal depression have been well documented for the mother, the wider family and social systems, and particularly for the development of her infant (Grace et al., 1993; Hay et al., 2001; Luoma et al., 2001). Knowledge of the risk factors for antenatal depression is crucial for informed decision making regarding screening and targets to be addressed in preventive and early intervention efforts.

Risk factors of postnatal depression have been extensively studied, and highlight the contribution of selected socio-demographic characteristics, and the importance of psychosocial variables. The relative contribution of various psychosocial risk factors such as a history of depression, levels of social support, coping, anxiety, major life events, daily hassles and perceived stress require further study in their association with antenatal depression. The continuity or discourse of these risk factors to the prediction of postnatal depression is also warranted. Previous studies have been limited in their breadth of inclusion for risk factors that have been identified across studies, have used demographically and/or psychiatrically narrow samples, and have restricted the period under investigation to either the antenatal or postnatal period (Affonso et al., 1991; Austin & Lumley, 2003; Rubertsson et al., 2005). The psychosocial risk factors that have been identified in contributing to perinatal depression are included in a screening protocol for the *beyondblue* PND Program, and those of perceived depression, anxiety and stress are assessed by the DASS. The significance of testing a broad range of these risk factors in their association with antenatal depression would be an important contribution to make

There have been reported differences in the risk factors for depression during pregnancy depending on the type of depression measure employed (O'Hara &

Swain, 1996). Both the EPDS as a measure of depressive symptoms, and a diagnostic interview for major depression is required to clarify the aetiological significance of risk factors for antenatal depression, which has been found to be lacking in studies (Campbell & Cohn, 1991). The identification of risk factors for women who screen positive to the EPDS, but do not meet the diagnostic criteria for major depression has implications for the treatment of this subgroup of women who experience significant social morbidity.

Whilst the empirical validation of the EPDS for postnatal depression screening with different population groups has been extensive, its antenatal validation has been limited. The EPDS has only previously been validated for antenatal use on a sample of British women over a decade ago (Murray & Cox, 1990). It however, has been increasingly incorporated in antenatal screening protocols in Australia without adequate validation for a sample of the population for which it is used. There are potential differences arising from cultural diversity, historical effects associated with the population of childbearing women, and changes in hospital practice relating to the implementation of EPDS screening. *Beyondblue* is a national action plan for the implementation of both antenatal and postnatal depression screening with the EPDS in 43 services/regions across Australia. It would therefore be prudent to evaluate the screening properties of the EPDS against a diagnostic interview for major depression with a sample of Western Australian pregnant women.

Current Study

A main aim of the study was to evaluate the validity of the EPDS during pregnancy against diagnoses of major depression based on the MINI in a sample of Western Australian women. The sensitivity, specificity and accuracy of the EPDS at

various cut-off scores to detect women with diagnoses of major depression during pregnancy were calculated. This enabled an optimum EPDS cut-off score to be recommended for the screening of depression during pregnancy. The second aim of the study was to ascertain the strongest subsets of demographic and psychosocial predictors associated with different indices of depression during pregnancy to include a diagnosis of major depression, depressive symptoms and level. The identification of risk factors associated with depression in pregnancy would contribute to the screening and early intervention of women at risk of negative sequelae.

The third aim of the study was to identify the strongest subset of demographic and psychosocial predictors associated with women who obtain a depression false positive result in pregnancy (i.e., who screen positive to depressive symptoms on the EPDS, but do not meet diagnostic criteria for major depression). This is a unique contribution of the study and will facilitate the treatment planning for women who experience significant social morbidity. Lastly, the aim of the study was to identify the best subset of antenatal, postnatal, and both antenatal and postnatal predictors associated with depression level in the early postpartum period. The identification of antenatal factors, progressing to postpartum factors is the most beneficial strategy from a preventative and early intervention approach.

Multiple regression analyses used stepwise procedures. A stepwise procedure was deemed as most appropriate given the aims of the study to delineate the best set of predictors for antenatal and postnatal depression. Although the importance of psychosocial predictors for antenatal depression has been implicated, the relative ordering of various predictors has not been well established. Hence, it was necessary to assess the relative contribution of selected demographic and psychosocial

variables identified in the *beyondblue* screening protocol and affective states in the DASS.

The present study was exploratory in nature and the following research questions were examined.

1. What is the screening performance of the EPDS during pregnancy in terms of its sensitivity, specificity and accuracy at various cut-off scores to detect women with diagnoses of major depression based on the MINI structured diagnostic interview?
2. What are the strongest demographic and/or psychosocial predictors of women with diagnoses of major depression compared to those without major depression in the antenatal period?
3. What are the strongest demographic and/or psychosocial predictors of women with depressive symptoms using the EPDS ≥ 9 compared to those scoring EPDS < 9 in the antenatal period?
4. What is the best subset of demographic and/or psychosocial predictors associated with women's depression symptom level using the EPDS total score in the antenatal period?
5. What are the strongest demographic and/or psychosocial predictors of women who obtain a false positive result, defined as scoring EPDS ≥ 9, but not meeting diagnostic criteria for major depression compared to all other cases in the antenatal period?
6. What is the best subset of antenatal, postnatal, and both antenatal and postnatal predictors associated with women's depression symptom level using the EPDS total score in the early postpartum period?

Chapter 3

Method

Study Design

This study was implemented within the framework of Western Australia's contribution to the *beyondblue* PND Program, a national depression initiative that had the aim of evaluating the feasibility of routine screening for antenatal and postnatal depressive symptoms using the EPDS across seven Australian States and Territories between 2001 and 2005. Within this framework, the current study had a prospective design with women assessed during late pregnancy and followed up after childbirth. The use of the prospective design was best able to facilitate a validation of the EPDS antenatally, as well as the identification of psychosocial risk factors in their association with antenatal and postnatal depressive symptoms.

The sample was drawn from Western Australia's largest tertiary maternity hospital and women were screened for inclusion based on their EPDS score at first administration ($M = 22$ weeks gestation). An EPDS ≥ 9 was selected for antenatal screening, and an EPDS ≥ 12 for postnatal screening, which was consistent with the hospital's screening protocol to ensure the utility of the findings, as well as with research for antenatal and postnatal screening (Cox et al., 1987; Rubertsson et al., 2003).

Women were administered the Demographic and Psychosocial Risk Factor Questionnaire (PSRF), the EPDS and DASS at 32 weeks gestation at hospital. The MINI diagnostic interview was conducted by telephone within seven days of the EPDS. Women were mailed the Postnatal Questionnaire, a repeat EPDS and DASS at six weeks postpartum of their expected date of delivery. Thereafter, the MINI

diagnostic interview was conducted by telephone within 14 days. Figure 1 presents the study design.

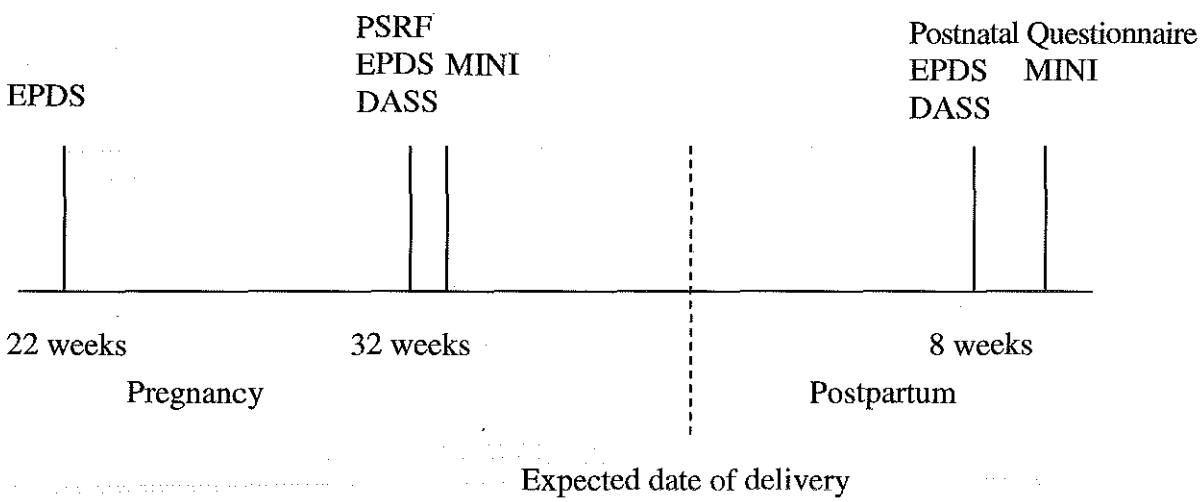

Figure 1. Study design.

The antenatal EPDS at 32 weeks gestation was evaluated against diagnoses of major depression with the MINI diagnostic interview as the criterion variable. Three logistic regression analyses were generated to identify demographic and psychosocial risk factors of antenatal: (a) diagnoses of major depression; (b) depressive symptomatology (EPDS ≥ 9); and (c) false positive results (EPDS ≥ 9, but did not meet the criteria for a diagnosis of major depression). Four multiple regression analyses were generated to assess demographic and psychosocial risk factors for antenatal and postpartum depression symptom level based on the EPDS total score.

Setting

King Edward Memorial Hospital for Women (KEMH) is Western Australia's only tertiary maternity and gynaecological hospital. There are approximately 24,000 births annually in Western Australia (Australian Bureau of Statistics, 2003) of which approximately 4,500 births are delivered each year at KEMH (Department of Health,

2005). KEMH has implemented routine screening using the EPDS by clinic midwives who have been trained in its administration, interpretation and scoring. Routine screening with the EPDS occurs for all antenatal women at approximately 20 weeks gestation, and again at 32 weeks gestation. Postnatal screening with the EPDS occurs in the community by child health nurses at community child health centres at six weeks postpartum.

Participants

Participants were women who were receiving their antenatal care at KEMH and had consented to participate in the *beyondblue* PND Program. They were at least 18 years old, possessed fluency in English, and did not have a concurrent major psychiatric illness (e.g., schizophrenia).

A total of 256 women were approached to participate in the study, and of these 29 women declined participation (11.3%). A further 27 women (11.9%) were excluded at antenatal assessment as the MINI diagnostic interview could not be conducted within seven days of the EPDS to allow for the antenatal validation. The study sample consisted of 200 women, with 82 women who scored at high risk of depressive symptoms (41%) and 118 women who scored at low risk of depressive symptoms (59%). At postnatal follow-up, the retention rate was 151 women (75.5%), with 25 women who had incomplete data, 21 women who could not be contacted, and three women were excluded due to neonatal or infant death. The sample at postnatal follow-up consisted of 23 women (15.2%) who scored at high risk of depressive symptoms and 128 women (84.8%) who scored at low risk of depressive symptoms. Figure 2 presents the sample response rates.

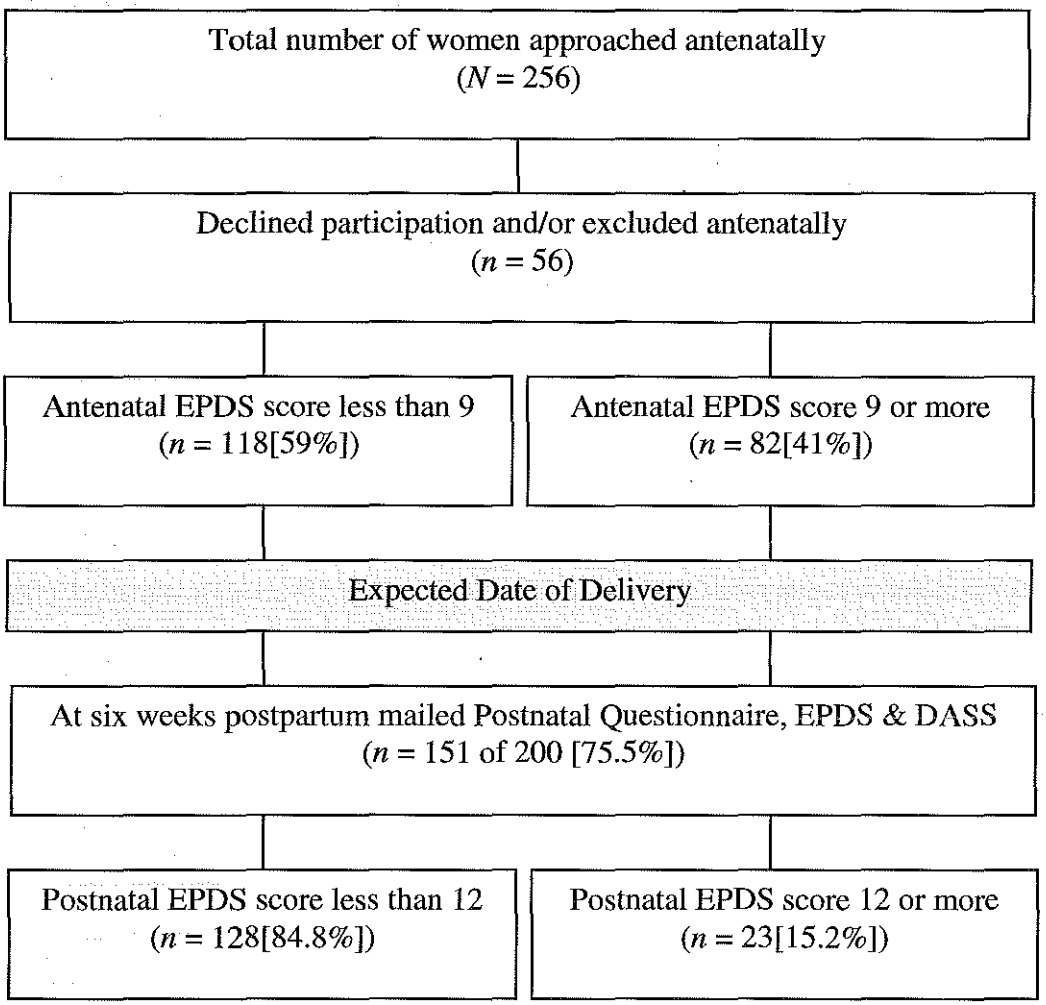

Figure 2. Sample response rates.

Women had a mean age of 27 years (*SD* = 5.61 years, range = 18 – 40 years) and 79.5% were married or in a defacto relationship. Forty-nine percent were expecting their first child and of the multiparous women, 61.2% had one child (range = 1 – 5 children). Seventy-two percent of women were born in Australia and those born overseas came from the United Kingdom (12.5%), New Zealand (6%), Asia (5%), Europe (3%), and Africa (1.5%). The majority of women spoke English as the main language at home and 6% were indigenous Aboriginals or Torres Strait Islanders. Seventy-five percent of women were employed during or prior to their

pregnancy and 84.9% of women with partners were employed. Fifty-two percent of women completed primary or secondary high school education and 41.5% reported a household income ≤ $40,000 per annum. Thirteen percent of women did not wish to divulge their annual income.

Study Measures

Demographic and Psychosocial Risk Factor Questionnaire (PSRF). This is a structured self-report questionnaire that assessed demographic characteristics and a range of psychosocial risk factors for the screening of antenatal and postnatal depressive symptoms (Appendix A). It consists of 34 questions divided into three sections. Section one assessed demographic characteristics including age, marital status, country of birth, occupation, education, family income, and parity. Section two assessed the presence of a past history of depression and/or other psychological disorders and treatment history. Section three assessed psychosocial risk factors including alcohol consumption, the relationship with partner, daily hassles, major life events, personality traits, expectations of support from significant others, coping with the baby, and whether the participant had experienced childhood abuse. The PSRF requires a range of response formats including binary, multiple responses, and five-point Likert scales such as a rating for daily hassles from 1 (very low) to 5 (very high).

The PSRF was developed as an antenatal screening questionnaire for the *beyondblue* PND Program by a team of Senior Investigators comprising of Psychiatrists and Clinical Psychologists who are regarded as perinatal mental health specialists internationally. Questions from the PSRF were adapted from the Antenatal Risk Questionnaire (Austin, 2003) and the validated Pregnancy Risk Questionnaire (Austin, Hadzi-Pavlovic, Saint & Parker, 2005). It has been

administered nationally in seven Australian States and Territories that participated in the *beyondblue* PND Program between 2001 and 2005. As such, 40, 333 women have completed this questionnaire.

Edinburgh Postnatal Depression Scale (EPDS; Cox et al., 1987). This is a ten-item self-report scale that was originally designed to screen for postpartum depressive symptomatology (Appendix B). The EPDS consists of eight items assessing symptoms of depression and two items assessing symptoms of anxiety. Women are asked to indicate the response that most closely reflects how they have felt during the past seven days on a four-point rating scale from 0 to 3 according to severity. Total scores range from 0 to 30, with higher scores indicating a greater probability of depressive symptoms. The EPDS has been translated in 11 languages (Cox & Holden, 1994), with validation studies conducted for postpartum use in several countries, including Australia (Boyce et al., 1993), antenatal use only in the United Kingdom (Murray & Cox, 1990), and non-postnatal mothers (Cox, Chapman, Murray & Jones, 1996). The EPDS takes less than 5 minutes to complete and has high face validity among postnatal women (Cox et al., 1987). Health professionals require training in its correct administration and scoring.

Cox et al.'s (1987) original validation reported the sensitivity of the EPDS using a clinical cut-off of $\geq$ 13 to be 86%, specificity 78%, and the positive predictive value 73% for identifying women with RDC diagnoses of major and minor depression at three months postpartum. Other validation studies including Boyce et al.'s (1993) on a sample of Australian women also found an EPDS $\geq$ 13 to be optimum for postpartum screening of depression, with a sensitivity ranging from 67.7% to 100% (e.g., Harris, Huckle, Thomas, Johns & Fung, 1989; Murray & Carothers, 1990). Murray and Cox's (1990) antenatal validation reported an EPDS $\geq$

15 to be optimum for the screening of RDC diagnoses of major depression in a sample of British women at between 28 to 34 weeks of pregnancy. An EPDS $\geq$ 15 obtained a sensitivity of 100%, specificity 96%, and a positive predictive value 60%.

For the present study, an EPDS $\geq$ 9 was selected for antenatal screening, and an EPDS $\geq$ 12 selected for postnatal screening, which was consistent with the hospital's screening protocol and referral guidelines where women were recruited. Also, the use of the EPDS in this study omitted the first few words in the instructions "as you have recently had a baby", for the applicability of the scale to both antenatal and postnatal women.

Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995a).

The DASS consists of 42 items measuring core symptoms of depression, anxiety and stress (Appendix C). Each of the three subscales consists of 14 items. The DASS Depression subscale primarily assesses symptoms of dysphoric mood. The DASS Anxiety subscale assesses symptoms of physical arousal, panic attacks and fear. The DASS Stress subscale assesses symptoms of tension, irritability, and a tendency to overreact to stressful events. Respondents indicate how much the item statement applied to them over the past week on a four-point scale, ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Scores for each subscale are summed and range from 0 to 42, with higher scores indicating a greater frequency/severity of symptoms. The severity ratings for each subscale (normal, mild, moderate, severe, and extremely severe) are based on an Australian normative sample of 2,914 females and males, aged 17 to 69 years. The normative sample consisted of both non-clinical (university students, blue and white collar employees) and clinical groups (psychiatric outpatients diagnosed with depression or anxiety). The DASS has also been validated in a general adult

population (N = 1,771) in the United Kingdom aged 15 to 91 years (Crawford & Henry, 2003). The DASS takes approximately 10 minutes to complete.

The DASS has shown excellent internal consistency in an Australian normative sample, with a coefficient alpha of 0.91 for the Depression subscale, 0.84 for the Anxiety subscale, and 0.90 for the Stress subscale. Similar values for the internal consistency of each subscale of the DASS has been obtained in a clinical sample of patients with anxiety disorders (N = 437) ranging from 0.89 to 0.96 (Brown, Chorpita, Korotitsch & Barlow, 1997) and patients with mood disorders (N = 439), ranging from 0.81 to 0.92 (Clara, Cox & Enns, 2001). Test-retest correlations of each subscale of the DASS show temporal stability over a two-week period for a clinical sample, with 0.71 for the Depression subscale, 0.79 for the Anxiety subscale, 0.81 for the Stress subscale (Brown et al., 1997). The DASS subscales showed long-term stability over three to eight years in the range of r = 0.35 to r = 0.45 for a non-clinical sample of university students (N = 882) (Lovibond, 1998).

The DASS subscales show evidence of convergent and divergent validity with other self-report depression and anxiety measures. The DASS Depression subscale was found to correlate most highly with the BDI (r = 0.74), the DASS Anxiety subscale correlated most highly with the Beck Anxiety Inventory (BAI; Beck & Steer, 1990) (r = 0.81), and the DASS Stress subscale showed moderate correlations with both the BDI (r = 0.60) and BAI (r = 0.64) for a non-clinical sample (Lovibond & Lovibond, 1995b). Similar results have been obtained for a clinical sample (Antony, Bieling, Cox, Enns & Swinson, 1998). The DASS subscales also show evidence of distinguishing across clinical groups. It was demonstrated that outpatients with a diagnosis of major depressive disorder scored highest on the DASS Depression subscale, those with a diagnosis of panic disorder scored highest

on the DASS Anxiety subscale, and a non-clinical group scored lowest across all three DASS subscales compared to the clinical groups (Antony et al., 1998).

In the present study, Cronbach's alpha for the DASS Depression subscale administered in the antenatal period was $r = 0.93$ and in the postnatal period was $r = 0.95$. For the DASS Anxiety subscale, Cronbach's alpha for antenatal administration was $r = 0.91$ and for postnatal administration was $r = 0.89$. Cronbach's alpha for the DASS Stress in the antenatal period was $r = 0.93$ and for the postpartum period was $r = 0.95$.

Mini International Neuropsychiatric Interview (MINI; Sheehan et al., 1998).

This is a short, diagnostic interview for major Axis I psychological disorders in the DSM-IV-TR and International Classification of Diseases (ICD-10). The MINI focuses on current diagnoses, using one or two screening questions to rule out the diagnosis when screen questions are answered negatively. When screen questions are positively endorsed, additional symptom questions are asked based on DSM-IV-TR criteria. Questions are responded to dichotomously, with a "yes" or "no" answer. A diagnosis is made based on the criterion number of symptoms, which must include the core symptoms of the disorder (diagnosis of major depression requires either depressed mood or loss of interest or pleasure, in addition to other symptoms).

Validation and reliability studies have compared the MINI to widely used structured interviews such as the SCID and the CIDI (Amorim, Lecrubier, Weiller, Hergueta & Sheehan, 1998; Lecrubier et al., 1997; Sheehan et al., 1998; Sheehan et al., 1997). Concordance between MINI and SCID diagnoses for major depression indicate excellent agreement (kappa value 0.84) and with the CIDI (kappa value 0.73). The operating characteristics of the MINI compared to the SCID for detecting major depression included values for sensitivity of 96%, specificity 88%, and a

positive predictive value 0.87%, with similar validity coefficients found for the MINI compared to the CIDI. Inter-rater reliability yielded kappa values above 0.75 for all diagnoses and re-test reliability had kappa values above 0.75 for 14 of 23 diagnoses (Sheehan et al., 1998). The MINI has also been used in an antenatal sample in France (Sutter-Dallay et al., 2004). The MINI has an average administration time of 21 minutes, ranging from six to 50 minutes.

In keeping with the study's rationale, only the mood and anxiety modules of the MINI were administered. The mood disorders included diagnoses of major depressive disorder and dysthymia. The anxiety disorders included panic disorder, agoraphobia, social phobia, obsessive-compulsive disorder, posttraumatic stress disorder and generalized anxiety disorder. In the assessment of a diagnosis of major depressive disorder, only appetite changes and not weight fluctuations were taken into consideration due to the expected weight changes during pregnancy and postpartum adjustment. For the postnatal administration of the MINI, some disorders included the addition of "since the birth of your baby" as the timeframe to be applicable for the postpartum period assessed. For example, this amendment was applied to the postpartum assessment of generalised anxiety disorder, as the six months timeframe could not be adhered to. Also, in the postpartum assessment of a major depressive episode for the presence of sleep difficulties, there was an additional probe of "that was not due to the baby crying" to differentiate between postpartum adjustment and symptoms of depression.

Postnatal Questionnaire. This questionnaire was adapted from the Postnatal Follow-up Questionnaire from the *beyondblue* PND Program and from reviews of predictors of postnatal depression (Austin & Lumley, 2003; Beck, 2001; O'Hara & Swain, 1996). It is a structured self-report questionnaire consisting of 28 questions

(Appendix D). The questionnaire assessed a range of postnatal psychosocial risk factors for depression such as delivery factors, discharge from hospital, physical and emotional problems since delivery, levels of support, the partner relationship, perception of self in the maternal role, managing with baby, daily hassles and help seeking behaviours.

Procedure

Ethical approval for the study was sought from the Human Research Ethics Committees of Edith Cowan University and KEMH. The researcher was trained in the recruitment procedures of the *beyondblue* PND Program, as recruitment for the national program was concurrent with the study. Training occurred in the form of attending a *beyondblue* debriefing seminar, as well as "shadowing" a research midwife employed by the national program for two days to ensure that the appropriate recruitment procedure and hospital processes were adhered to. The researcher was also trained in conducting the MINI diagnostic interview by an experienced clinician, which included performing mock interviews.

Women were approached during the full operating hours of KEMH's general antenatal clinics (Monday, Tuesday, Friday with the exception of Wednesday as the researcher was unavailable), and not during the operation of specialised clinics such as the antenatal adolescent and chemical dependency clinics (Thursday) to facilitate the generalisability of the results to community samples of antenatal women. The researcher was made aware of all appointment times for women who were to attend the antenatal clinic on a given day to ensure that eligible women were not missed. The researcher screened the medical files of all women who were to attend the antenatal clinic that day to ensure the eligibility criteria (i.e., age, language barriers, exclusion of concurrent major psychiatric diagnosis) were met and a copy taken of

their EPDS at the first booking visit (20 weeks gestation). Thereafter, eligible women were approached to participate while waiting for their antenatal appointment at the East Wing Clinic of KEMH.

All women who scored EPDS ≥ 9 at their first booking visit were prioritised for recruitment and approached at their appointment time to participate in the *beyondblue* PND Program and the current study. The circumstances where women who scored EPDS ≥ 9 may have been missed include those that did not attend their appointment, insufficient time due to being called by medical staff (waiting periods for appointments tended to be 30-45 minutes) or they had their appointment day on Wednesdays (when the researcher was unavailable). It appeared unlikely that a systematic bias was operating in the procedures for recruiting women with elevated EPDS scores. As there was a much higher prevalence of women who scored EPDS < 9, a convenience sample was selected, defined as those women who were available to be approached between the appointment times of women who scored EPDS ≥ 9.

Women were approached at a mean of 32 weeks gestation ($SD = 4.76$ weeks, range = 19 – 41 weeks). The *beyondblue* PND Program was explained (Information Sheet; Appendix E), the consent form was signed (Appendix F), and the PSRF questionnaire completed (Appendix A). The current study was explained (Information Sheet; Appendix G), and women who agreed to take part signed a separate consent form for the current study (Appendix H), completed a repeat EPDS (Appendix B) and DASS (Appendix C). A telephone appointment was scheduled for the MINI diagnostic interview within seven days of completing the EPDS for all women. This interval was chosen to ensure the time frame assessed by the EPDS (past seven days) overlapped with the time period required for a diagnosis of major depression using the MINI (past two weeks). All women who were approached,

including those who declined participation were provided with a community resource sheet listing available support services that may be of benefit during their antenatal care (Appendix I). All psychological measures were checked for completeness and women followed-up prior to leaving the clinic should there have been any missing responses.

Women were contacted by telephone to conduct the MINI diagnostic interview at a mean of two days (SD = 1.89 days, range = 0 – 7 days) of the repeat EPDS that was administered during their pregnancy. Standardised instructions were provided for the MINI. If a positive response was obtained for a screening question of the MINI, then additional symptom questions were asked, otherwise the interview continued to the next diagnostic module. If a woman was unavailable at her nominated appointment time, at least six telephone contacts were attempted prior to being withdrawn from the study.

At approximately six weeks after women's expected date of delivery, a follow-up letter (Appendix J), together with the postnatal questionnaire, EPDS and DASS were posted. Women were asked to complete the questionnaires and return by replied paid envelopes within seven days. Once again, questionnaires were checked for completeness and women were contacted by telephone if there were missing responses. A reminder note with another set of questionnaires was posted after two weeks' of non-response. Thereafter, women who could not be contacted by telephone were considered lost to postpartum follow-up. Those who returned the postpartum questionnaires were contacted within seven days to conduct the MINI diagnostic interview. Women participated in the study from 23rd May 2003 to 29th February 2004, with postpartum follow-up completed by 25th June 2004.

Ethical Considerations. The repeat EPDS was scored by the researcher and women who scored EPDS ≥ 9 and/or indicated a positive response to self-harm thoughts (Question 10) were brought to the attention of the clinic midwife/manager who provided debriefing and/or referral to the Department of Psychological Medicine at KEMH. Accordingly, the researcher was not blind to women's EPDS score prior to conducting the MINI diagnostic interview. The referral guidelines for the Department of Psychological Medicine stipulate that antenatal women who score EPDS 9, 10 or 11 have their medical charts flagged for review at delivery or admission (unless there are other risk factors that warrant an antenatal assessment) and women who score EPDS ≥ 12 are offered an initial assessment interview. For antenatal women, the role of the Department of Psychological Medicine is to provide monitoring and management, including supportive therapy, counselling and pharmacological treatment, as deemed appropriate. It is not known what type of intervention followed for women who were referred to the Department of Psychological Medicine as no records, nor ethical approval sought to access this information.

However, the results from the PSRF questionnaire indicated that of the entire sample (n = 200) at 32 weeks of pregnancy, 39 (19.5%) women endorsed they had already received treatment during pregnancy, with 26 (13%) receiving counselling or psychological therapy and 17 (8.5%) treated by antidepressant medication. The sample (n = 151) at eight weeks postpartum indicated that 12 (7.9%) women sought help from a mental health professional since the birth of the baby.

The postnatal risk management procedures for women who scored EPDS ≥ 12 or endorsed a positive response to self-harm thoughts included telephone contact with the researcher (or written correspondence should telephone contact be

unsuccessful after three attempts) to offer referral to the Department of Psychological Medicine. Again, postnatal women were offered assessment, psychological or psychiatric intervention, as deemed appropriate by the department. Women were reminded of their eligibility to receive psychological services by the Department of Psychological Medicine for up to six months postpartum, informed of relevant community agencies that may be of assistance, and mailed the Child Stress and Depression Information Book (Pope & Watts, 2003).

Chapter 4

Results

The main aims of this study were to evaluate the antenatal screening performance of the EPDS and to develop regression models for multiple indices of depression from the antenatal to postnatal period. For the antenatal period, regression models were generated to predict a diagnosis of major depression, the presence and level of depressive symptoms, and for obtaining a false positive result (i.e., women who scored EPDS ≥ 9, but did not meet a clinical diagnosis of major depression). For the postnatal period, regression models were generated to predict the level of postpartum depressive symptoms with the inclusion of antenatal risk factors only, postnatal risk factors only, and the best combination of risk factors across both periods. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 11.5, and statistical power determined by Power Analysis and Sample Size (PASS, 2002) for Windows.

Data Coding

Descriptive Statistics

Frequencies, measures of central tendency and variability were calculated to summarise the sample demographics, pregnancy and delivery factors, antenatal and postnatal affective functioning, and psychosocial risk factors.

Univariate Hypothesis Tests

Non-parametric tests were performed when the data did not meet the assumptions of normality. Mann-Whitney U tests and Pearson chi-square tests of independence were performed to assess the demographic and affective functioning differences between the study sample and those lost at follow-up for both the antenatal and postnatal periods. Chi-square tests were checked for expected

frequencies greater than five to ensure sampling adequacy. When expected frequencies were less than five, Fisher's exact test was reported (Brace, Kemp & Snelgar, 2000).

McNemar tests in related samples using nominal data were performed to assess differences in the occurrence of major depression, the proportion scoring antenatal EPDS ≥ 9 and postnatal EPDS ≥ 12, DASS Depression ≥ 10, DASS Anxiety ≥ 8 and DASS Stress ≥ 15 at 32 weeks of pregnancy compared to eight weeks postpartum. Wilcoxon signed-ranked tests in related samples using continuous data were performed to assess differences in the level of daily hassles, expectations of support when home with baby, expectations of managing with baby, and partner support during pregnancy compared to the early postpartum period. These psychosocial risk factors were measured on a five-point scale. Higher scores for daily hassles and managing with baby were associated with greater risk, and for the support variables lower scores were associated with greater risk.

Multivariable Analyses

Statistical power. Statistical power was calculated for the main aims of the study due to the multiple analyses performed. Hence, statistical power was determined for the antenatal validation of the EPDS using receiver operating characteristic (ROC) curve analysis and the prediction of depression variables using binary logistic regression analyses. For the ROC, a sample of 82 from the high risk group (EPDS ≥ 9) and 118 from the low risk group (EPDS < 9) achieved 87% power to detect a difference of .09 between the area under the ROC curve under the null hypothesis of .89 and under the alternative hypothesis of .80 at a significance level of .05. Therefore, the sample size at antenatal assessment provided adequate power for the detection of differences between depressed and non-depressed groups.

A sample size of 200 achieved 80% power at a significance level of .05 to detect an odds ratio of at least 2.0 for continuous predictor variables entered into the logistic regression. An adjustment was made for other predictor variables of interest in the logistic regression, which obtained an R^2 of .35. While a sample size of 200 (assuming between 25% and 50% of high risk cases) achieved at least 60% power at a significance level of .05 to detect an odds ratio of 2.5 for binary predictor variables in the logistic regression (assuming baseline rates between .15 and .25). An adjustment was made for other predictor variables of interest in the logistic regression, which obtained an R^2 of .25.

ROC analysis. A Mann-Whitney U test was initially performed to assess differences in major depression as a function of gestational age due to the wide range for assessing women during pregnancy. The EPDS at 32 weeks of pregnancy was evaluated against diagnoses of major depression using ROC analysis, which plots the scale's sensitivity against the false positive rate over a range of cut-off scores (Streiner & Norman, 1999). An optimal cut-off score for EPDS screening during pregnancy was identified.

Binary logistic regression. The three criterion variables for the binary logistic regression analyses performed on antenatal data were: (a) the presence or absence of a diagnosis of major depression based on the MINI diagnostic interview; (b) EPDS $\geq$ 9 or $<$ 9, which indicated either high or low risk for depressive symptoms; and (c) EPDS $\geq$ 9, but did not meet a diagnosis of major depression based on the MINI diagnostic interview (false positive case) compared to all other cases (false negative, true positive and true negative cases). The false negative cases included women who scored EPDS $<$ 9 but were diagnosed with major depression according to the MINI

interview (n = 3). These false negative cases were retained in the analyses due to the importance of missed cases of major depression.

Model fit was evaluated using ROC analysis and the optimal classification cut-off for prediction accuracy. Predictive models of major depression were compared to models of the EPDS solely at 32 weeks of pregnancy. The utility of logistic regression models for predicting antenatal depressive symptoms and false positive cases were evaluated for its classification accuracy, which compared the predicted group membership of women (e.g., those with depressive symptoms) to their actual group membership. For a model to have clinical utility, it should provide a 25% or greater improvement in the rate of accuracy compared to that achieved by chance alone (Hosmer & Lemeshow, 1989). The logistic regression models that predicted antenatal depressive symptoms and false positive results achieved a classification accuracy at least 25% or higher when compared with chance alone using the proportional by chance accuracy rate.

Predictor and criterion variables of interest were coded as 1 (e.g., major depression present) and the reference category coded as 0 (e.g., major depression absent). Predictors were recoded into smaller categories, collapsed with conceptually relevant predictors, or deleted from the analysis to ensure sampling adequacy. All expected cell frequencies were greater than one and no more than 20% of cells less than five (Tabachnick & Fidell, 2001). Final logistic regression models were checked for multicollinearity using standard errors of coefficients greater than 2.0, outliers using standardised residuals greater than ± 3.0, and influential cases using Cook's distance greater than 1.0. Two outliers were detected in the model developed for predicting EPDS $\geq$ 9 at 32 weeks of pregnancy. The deletion of these outliers only

improved prediction accuracy by 1% and hence these outliers were retained in the analyses.

Multiple linear regression. The criterion variables were EPDS total scores at 32 weeks of pregnancy and at eight weeks postpartum. Multiple linear regression models for predicting EPDS total scores at eight weeks postpartum were developed using antenatal predictors only, postnatal predictors only, and the best combination of antenatal and postnatal predictors. Table 1 provides a summary of the logistic and multiple regression analyses undertaken in this study.

Table 1

Summary of Binary Logistic and Multiple Linear Regression Analyses

Models	Regression analyses	Prediction of
1.	Logistic	Antenatal diagnoses of major depression
2.	Logistic	Antenatal EPDS ≥ 9
3.	Logistic	Antenatal false positives
4.	Multiple linear	Antenatal EPDS total scores
5.	Multiple linear	Postpartum EPDS total scores – antenatal predictors
6.	Multiple linear	Postpartum EPDS total scores – postnatal predictors
7.	Multiple linear	Postpartum EPDS total scores – antenatal & postnatal predictors

The inclusion of predictors from the antenatal to the postnatal period facilitated the identification of variables that had important implications for early intervention and prevention. Univariate associations of antenatal predictors with EPDS total scores at eight weeks postpartum were re-computed due to attrition at postnatal follow-up.

Predictors that were measured on a five-point scale were recoded into smaller categories or dichotomised due to non-normal distributions. Affective functioning scale measures such as the EPDS and DASS were dichotomised into at risk and not at risk cut-offs for greater clinical utility than mean scores. An antenatal EPDS ≥ 9 was selected to ensure consistency with the hospital's screening protocol. The antenatal and postnatal cut-offs for the DASS subscales (DASS Depression ≥ 10, DASS Anxiety ≥ 8 and DASS Stress ≥ 15) was based on the normative sample as indicative of at least mild levels of severity (Lovibond & Lovibond, 1995a).

Final multiple regression models were checked for independence of errors using the Durbin-Watson statistic between 1.5 to 2.5, multicollinearity using tolerance values greater than .10, outliers and influential cases using studentized residuals greater than ± 3.0, Cook's distance criteria, and Mahalanobis distance, $p < .001$. Outliers were detected in three multiple regression solutions. The deletion of these outliers improved the proportion of variance explained in EPDS total scores by a maximum of 2.9% and hence the outliers were retained in the analyses.

Logistic and multiple linear regression analyses. Binary logistic regression used forward Wald and multiple linear regression analyses used stepwise procedures to identify the best subset of predictors. A stepwise procedure was deemed as the most appropriate due to the exploratory nature of the study, the relative importance of a range of psychosocial risk factors for antenatal depression had not been extensively studied, and with the aim of identifying the best set of predictors from the *beyondblue* PSRF questionnaire and the DASS for antenatal screening.

All regression analyses included demographic, personality, psychosocial, pregnancy and scale measures (EPDS and DASS) that had significant ($p < .05$) univariate associations with the criterion. Alpha was set at $p < .15$ for entry of

predictors and $p < .20$ for removal to ensure inclusion of relevant predictors in model building (Hosmer & Lemeshow, 1989). Alpha was set at $p < .05$ or $p < .01$ for the entry of predictors in the final models. Bonferroni adjustment was applied to multiple regression analyses that utilised stepwise procedures to reduce the probability of Type I errors, which resulted in $p < .01$ (Hinkle, Wiersma & Jurs, 1988). The final multiple regression models each comprised of four predictors, which remained significant after Bonferroni adjustment at $p < .001$. The minimum ratio of cases to predictors for the regression analyses was 30.2 to 1. Hence, the recommended ratio requirement of 40 to 1 for stepwise regression was not met for some models (Tabachnick & Fidell, 2001), though others have suggested a lower ratio of cases to predictors (Coakes & Steed, 2003). Missing data were excluded from the analyses.

Statistical Analysis

Descriptive Statistics

Antenatal Psychosocial Risk Factors. The proportion of women who scored EPDS ≥ 9 at 22 weeks and 32 weeks of pregnancy are presented in Table 2. Half the sample scored EPDS ≥ 9, indicative of at least mild depressive symptoms at 22 weeks gestation (*SD* = 5.73 weeks, range = 11 – 40 weeks). A lower proportion of women scored EPDS ≥ 9 at 32 weeks gestation.

Table 2

Antenatal Depressive Symptoms (N = 200)

	22 Weeks		32 Weeks	
EPDS	*n*	%	*n*	%
< 9	105	52.5	118	59.0
≥ 9	95	47.5	82	41.0

The proportion of women who scored DASS Depression ≥ 10, DASS Anxiety ≥ 8 and DASS Stress ≥ 15 at 32 weeks gestation are presented in Table 3. Seventeen percent to 21.5% of women scored above DASS Depression, Anxiety and Stress cut-off scores indicative of at least mild symptoms.

Table 3

Depression, Anxiety and Stress Symptoms at 32 Weeks of Pregnancy (N = 197)

	Depression		Anxiety		Stress	
	n	%	*n*	%	*n*	%
Below DASS cut-off	163	81.5	157	78.5	154	77.0
Above DASS cut-off[a]	34	17.0	40	20.0	43	21.5

Note. [a]DASS Depression ≥ 10, DASS Anxiety ≥ 8, and DASS Stress ≥ 15.

Table 4 displays the EPDS ≥ 9 by diagnoses of major depression according to the MINI interview at 32 weeks gestation. Using EPDS ≥ 9 to define caseness, 28 of 31 women with major depression were correctly identified (true positives) and three women with major depression were missed (false negatives). However, 32% of women who scored EPDS ≥ 9 were incorrectly identified with probable depression (false positives).

Table 4

EPDS by MINI Diagnoses of Major Depression at 32 Weeks of Pregnancy (*N* = 200)

	Major depression	
EPDS	No (%)	Yes (%)
< 9	115 (68.0)	3 (9.7)
≥ 9	54 (32.0)	28 (90.3)

At antenatal assessment, 15.5% (n = 31) of women met the criteria for a major depressive episode according to the MINI interview (see Appendix K, Table K1). Sixty-eight percent of women (n = 21) with a major depressive episode reported a history of a prior major depressive episode in their lifetime. A minor depressive episode was diagnosed for 8.5% of women who did not meet the full criteria for a major depressive episode. Of women with minor depression, 58.8% reported a prior minor depressive episode in their lifetime. There were thirty- four women (17%) who reported a suicide attempt in their lifetime and of these women 51.6% were identified as having major depression at antenatal assessment.

Table 5 presents a summary of women's self-reported psychological or psychiatric history prior to their current pregnancy. Thirty-six percent of women reported a history of depressed mood prior to pregnancy, defined as having ever experienced a period of two weeks or more when they felt particularly miserable or depressed. The impact of the depressed mood on work and relationships was measured on a five-point scale from 1 (not at all) to 5 (a large extent). Women with a history of depressed mood reported that their experience had impacted more severely on relationships with family and friends (M = 3.43) than interfering with work (M = 2.54). Sixty-five percent of women with a history of depressed mood sought professional help to address their depressed mood, while 35.2% had not sought professional help. Thirty-six percent reported they had been diagnosed with a psychiatric or psychological condition in their lifetime, most commonly with major or minor depression.

Table 5

Self-Reported Psychological/Psychiatric History Prior to Pregnancy (N = 200)

Variable	*n*	% of sample	% of responses
Depressed mood prior to pregnancy	71	35.5	
Professional help sought for depressed mood	46	23.0	
Psychological/psychiatric diagnosis in lifetime			
Minor depression	37	18.5	39.4
Major depression	28	14.0	29.8
Anxiety	24	12.0	25.5
Other	5	2.5	5.3
One diagnosis	49	24.5	
More than one diagnosis	22	11.0	
Any diagnosis	71	35.5	

The obstetric and pregnancy related factors are displayed in Table 6. The majority of the sample were expecting a single birth and 3.5% a multiple birth with twins. Thirty-two percent of women had a baby gender preference and 34.5% had experienced at least one pregnancy loss (e.g., miscarriage) prior to their current pregnancy. Fifty-six percent of women did not consume any alcohol during pregnancy, 35.5% consumed on average, less than one standard alcoholic drink per day, and 9% between one and five standard alcoholic drinks per day. Fifty-seven percent of women reported physical problems with their pregnancy (range = 1 – 4 problems), of which 29.4% of the responses indicated excessive vomiting as the most common complaint. Thirty-nine percent of women reported emotional problems during their pregnancy, with depression and anxiety being the most common. Half of

the women who experienced emotional problems during pregnancy reported receiving treatment during pregnancy, with 13% of treatment involving counselling or psychological therapy, and 8.5% the use of antidepressant medication.

Table 6

Obstetric and Pregnancy Related Factors at 32 Weeks of Pregnancy (N = 200)

Variable	*n*	% of sample	% of responses
Baby gender preference	63	31.5	
Prior pregnancy loss (e.g., miscarriage)	69	34.5	
Physical problems with pregnancy			
Excessive vomiting	50	25.0	29.4
Varicose veins, haemorrhoids or similar	36	18.0	21.2
Bleeding/threatened miscarriage	27	13.5	15.9
High blood pressure	20	10.0	11.8
Bladder or kidney infection	14	7.0	8.2
Other	23	11.5	13.5
Emotional problems during pregnancy[a]			
Depression	49	24.5	43.8
Anxiety	39	19.5	34.8
Difficulty accepting being pregnant	11	5.5	9.8
Other[b]	13	6.5	11.6
Treatment received during pregnancy			
Counselling or psychological therapy	26	13.0	56.5
Antidepressants	17	8.5	37.0
Any treatment received	39	19.5	

Note. [a]Missing data for one woman. [b]Eating disorder, stress, feeling upset, grief and insomnia.

The antenatal psychosocial risk factors are presented in Table 7. The level of daily hassles was moderate during pregnancy (*Mdn* = 3). Partner support was rated as very supportive during pregnancy (*Mdn* = 5). Women expected to manage easily with their baby in the postpartum period (*Mdn* = 2). Nearly all women (98.5%) reported there were people they could depend on for practical and emotional support when they returned home from hospital with baby. The majority of women (84.3%) reported that their partners were the most likely support person, followed by parents (27.9%) and friends (22.8%). They expected to receive a high level of support in the early postpartum period (*Mdn* = 5). They reported being very emotionally supported by their mothers when growing up (*Mdn* = 5).

Table 7

Antenatal Psychosocial Risk Factors at 32 Weeks of Pregnancy

Variable	*M*	*SD*	*Mdn*
Level of daily hassles	2.43	1.04	3
Partner support[a]	4.41	0.93	5
Expect to manage with baby	2.23	0.87	2
Support when home with baby[b]	4.30	0.98	5
Mother supportive when growing up[c]	4.04	1.26	5

Note. Risk factors measured on a five-point scale. Lower scores indicate higher risk, except for daily hassles and managing with baby.

[a]*n* = 8 no partners. [b]*n* = 3 no support. [c]*n* = 3 did not know their mothers.

The major life events rated by women as distressful in the past 12 months are presented in Table 8. Sixty-seven percent of women reported experiencing one or more major life events in the past 12 months (range = 1 – 8 events). One-quarter of the responses indicated that moving house (24.7%) and financial difficulties (24%)

were most commonly experienced as distressing. This was followed by unemployment (9.5%) and the death of someone close (9.1%) as the next most distressful major life events.

Table 8

Major Life Events in the Past 12 Months (N = 198)

Variable	*n*	% of sample	% of responses
Moving house	73	36.5	24.7
Financial difficulties	71	35.5	24.0
Unemployment	28	14.0	9.5
Death of someone close	27	13.5	9.1
Separation	17	8.5	5.7
Miscarriage	16	8.0	5.4
Physical illness	16	8.0	5.4
Psychological/psychiatric disorder[a]	14	7.0	4.7
Domestic violence	13	6.5	4.4
Other	21	10.5	7.1
One major life event	47	23.5	
More than one major life event	86	43.0	
Any major life event	133	66.5	

Note. [a]Substance dependency and eating disorder.

Women's responses to statements that assessed a range of personality characteristics are presented in Table 9. Fifty-six percent of women endorsed they were a worrier, 44.5% endorsed they were a perfectionist such as wanting everything to be just right, and 41% endorsed being guilt prone such as blaming themselves too

often. Thirty-seven percent of women reported becoming upset if they did not have order in their lives such as having a regular timetable and being organised. Seventy-eight percent of women endorsed they were optimistic such as looking on the positive side of things and 20.5% endorsed they viewed situations negatively such as looking for problems. Eighty-four percent of women endorsed they were able to achieve what they wanted to.

Table 9

Personality Characteristics Identified at 32 Weeks of Pregnancy (N = 200)

Personality Trait	*n*	%
Are a worrier	113	56.5
Are a perfectionist[a]	89	44.5
Are guilt prone	82	41.0
Become upset if you do not have order in your life[a]	74	37.0
Optimistic[b]	156	78.0
View situations negatively[a]	41	20.5
Can achieve what you want to[a]	168	84.0

Note. [a]*n* = 1 missing data. [b]*n* = 2 missing data.

The prevalence of childhood abuse in the sample is presented in Table 10. Twenty-five percent of women reported they experienced abuse when growing up. Emotional abuse, which was defined as being put down constantly and told you were no good was the most frequent type of abuse reported by 18% of women. This was followed by both sexual abuse being subjected to sexual activity with an adult, and physical abuse being physically hurt, neglected or punished when growing up reported by 13% of women.

Table 10

Childhood Abuse (N = 200)

Type of abuse	*n*	%
Emotional abuse	36	18.0
Sexual abuse	26	13.0
Physical abuse	26	13.0
One type of abuse[a]	21	10.5
More than one type of abuse[b]	28	14.0
Any abuse	49	24.5

Note. [a]5% sexual abuse only, 4% emotional abuse only, and 1.5% physical abuse only. [b]6% both emotional and physical abuse, 2.5% both emotional and sexual abuse, and 5.5% all three types of abuse.

Postnatal psychosocial risk factors. The sample consisted of 151 women at postnatal follow-up, which occurred at a mean of eight weeks postpartum (*SD* = 3.23 weeks, range = 3 – 22 weeks). The delivery factors are presented in Table 11. One hundred and forty-five women had a singleton delivery and six women had a multiple delivery with twins. The majority of women delivered at full-term between 37 to 42 weeks gestation and 7.9% delivered prematurely at ≤ 36 weeks gestation. Eighty-six percent of babies were within the normal birth weight range at ≥ 2500 grams, and 9.6% were within the low birth weight range at ≤ 2500 grams. Fifty-five percent of women had a spontaneous vaginal delivery, 18.5% delivered by emergency caesarean section, 13.9% by elective caesarean section, and 12.6% required an assisted vaginal delivery (e.g., forceps or vacuum extraction). The majority of women used at least one type of pain relief during labour and delivery, most commonly an epidural anaesthetic. Forty-six percent of women reported they

experienced complications of labour and delivery such as foetal distress, loss of blood, delay in labour progress, cord around baby's neck, breech delivery, and ineffectual pain relief.

Women's feelings regarding their labour and birth experience were rated on a five-point scale from 1 (very disappointed) to 5 (very positive). Women rated the labour experience as slightly positive (*Mdn* = 4, excluding women with elective caesarean delivery). While the full sample rated the birth experience as slightly positive (*Mdn* = 4). Seventy-four percent of women stayed in hospital for three or more days after delivery, and reported feeling slightly prepared for the discharge home with baby (*Mdn* = 4). Fifty-two percent reported that their current pregnancy was unplanned. A small proportion of women who endorsed they had a baby gender preference during their pregnancy did not have their preference met (6.6%).

Table 11

Delivery Factors (N = 151)

Variable	Category	*n*	% of sample	% of responses
Gestational age at delivery (weeks)	Full term 37 – 42	139	92.1	
	Premature ≤ 36	12	7.9	
Baby birth weight (grams)[a]	≥ 2500	135	85.9	
	< 2500	15	9.6	
Delivery	Spontaneous vaginal	83	55.0	
	Emergency caesarean	28	18.5	
	Elective caesarean	21	13.9	
	Assisted vaginal	19	12.6	
Pain relief	Epidural anaesthetic	92	60.9	47.7
	Inhalation gas	56	37.1	29.0
	Pethidine injection	37	24.5	19.2
	Other	8	5.3	4.1
	One type	86	57.0	
	More than one type	49	32.4	
	Any pain relief	135	89.4	
Length of hospital stay (days)	≤ 2	40	26.5	
	> 2	111	73.5	
Unplanned pregnancy		79	52.3	
Baby gender preference not met		10	6.6	

Note. [a]*n* = 7 babies had missing data.

At eight weeks postpartum, 17.9% (n = 27) of women met diagnostic criteria for any disorder, the most common being a major depressive episode (n = 22). The proportion of women who met diagnoses for major depression and anxiety disorders based on the MINI diagnostic interview at postnatal assessment are shown in Appendix K, Table K2.

The postnatal psychosocial risk factors are summarised in Table 12. The level of daily hassles was moderate since delivery (*Mdn* = 3). Women reported they were managing easily with their baby since delivery (*Mdn* = 2). They indicated that their experience of their baby's behaviour was quite consistent with expectations (*Mdn* = 4). Women reported feeling strongly positive about themselves in the maternal role (*Mdn* = 5). They felt very supported by their mothers since delivery (*Mdn* = 5) and reported the relationship with their partner had also been very supportive since delivery (*Mdn* = 5). Nearly all women (98.7%) reported there were people available for practical and emotional support when they returned home with the baby, which was consistent with their expectations of perceived support during pregnancy. The women's partner was the most likely person to provide support (81.2%), followed by parents (42.3%), and to a lesser extent, friends (16.8%). The level of support received when home with the baby was also rated highly (*Mdn* = 4).

Table 12

Postnatal Psychosocial Risk Factors (N = 151)

Variable	*M*	*SD*	*Mdn*
Level of daily hassles	2.68	1.00	3
Managing with baby	1.96	0.87	2
Expectation of baby's behaviour	3.64	1.09	4
Feelings about self as mother	4.38	0.82	5
Mother supportive since delivery[a]	4.07	1.24	5
Partner support since delivery[b]	4.22	1.02	5
Support when home with baby[c]	4.11	1.02	4

Note. Risk factors measured on a five-point scale. Lower scores indicate higher risk, except for daily hassles and managing with baby.

[a]$n = 13$ no contact with mother or deceased. [b]$n = 7$ no partner. [c]$n = 2$ no support.

Table 13 summarises the physical and emotional difficulties reported by women since delivery. In the first week after delivery, 57.6% reported experiencing the "baby blues", a period of crying and feeling extra sensitive. The mean duration for the baby blues was six days ($SD = 5.90$ days, $Mdn = 4$ days, range = 1 – 35 days).

Table 13

Difficulties Since Delivery (N = 151)

Variable	*n*	% of sample	% of responses
Self-reported baby blues	87	57.6	
Breastfeeding difficulties[a]	72	51.4	
Self-reported problems since delivery			
Back, neck & shoulder pain	64	42.4	17.0
Excessive feelings of tiredness/fatigue	58	38.4	15.4
Baby's feeding, sleeping or settling difficulties	56	37.1	14.9
Post delivery physical difficulties	49	32.5	13.0
Feelings of depression/unable to cope	35	23.2	9.3
Pain during sexual intercourse	25	16.6	6.6
Anaemia	25	16.6	6.6
Baby ill-health	16	10.6	4.2
Separation from baby (e.g., neonatal unit)	15	9.9	4.0
Difficulty adjusting to parenting	14	9.3	3.7
Other	20	13.2	5.3
≤ Two problems	62	41.1	
> Two problems	68	45.0	
Any problems	130	86.1	

Note. [a]*n* = 11 did not breastfeed.

Of the women that breastfed, 51.4% reported breastfeeding difficulties related to attachment, milk flow, engorgement and mastitis. Eighty-six percent of women reported experiencing at least one physical or emotional problem since delivery. The most common complaints affecting 42.4% of women were back, neck and shoulder pain, 38.4% for excessive tiredness or fatigue, 37.1% for baby's feeding, sleeping or settling difficulties, 32.5% for post delivery physical difficulties (e.g., painful or infected episiotomy/caesarean scar, excessive vaginal bleeding, and difficulties passing urine), and 23.2% for feelings of depression/ unable to cope.

Women's help seeking behaviours are summarised in Table 14. Fifty-eight percent of women sought assistance to cope since delivery. The most common formal source of assistance was the community nurse/midwife/child health nurse reported by 24.5% of women in the early postpartum period. The most common informal sources of assistance reported by 34.4% of women were from family members, 32.5% from spouses/partners, and 21.9% from friends. The main reasons for seeking help in the first instance involved the baby's feeding, sleeping or settling difficulties, not coping with household or work chores, and feeling depressed/unable to cope.

Table 14

Postpartum Help Seeking Behaviours (N = 151)

Variable	*n*	% of sample	% of responses
Assistance to cope since delivery	87	57.6	
Reason/s for seeking help			
Baby's feeding, sleeping or settling	49	32.5	23.1
Not coping with household or work chores	32	21.2	15.1
Feelings of depression/unable to cope	29	19.2	13.7
Sleep difficulties	23	15.2	10.8
Someone else's advice	22	14.6	10.4
Feeling isolated	17	11.3	8.0
Couple/relationship difficulties	13	8.6	6.1
Other	27	17.9	12.7

Univariate Hypothesis Tests

Missing data analysis. The study sample consisted of 200 women at 32 weeks gestation. Twenty-seven women (11.9%) were withdrawn at antenatal assessment, as their diagnostic interview could not be conducted within the timeframe of the EPDS to facilitate the validation. The significant demographic differences of women withdrawn at antenatal assessment were marital status, $\chi^2(1, N = 222) = 9.93, p < .01$, employment status, $\chi^2(1, N = 227) = 22.46, p < .001$, family income per year, $\chi^2(1, N = 195) = 6.09, p < .05$, and indigenous status, $p < .05$, Fisher's exact test. Women who were withdrawn at antenatal assessment when compared to the study sample were more likely to be never married than married or in a de-facto relationship

(24.5% versus 8.1%), unemployed than employed (27.1% versus 5.1%), earning ≤ $40,000 compared to >$40,000 family income per year (16.2% versus 5.2%), and Aboriginal or Torres Strait Islander (29.4% versus 10.5%).

There were no significant differences in the affective functioning of women who were withdrawn at antenatal assessment compared to the study sample. The affective functioning variables were scoring at risk for probable depression EPDS ≥ 9, $\chi^2(1, N = 227) = 2.06$, $p = .15$, mild depressive symptoms DASS Depression scale ≥ 10, $p = .40$, Fisher's exact test, mild anxiety symptoms DASS Anxiety scale ≥ 8, $\chi^2(1, N = 220) = 2.53$, $p = .11$, and mild stress symptoms DASS Stress scale ≥ 15, $\chi^2(1, N = 221) = .012$, $p = .91$. There were also no significant differences for self-reported depression history indices such as past depressed mood, $\chi^2(1, N = 225) = .552$, $p = .46$, and past major depression, $p = 1.00$, Fisher's exact test. Women withdrawn at antenatal assessment were comparable to the study sample with respect to their affective functioning and history of depression, but were from a different demographic background.

The study sample consisted of 151 women at a mean of eight weeks postpartum. The retention rate was 75.5%. Forty-nine women were lost at postnatal assessment due to incomplete data comprising of the postnatal interview or postnatal questionnaire only ($n = 25$), non-response ($n = 21$), or ineligible due to infant death ($n = 3$). The significant demographic differences of women lost at postnatal assessment compared to the study sample included age, $U = 2386.50$, $N_1 = 46$, $N_2 = 151$, $p < .01$, education, $\chi^2(1, N = 197) = 9.58$, $p < .01$, family income per year, $\chi^2(1, N = 173) = 4.61$, $p < .05$, main language spoken at home, $p < .05$, Fisher's exact test, and indigenous status, $p < .01$, Fisher's exact test. Women lost at postnatal assessment were younger (*Mdn* = 24 years) compared to the study sample (*Mdn* = 27

years). They were more likely to have ≤ high school education than ≥ technical or university education as the highest level completed (32.4% versus 13.7%), earning ≤ $40,000 compared to > $40,000 family income per year (27.7% versus 14.4%), non-English speaking as the main language (55.6% versus 21.8%), and Aboriginal or Torres Strait Islander (66.7% versus 20.5%).

For 27 of 46 women lost at postnatal assessment, an EPDS from the *beyondblue* PND Program demonstrated no significant differences in scoring EPDS ≥ 12 at nine weeks postpartum, $p = .77$, Fisher's exact test. For 21 of 46 women with a completed postnatal interview only, there were no significant differences in the occurrence of diagnosed major depression according to the MINI at eight weeks postpartum, $p = .74$, Fisher's exact test. Women lost to follow-up at postnatal assessment were comparable to the study sample for probable depression using EPDS ≥ 12 and diagnosed major depression based on the MINI. However, similar to women who were lost at antenatal assessment, they tended to be from a different demographic background to the remaining postnatal study sample.

Affective functioning in the antenatal and postpartum period. Table 15 displays the proportion of women scoring above EPDS and DASS scale cut-offs at 32 weeks of pregnancy compared to eight weeks postpartum. Significant differences were found for antenatal EPDS ≥ 9 and postnatal EPDS ≥ 12 ($p < .001$, $N = 151$, McNemar test), and for DASS Anxiety ≥ 8 ($p < .05$, $N = 148$, McNemar test) in the antenatal and postnatal period. There were no significant differences in DASS Depression ≥ 10 ($p = 1.00$, $N = 148$, McNemar test) and DASS Stress ≥ 15 ($p = 1.00$, $N = 148$, McNemar test) across the two assessment periods.

Table 15

EPDS and DASS from Antenatal to Postnatal Period

	8 Weeks Postpartum	
32 Weeks Gestation	Below cut-off *n (%)*	Above cut-off[a] *n (%)*
EPDS (N = 151)		
< 9	90 (92.8)	7 (7.2)
≥ 9	38 (70.4)	16 (29.6)
DASS Depression (N = 148)		
< 10	116 (90.6)	12 (9.4)
≥ 10	13 (65.0)	7 (35.0)
DASS Anxiety (N = 148)		
< 8	114 (95.0)	6 (5.0)
≥ 8	18 (64.3)	10 (35.7)
DASS Stress (N = 148)		
< 15	113 (91.9)	10 (8.1)
≥ 15	9 (36.0)	16 (64.0)

Note. [a]EPDS ≥ 12.

Table 16 displays the proportion of women with a major depressive episode according to the MINI interview in the antenatal and postnatal period. No significant differences were found for the occurrence of major depression across the two assessment periods (p = .82, N = 151, McNemar test). However, fifty-five percent of women (n = 11) with a diagnosis of major depression in the early postnatal period also met a diagnosis of major depression in late pregnancy. Of these women who met a diagnosis of major depression in both the antenatal and postnatal period, ninety-one

percent (n = 10) reported a history of depressed mood prior to pregnancy. Of these women, 81.8% (n = 9) had also sought professional help to address their depressed mood prior to pregnancy, and all had sought formal or informal help to cope since delivery.

Ninety-two percent of women did not meet a diagnosis of major depression in either the antenatal or postnatal period. Eight percent of women (n = 11) who did not meet a diagnosis of major depression in pregnancy subsequently met the criteria for a diagnosis of major depression in the postnatal period. Forty-five percent of women (n = 9) with a diagnosis of major depression in pregnancy had remitted by the early postnatal period.

Table 16

MINI Diagnoses of Major Depression at 32 Weeks of Pregnancy and Eight Weeks Postpartum (N =151)

	Postnatal major depression	
Antenatal major depression	No (%)	Yes (%)
No	120 (91.6)	11 (8.4)
Yes	9 (45.0)	11 (55.0)

Psychosocial risk factors in the antenatal to postpartum period. There were significant differences in the level of daily hassles ($z = 3.35$, $p < .001$, two-tailed), managing with baby ($z = 4.09$, $p < .001$, two-tailed), and partner support ($z = 2.84$, $p < .01$, two-tailed) at 32 weeks of pregnancy compared to eight weeks postpartum. No significant differences were found in the expectation of support and the actual level of support received in the early postpartum period ($z = 1.81$, $p = .07$, two-tailed).

There was a lower level of daily hassles during pregnancy compared to the early postpartum period (*Mdn* = 2 low, versus *Mdn* = 3 moderate). Women's expectations of how they would manage with their baby when assessed earlier in pregnancy were consistent with how they were managing in the postpartum period (*Mdn* = 2 easily). Differences occurred at the 30th and 60th percentiles, with women reporting they had more difficult expectations of how they would manage with their baby during pregnancy than experienced in the early postpartum period (30th *P* = 2 manage easily, versus 1 manage very easily, and 60th *P* = 3 manage reasonably, versus 2 manage easily). Ratings of partner support were consistent across the antenatal and postpartum period (*Mdn* = 5 very supportive). However, at the 20th and 40th percentiles, partner support was rated as more supportive during pregnancy compared to the postpartum period (20th *P* = 4 quite supportive, versus 3 somewhat supportive, and 40th *P* = 5 very supportive, versus 4 quite supportive).

Multivariable Analyses

Antenatal validation of EPDS. Diagnoses of major depression based on the MINI interview were conducted at a mean of 32 weeks pregnancy (*SD* = 4.76 weeks, range = 19 – 41 weeks). There were no significant differences for the occurrence of major depression as a function of gestational age, $U = 2524$, $N_1 = 31$, $N_2 = 169$, $p = .75$. Figure 3 presents the ROC curve for EPDS cut-off scores from 0 to 22 (highest score obtained by one woman). The area under the curve (AUC) for discriminating major depression was .89 (95% CI .82 – .96, $p < .001$).

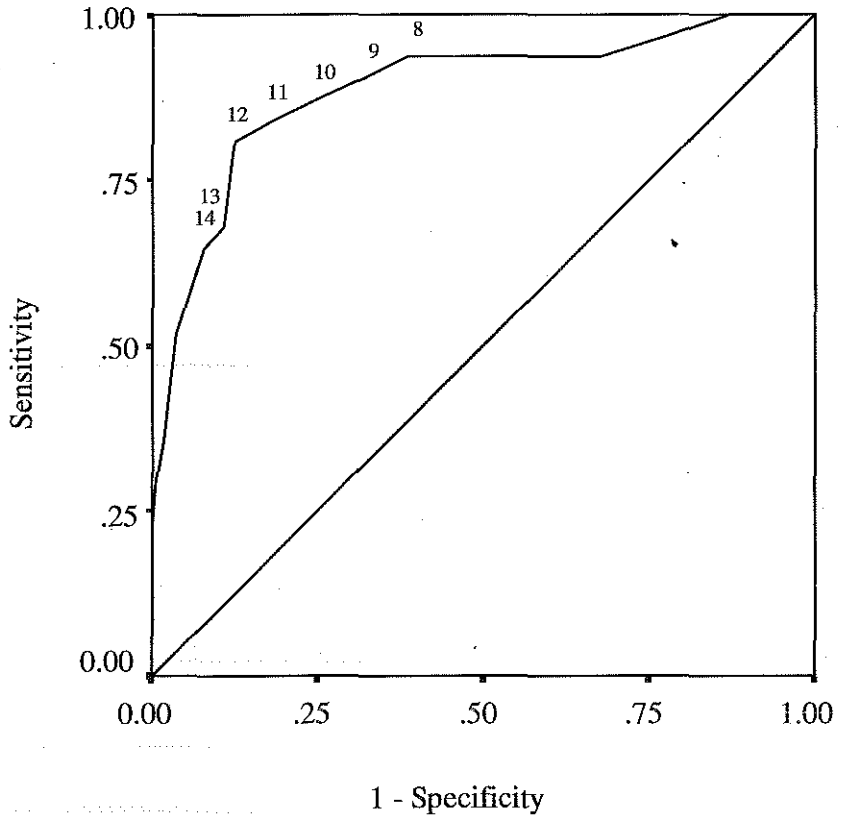

Figure 3. ROC curve of EPDS total scores as a predictor of major depression at 32 weeks of pregnancy.

The sensitivity, specificity and accuracy values for a range of EPDS scores at 32 weeks of pregnancy are displayed in Table 17. An EPDS cut-off $\geq$ 12 discriminated between women with and without major depression during pregnancy at 86.5% accuracy. At this EPDS cut-off, 25 women (80.6%) with major depression were correctly identified and 148 women (87.6%) without major depression were correctly identified. Six women (19.4%) with major depression were incorrectly identified as non-depressed and 21 women (12.4%) without major depression were incorrectly identified as depressed.

Table 17

Accuracy of Antenatal EPDS Cut-Off Scores for Identifying Women with MINI Diagnoses of Major Depression

EPDS Cut-Off >	Sensitivity %	Specificity %	Accuracy %
7.5	93.5	61.5	66.5
8.5	90.3	68.0	71.5
9.5	87.1	75.1	77.0
10.5	83.9	82.2	82.5
11.5	80.6	87.6	86.5
12.5	67.7	89.3	86.0
13.5	64.5	92.3	88.0

Prediction of antenatal diagnoses of major depression. Data from 196 women were available for analysis, 30 with major depression and 166 without major depression at 32 weeks of pregnancy. The results of the logistic regression analysis for predicting antenatal major depression (Model 1) are presented in Table 18 (see Appendix L, Table L1 for all significant univariate predictors of major depression, and Table L2 for entry of predictors into final model). The model for antenatal major depression included four predictors, the DASS Depression total score, the level of daily hassles, self-reported anxiety during pregnancy, and prior history of a suicide attempt. The model with all four predictors against the constant only model was significantly reliable, $\chi^2(4, N = 196) = 86.31, p < .001$. The model accounted for between 35.6% and 61.9% of the variance in major depression status. The area under the ROC was .93 (CI .88 – .98, $p < .001$) for predicting major depression at 32 weeks

of pregnancy. The model correctly predicted 93.4% of women (n = 155) without major depression, 83.3% with major depression (n = 25) for an overall prediction accuracy of 91.8%.

Table 18

Model 1: Logistic Regression Analysis of Antenatal Diagnoses of Major Depression (N = 196)

Variable	Odds ratio	(95% CI)
DASS Depression total score	1.27	(1.15 – 1.40)***
Anxiety during pregnancy[a]	4.54	(1.31 – 15.74)*
Daily hassles[b]	3.91	(1.02 – 15.31)*
Suicide attempt in lifetime[c]	7.88	(2.15 – 28.91)**

Note. [a]Yes vs. no. [b]High vs. low/moderate. [c]Yes vs. no.

*p < .05. **p < .01. ***p < .001.

When compared to the range of EPDS scores at 32 weeks of pregnancy (as presented in Figure 1) for the same sample, the area under the ROC was .89 (95% CI .81 – .96, p < .001). The EPDS scores correctly predicted 88% of women without major depression (n = 146), 80% of women with major depression (n = 24) for an overall accuracy of 86.7%. Hence, the model with four predictors when compared to the EPDS solely at 32 weeks of pregnancy showed better prediction of antenatal major depression status.

Women with major depression obtained a DASS Depression M = 13.80 and those without major depression, a DASS Depression M = 2.96. Women with a high level of daily hassles were more likely than those with a low/moderate level of daily hassles to have antenatal major depression (50.5% versus 10%). Women with self-reported anxiety during pregnancy were more likely than those who were not anxious

during pregnancy to have antenatal major depression (36.8% versus 10.1%). Women with a prior history of a suicide attempt in their lifetime were more likely than those without a prior history to have antenatal major depression (45.5% versus 9.2%).

Prediction of antenatal EPDS ≥ 9 versus < 9. Data from 197 women were available for analysis with 79 women scoring EPDS ≥ 9 and 118 scoring EPDS < 9 at 32 weeks of pregnancy. Table 19 presents the logistic regression results for Model 2 in predicting EPDS ≥ 9 (see Appendix L, Table L3 for all significant univariate predictors of EPDS ≥ 9 and Table L4 for entry of predictors into model). The set of predictors included the EPDS total score at 22 weeks gestation, the DASS Depression total score at 32 weeks gestation, the level of daily hassles, and personality trait of being a worrier. The model with five predictors versus the constant only model was significantly reliable, χ^2 (5, N = 197) = 150.98, p < .001, accounting for between 53.5% and 72.3% of the variance in EPDS ≥ 9 and < 9. The area under the ROC curve was .95 (95% CI .92 – .98, p < .001). The model correctly predicted 83.9% of women who scored EPDS < 9, and correctly predicted 89.9% of those who scored EPDS ≥ 9, for an overall accuracy of 86.3%.

Table 19

Model 2: Logistic Regression Analysis of Antenatal EPDS ≥ 9 (N = 197)

Variable	Odds ratio	(95% CI)
EPDS total score at 22 weeks	1.21	(1.08 – 1.34)**
DASS Depression total score	1.59	(1.32 – 1.91)***
Daily hassles[a]	4.86	(1.71 – 13.80)**
Daily hassles[b]	0.20	(0.03 – 1.61)
Worrier[c]	11.80	(3.81 – 36.53)***

Note. [a]Moderate vs. low. [b]High vs. low. [c]Yes vs. no.

*p < .05. **p < .01. ***p < .001.

Women with higher EPDS scores at 22 weeks of pregnancy were more likely to score EPDS ≥ 9 than < 9 at 32 weeks of pregnancy (M = 12.18 and M = 6.23, respectively). Women with higher DASS Depression scores were more likely to score EPDS ≥ 9 than < 9 at 32 weeks of pregnancy (M = 9.06 and M = 1.66, respectively). Women with a moderate level of daily hassles compared to those with a low level of daily hassles were more likely to score EPDS ≥ 9 during pregnancy (52.1% versus 25.5%). However, a high level of daily hassles compared with a low level of daily hassles did not significantly predict EPDS ≥ 9 during pregnancy. Women who were worriers were more likely than those who did not endorse themselves as worriers to score EPDS ≥ 9 at 32 weeks of pregnancy (59.5% versus 15.1%).

Prediction of antenatal depression; false positive results. Data from 197 women were available for analysis, 54 women with depression false positive results (scored EPDS ≥ 9, but did not meet a diagnosis of major depression) compared to 143 all other women. Table 20 presents the logistic regression results for Model 3, the prediction of women with depression false positive results at 32 weeks of pregnancy (see Appendix L, Table L5 for all significant univariate predictors of false positive results and Table L6 for entry of predictors into model). The set of predictors for the model included the EPDS total score at 22 weeks of pregnancy, the level of daily hassles, perceived level of support when home with the baby, and the personality trait of being a worrier. The set of predictors against the constant only model was statistically significant, χ^2 (5, N = 197) = 52.34, p < .001, accounting for between 23.3% and 33.8% of the variance in false positive results. The area under the ROC for the model was .82 (95% CI .76 – .88, p < .001). The model correctly

predicted 81.5% of women who scored EPDS ≥ 9, but did not have major depression, and 74.1% of all other women. The overall accuracy rate was 76.1%.

Table 20

Model 3: Logistic Regression Analysis of Antenatal False Positives (N = 197)

Variable	Odds ratio	(95% CI)
EPDS total score at 22 weeks	1.12	(1.03 – 1.21)**
Daily hassles[a]	2.52	(1.15 – 5.56)*
Daily hassles[b]	0.32	(0.90 – 1.15)
Support with baby[c]	3.05	(1.29 – 7.22)*
Worrier[d]	6.10	(2.42 – 15.37)***

Note. [a]Moderate vs. low. [b]High vs. low. [c]Low vs. high. [d]Yes vs. no.
*$p < .05$. **$p < .01$. ***$p < .001$.

Women who scored EPDS ≥ 9, but did not meet diagnostic criteria for major depression at 32 weeks of pregnancy obtained an EPDS $M = 11.35$ compared to all other women with an EPDS $M = 7.50$ at 22 weeks of pregnancy. However, they did not score higher than the subgroup of women with true positive results ($M = 13.23$; women who scored EPDS ≥ 9 and with a diagnosis of major depression). Women with a moderate level of daily hassles were more likely than those with a low level of daily hassles to obtain a false positive result (39.2% versus 20.6%). A false positive result was not reliably predicted from women with a high level of daily hassles compared to those with a level of low daily hassles (19.2% versus 20.6%). Women who reported they would have low support in the early postpartum period were more likely than those who reported they would have high support to obtain a false positive result (42.9% versus 23.2%). Women who were worriers were more likely than those who were not worriers to obtain a false positive result (40.5% versus 10.5%).

Prediction of antenatal EPDS total scores. The multiple regression results of Model 4 for predicting EPDS total scores at 32 weeks of pregnancy are presented in Table 21 (see Appendix L, Table L7 for all significant univariate predictors of EPDS total scores). The model consisting of four predictors accounted for 62.9% (adjusted $R^2 = 62.2\%$) of the variance in EPDS total scores at 32 weeks of pregnancy, F (4, 192) = 81.50, $p < .000$. Each predictor had significant partial effects in the model. The strongest predictor of EPDS total scores during pregnancy was the DASS Depression ≥ 10 accounting for 40.4% of the unique variance. At step 2, the addition of EPDS ≥ 9 at 22 weeks of pregnancy contributed 12.9% of the unique variance. At step 3, the tendency to be guilt prone explained 6.2% of the variance and at step 4, the DASS Stress ≥ 15 contributed a further 3.4% of the unique variance in EPDS total scores at 32 weeks of pregnancy.

Table 21

Model 4: Multiple Linear Regression Analysis of Antenatal EPDS Total Scores (N = 197)

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step1					
DASS Depression[a]	8.74	0.76	.64***	.40	.40***
Step 2					
DASS Depression	7.34	0.70	.53***		
EPDS at 22 weeks[b]	3.88	0.53	.37***	.53	.13***
Step 3					
DASS Depression	6.66	0.67	.49***		
EPDS at 22 weeks	3.15	0.51	.30***		
Guilt prone[c]	2.84	0.52	.27***	.60	.06***
Step 4					
DASS Depression	4.74	0.79	.35***		
EPDS at 22 weeks	2.67	0.51	.26***		
Guilt prone	2.60	0.50	.25***		
DASS Stress[d]	3.13	0.75	.25***	.63	.03***

Note. [a]≥ 10 vs. < 10. [b]≥ 9 vs. < 9. [c]Yes vs. no. [d]≥ 15 vs. < 15.

*$p < .05$. **$p < .01$. ***$p < .001$.

Prediction of postpartum EPDS using antenatal factors. Table 22 presents the multiple regression results for antenatal predictors of EPDS total scores at eight weeks postpartum (Model 5, see Appendix L, Table L8 for all significant univariate predictors of EPDS total scores). The set of predictors for the model included the DASS Stress and Anxiety scales, childhood abuse, and the major life event of moving house, which only became a significant predictor of EPDS total scores in the

early postpartum period. The model accounted for 36.8% (adjusted R^2 = 35%) of the variance in EPDS total scores at eight weeks postpartum, F (4, 141) = 20.56, $p <$ .001. In step 1, the DASS Stress ≥ 15 accounted for 23.3% of the unique variance. In step 2, childhood abuse further explained 7% of the unique variance in EPDS total scores during pregnancy. In step 3, moving house resulted in a significant increment of 3.3% of unique variance and in step 4, the DASS Anxiety ≥ 8 and < 8 also contributed 3.3% of unique variance in EPDS total score during pregnancy.

Table 22

Model 5: Multiple Linear Regression Analysis of Antenatal Predictors of Postpartum EPDS Total Scores (N = 146)

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step 1					
DASS Stress[a]	6.80	1.03	.48***	.23	.23***
Step 2					
DASS Stress	5.87	1.02	.42***		
Childhood abuse[b]	3.49	0.92	.27***	.30	.07***
Step 3					
DASS Stress	5.57	1.00	.40***		
Childhood abuse	3.13	0.92	.24**		
Moving house[c]	2.01	0.76	.19**	.34	.03**
Step 4					
DASS Stress	3.41	1.26	.24**		
Childhood abuse	2.84	0.90	.22**		
Moving house	2.04	0.74	.19**		
DASS Anxiety[d]	3.27	1.21	.24**	.37	.03**

Note. [a]≥ 15 vs. < 15. [b]Yes vs. no. [c]Yes vs. no. [d]≥ 8 vs. < 8.
*p < .05. **p < .01. ***p < .001.

Prediction of postpartum EPDS using postnatal predictors. The multiple regression results for predicting EPDS total scores at eight weeks postpartum are presented in Table 23 (Model 6, see Appendix L, Table L9 for all significant univariate predictors of EPDS total scores). The set of four predictors, the DASS Stress ≥ 15, major depression diagnosis, managing with baby, and self-reported feelings of depression/unable to cope accounted for 71.5% (adjusted R^2 = 70.7%) of the variance in EPDS total scores at eight weeks postpartum, F (4, 146) = 91.54, p < .001.

Table 23

Model 6: Multiple Linear Regression Analysis of Postnatal Predictors of Postpartum EPDS Total Scores (N =151)

Variable	*B*	*SE B*	*β*	R^2	ΔR^2
Step 1					
DASS Stress[a]	9.44	0.81	.69***	.48	.48***
Step 2					
DASS Stress	6.23	0.82	.46***		
Major depression diagnosis[b]	6.69	0.90	.44***	.62	.14***
Step 3					
DASS Stress	5.78	0.76	.42***		
Major depression diagnosis	5.76	0.85	.38***		
Manage with baby[c]	3.20	0.59	.27***	.68	.06***
Step 4					
DASS Stress	5.12	0.73	.37***		
Major depression diagnosis	4.65	0.84	.31***		
Manage with baby	2.91	0.56	.24***		
Depression/unable cope[d]	2.76	0.66	.22***	.72	.03***

Note. [a]≥ 15 vs. < 15. [b]Yes vs. no. [c]Difficulty vs. easily. [d]Yes vs. no.
*p < .05. **p < .01. ***p < .001.

In the first step, the DASS Stress ≥ 15 accounted for 47.5% of the unique variance in EPDS total score at eight weeks postpartum. In step 2, major depression diagnosis added 14.2% of the unique variance, and the addition of managing with baby contributed a further 6.4% of the variance in the EPDS total scores at eight weeks postpartum. In step 4, self-reported feelings of depression/unable to cope since delivery resulted in a significant increment of 3.4%.

Prediction of postpartum EPDS using both antenatal and postnatal predictors. The inclusion of antenatal with postnatal predictors in Model 7 did not reliably contribute to the prediction of EPDS total scores at eight weeks postpartum. The same set of postnatal predictors as in Model 6, the DASS Stress ≥ 15, major depression diagnosis, managing with baby, and feelings of depression/unable to cope were selected as the strongest predictors of EPDS total scores at eight weeks postpartum.

Table 24 presents the summary of the logistic and multiple regression results for the antenatal and postnatal models.

Table 24

Summary of Logistic and Multiple Linear Regression Results for Antenatal and Postnatal Models

Models	Prediction of	Strongest predictors	Variance explained (%)
1.	Antenatal diagnosis of major depression	DASS Depression, antenatal anxiety, high daily hassles, suicide attempt.	35.6 – 61.9
2.	Antenatal EPDS ≥ 9	EPDS at 22 weeks, DASS Depression, moderate & high daily hassles, worrier.	53.5 – 72.3
3.	Antenatal false positives	EPDS at 22 weeks, moderate & high daily hassles, expectation of support, worrier.	23.3 – 33.8
4.	Antenatal EPDS total scores	DASS Depression ≥ 10, EPDS ≥ 9 at 22 weeks, guilt prone, DASS Stress ≥ 15.	$R^2 = 62.9$
5.	Postpartum EPDS total scores – antenatal predictors	DASS Stress ≥ 15, childhood abuse, moving house, DASS Anxiety ≥ 8.	$R^2 = 36.8$
6.	Postpartum EPDS total scores – postnatal predictors	DASS Stress ≥ 15, postpartum major depression diagnosis, difficulty managing baby, self-reported depression/unable to cope.	$R^2 = 71.5$
7.	Postpartum EPDS total scores – both antenatal & postnatal predictors	Same predictors as above for Model 6.	$R^2 = 71.5$

Chapter 5

Discussion

Summary of Results

In addressing the first question of the study, the results from the validation of the EPDS showed that it had good predictive utility to discriminate between women with and without major depression during pregnancy. In the second set of questions, the strongest predictors of antenatal depression as measured by a diagnosis of major depression and depressive symptoms and level using the EPDS were depressive symptoms earlier in pregnancy, anxiety, daily hassles, perceived stress, personality traits of being guilt prone and a worrier, and having a past history of a suicide attempt. For the third question of the study, women with an antenatal false positive result (i.e., scored EPDS ≥ 9, but did not meet the criteria for a diagnosis of major depression) were predicted by depressive symptoms earlier in pregnancy, a moderate level of daily hassles, expectations of low support, and being a worrier. In relation to the fourth question of the study, the strongest predictors of postpartum depression level as measured by EPDS total scores were perceived stress and anxiety, having a diagnosis of postpartum major depression, self-reported depression and being unable to cope, difficulty managing with the baby, a history of childhood abuse, and the major stressor of moving house.

The results are in support of the EPDS for antenatal use, which is consistent with previous findings (Murray & Cox, 1990), though a lower EPDS cut-off score is recommended for the clinical screening of antenatal depression in a sample of Western Australian women. The strongest predictors of antenatal depression across the different regression models replicate those from previous findings, particularly for the recurrence of depression, the impact of daily stressors on mood, the

comorbidity with anxiety during pregnancy, and of selected personality traits (Da Costa et al., 2000; Sutter-Dallay et al., 2004; Verkerk et al., 2003). Demographic variables such as marital status, education, maternal and partner employment and family income yielded significant univariate associations with depression in pregnancy, though they did not contribute significantly in the multivariate regression analyses with the inclusion of affective functioning and psychosocial variables. These findings are consistent with reviews that highlight the low association of socio-demographic variables with postnatal depression (Beck, 2001; O'Hara & Swain, 1996). The identification of predictors associated with women who had elevated EPDS scores during pregnancy, though were not diagnosed with major depression was a new contribution of the study. These results highlight the impact of transient anxiety and stress in predicting antenatal false positive results. The prediction of postnatal depression indicated that different predictors accounted for the change into the postpartum period, with antenatal variables contributing minimally to women's mood, and coping with the new baby and stresses of motherhood becoming prominent. These results are in support of the differences in the aetiological significance of both antenatal and postnatal depression, which has been recognised in previous studies (Affonso et al., 1991; Gotlib et al., 1989; Ross et al., 2004).

Antenatal Validation of EPDS

Murray and Cox (1990) used ROC curve analysis and recommended an EPDS $\geq$ 15 for the screening of major depression, and an EPDS $\geq$ 13 for the screening of major and minor depression during pregnancy in a sample of British women. The results of the present study found an EPDS $\geq$ 12 to be optimum for the screening of major depression during pregnancy in a sample of Western Australian

women. An EPDS ≥ 12 provided the optimum trade-off between sensitivity, with 80.6% (25/31) of women with major depression correctly identified, and specificity with 87.6% (148/169) of women without major depression correctly identified, yielding an overall accuracy of 86.5% (173/200). The lower EPDS cut-off score determined for clinical screening in the present study compared to Murray and Cox's (1990) study was likely due to differences in the sample characteristics (e.g., lower proportion of women in the present study were married or in a stable relationship), the diagnostic interview used (e.g., the MINI is a fully structured clinical interview compared to the SPI which is a semi-structured clinical interview), and the ratio of high and low EPDS scorers (e.g., higher ratio of high to low EPDS scorers in the present study).

The selection of a lower EPDS cut-off score will increase sensitivity, but will also decrease specificity, and vice versa. For example, the use of an antenatal EPDS ≥ 9 in the present study for the screening of depressive symptoms yielded a sensitivity of 90.3% (28/31), though the specificity was 68% (115/169), with an overall accuracy of 71.5%. The use of a higher antenatal EPDS cut-off score such as EPDS ≥ 15, as recommended in Murray and Cox's (1990) study yielded a sensitivity of 51.6% (16/31), though the specificity was 96.4% (163/169), with an accuracy of 89.5%. The choice of an appropriate antenatal EPDS cut-off score will depend on a number of factors such as the setting (e.g., clinical, community), service capacity (e.g., availability of referral sources), population (e.g., high or low risk), assessment purpose (e.g., screening, prediction), and the consequences associated with missing women who may be depressed. A lower EPDS cut-off score is often recommended for a two-stage process that involves screening and further assessment of women

with high scores in primary settings to ensure those most at risk for depression are not missed.

Prediction of Depression During Pregnancy

Predictors of Antenatal Major Depression

The strongest predictors of a diagnosis of major depression at 32 weeks of pregnancy included the DASS Depression total score, anxiety during pregnancy, a high level of daily hassles, and a history of suicide attempt in women's lifetime. The finding that the concurrent level of depressive symptoms was predictive of antenatal major depression is consistent with Verkerk et al.'s (2003) large population based study in the Netherlands. Verkerk et al. (2003) found that depressive symptoms, as measured by an EPDS $\geq$ 12 at 25 weeks of pregnancy was the strongest predictor of diagnoses of major depression at 32 weeks of pregnancy. Depression during pregnancy, and in particular the level of depression in pregnancy has been a reliable predictor of postpartum depression (O'Hara & Swain, 1996; Pope et al., 2000). These results indicate a vulnerability or predisposition to depression that can be ascertained during early pregnancy for preventative and intervention efforts.

The finding that women with a past history of suicide attempt were at increased risk for antenatal major depression compared to those without a history is consistent with a predisposition to depression, as suicidal behaviour is part of the constellation of symptoms for making a diagnosis of depression. A prior suicide attempt is likely to be associated with an earlier episode of depression that is mediated by the occurrence of life stressors and poor coping skills (Jeanneret, 1992). Further, a history of suicide attempt is indicative of a greater severity in depression (American Psychiatric Association, 2000). Wilhelm et al.'s (1999) 15-year longitudinal study of the predictors for major depression in the general population

reported that participants with recurrent episodes of major depression (two or more) were more likely to have a history of suicide attempts than those who never experienced depression or only had a single episode of major depression previously. Wilhelm et al. (1999) highlighted that suicide attempts occurred mostly during adolescence rather than a consequence of repeated depressive episodes. Nevertheless, it appears that a history of suicide attempts was a marker for recurrent episodes of major depression.

In the perinatal literature, it has been demonstrated that maternal anxiety during pregnancy is strongly associated with the development of postpartum depression (Beck, 2001; O'Hara & Swain, 1996). The present study extends these findings by showing that self-reported anxiety during pregnancy was associated with an increased risk for a diagnosis of major depression antenatally. These results are consistent with Sutter-Dallay et al.'s (2004) large prospective study in France that reported strong comorbidity of an anxiety disorder (e.g., generalised anxiety disorder, social phobia, obsessive-compulsive disorder, agoraphobia, panic disorder) with a major depressive disorder during the third trimester of pregnancy. Women who met the criteria for an anxiety disorder compared to those that did not were four times more likely to also have a major depressive episode during pregnancy (Sutter-Dallay et al., 2004). Heron et al. (2004) reported a strong concurrent association between symptoms of depression and anxiety at 18 weeks and 32 weeks of pregnancy, which persisted into the postpartum period. The increased risk of anxiety during pregnancy for a diagnosis of major depression highlights the need to assess for both depression and anxiety in antenatal women. In the general population, the comorbidity of depression and anxiety has been associated with a more difficult

prognosis, requiring a differential clinical approach than either disorder alone (Sartorius et al., 1996).

Powell and Drotar (1992) highlighted the importance of daily hassles in their relationship with postpartum depression, but not the significance of this relationship during pregnancy. The findings of the present study demonstrate that women who reported a high level of daily hassles compared to those with a low/moderate level of daily hassles during pregnancy were more likely to have a diagnosis of major depression. Da Costa et al. (2000) in a small sample of married women found that those who were depressed only in the antenatal period reported higher hassles than women who were not depressed in either the antenatal or postnatal period. Further, hassle scores during pregnancy emerged as the most important predictor of antenatal depressed mood (Da Costa et al., 2000). According to Lazarus and Folkman's (1984) transactional model of stress, daily hassles are conceptualised as minor stressors or everyday stress-provoking events that depending on an individual's appraisal processes, availability of social resources and coping repertoire can lead to a stress response. The increased risk of a high level of daily hassles indicates that the perception of stress and/or the presence of increased stressors during pregnancy is associated with a diagnosis of major depression.

Predictors of Antenatal Depressive Symptoms

The strongest predictors of antenatal depressive symptoms, as measured by an EPDS ≥ 9 at 32 weeks of pregnancy were indices of depression during pregnancy including the EPDS total score at 22 weeks gestation and the concurrent DASS Depression total score, the personality trait of being a worrier, and daily hassles.

Consistent with the predictors of a diagnosis of major depression, the level of depression in early pregnancy emerged as the strongest predictor of depressive

symptoms in late pregnancy. These findings are similar to Affonso et al. (1991) who found that the initial level of depressive symptoms was a significant predictor of depression at each trimester of pregnancy and up to 14 weeks postpartum. Affonso et al. (1991) further demonstrated that initial levels of depression accounted for more of the variance in pregnancy than the postpartum period, where in contrast psychosocial variables became more prominent. These results highlight the recurrence of depressive symptoms early in pregnancy for late pregnancy, and the predictive contribution of women's prior history of depression.

Few studies have focused on the contribution of personality traits in the role of perinatal depression. Personality traits refer to an individual's enduring pattern of cognition, behaviour and emotion about self and the environment that is exhibited across a range of situations (American Psychiatric Association, 2000). The increased risk of depression associated with the personality trait of being a worrier has been reported in pregnancy and the postpartum period (Cox et al., 1982; Johnstone et al., 2001). Cox et al. (1982) found that women who described themselves as a worrier were more likely to have high symptom scores in pregnancy and at three to five months postpartum. Worry has been described as a thinking activity and also as the cognitive aspect of anxiety (Affonso, Liu-Chiang & Mayberry, 1999). Affonso et al. (1999) suggest that worrying is linked to both depression and anxiety, depending on an individual's coping responses from their appraisal of threatening situations. Nolen-Hoeksema (2000) demonstrated that worrying, as part of a ruminative response style was particularly characteristic of individuals with mixed anxiety and depressive symptoms compared to those with depressive or anxiety symptoms only, or without symptoms. In these findings, it is suggested that the predictive

contribution of being a worrier relates to cognitive processes and anxiety associated with depressed mood.

The results of the present study highlight a dose-response relationship between the level of daily hassles and depression in pregnancy. Women with a moderate level of daily hassles compared to those with a low level of daily hassles were found to be at increased risk for depressive symptoms. While women with a high level of daily hassles compared to those with a low/moderate level of daily hassles were more likely to have a diagnosis of major depression. These results highlight the role of stress, as measured by the appraisal of everyday environmental stressors rather than major life events for increasing liability to depressive symptoms during pregnancy. Findings from other studies have shown that a high level of daily hassles is predictive of postpartum depressive symptoms (Honey et al., 2003; Powell & Drotar, 1992), with daily hassles exhibiting both direct and indirect effects such as through the impact of self-esteem on postpartum depressive symptoms (Hall et al., 1996). Studies that measured daily stressors in the general population report those involving interpersonal conflicts have the most impact on mood (e.g., Bolger et al., 1989), although the type of daily stressors that have an impact on mood in the antenatal population requires further study.

Predictors of Antenatal Depression; False Positive Results

The strongest predictors for an antenatal false positive result was the EPDS total score at 22 weeks of pregnancy, a moderate level of daily hassles, expectations of low support with the baby in the early postpartum period, and the personality trait of being a worrier.

Women with a false positive result at 32 weeks of pregnancy were more likely to score higher on the EPDS at 22 weeks of pregnancy ($M = 11.35$) compared

to all other cases ($M = 7.50$), except for the subgroup of women who obtained a true positive result ($M = 13.23$). These results highlight the stability or recurrence of depressive symptoms for women with a false positive result over an approximately ten-week period when the EPDS was used for repeated screening during pregnancy. Gotlib et al. (1995) in a sample of adolescents found those with a false positive result were at increased risk for any psychological disorder in the 12-month follow-up compared to those with a true negative result (i.e., low self-report depression score and no diagnosis of major depressive disorder). The risk of future psychopathology for women identified with a false positive result during pregnancy, particularly in the postpartum period warrants further investigation to assess their long-term risk status.

While a moderate level of daily hassles compared to a low level of daily hassles was found to significantly increase the likelihood of antenatal depressive symptoms, it also increased the risk of an antenatal false positive result. These results are consistent with the cumulative effects of stress on depression. It appears that moderate or manageable levels of stress placed women at risk for antenatal depressive symptoms, and high or unmanageable levels of stress taxed women's resources to cope and placed them at risk for a diagnosis of major depression. The expectation of low support when returning home with the baby was also another stressor found to increase the risk of an antenatal false positive result. Findings from previous studies report that social support mediates the effects of stress on both depression and anxiety in pregnant women (e.g., Glazier et al., 2004). The finding that being a worrier increased the risk of an antenatal false positive result is consistent with Affonso et al.'s (1990) study, which differentiated pregnancy and postpartum symptoms from perinatal clinical depression. Worrying was one of eight symptoms reported most frequently and intensely by antenatal and postnatal women

with depression that was not necessarily predictive of perinatal clinical depression (Affonso et al., 1990).

As a set, these predictors indicate that women who scored EPDS ≥ 9 at 32 weeks of pregnancy, but did not have a diagnosis of major depression were more likely to be experiencing non-specific transient anxiety and stress related symptoms. The descriptive analyses of these results are consistent with this assertion. These analyses highlighted that 30.8% of women with an antenatal depression false positive result obtained a DASS Anxiety score ≥ 8, indicative of at least mild levels of anxiety compared to 16.2% of all other cases. The same trend was evident for symptoms of stress, with 32.7% of women who obtained an antenatal depression false positive result scoring DASS Stress ≥ 15, indicative of at least mild levels of stress compared to 16.9% of all other cases.

The differences in the predictors of an antenatal false positive result can also be attributed to the measurement and conceptualisation of depression according to the EPDS and diagnostic interview. The constellation of symptoms measured by the EPDS would more likely be variable and non-specific compared to a diagnosis of major depressive disorder based on DSM-IV-TR criteria. The EPDS assesses a range of symptoms over a one-week period, whereas a diagnosis of major depression requires at least five core symptoms, one of which must either be depressed mood or loss of interest over a two-week period. In factor analytic studies that have been conducted on the EPDS, the results indicate that the scale is not unidimensional, but has separate depression and anxiety subscales (e.g., Brouwers et al., 2001). The EPDS total score has shown to correlate highly with measures of both depression and anxiety in pregnancy and the postpartum period (Brouwers et al., 2001; Stuart et al., 1998). Therefore, it would appear plausible that predictors of an antenatal false

positive result based on EPDS ≥ 9, but not a diagnosis of major depression may also be related to anxiety symptoms and the generalised effects of stress on depressive symptoms.

Predictors of Antenatal Depression Symptom Level

The strongest predictors of antenatal depression level were the concurrent DASS Depression ≥ 10, EPDS ≥ 9 at 22 weeks of pregnancy, the personality trait of being guilt prone, and the concurrent DASS Stress ≥ 15. Depression symptoms earlier in pregnancy largely accounted for the severity of depressive symptoms in the third trimester of pregnancy. These results are consistent with studies that have used a similar interval of assessment during pregnancy, as well as those measuring a much longer interval of assessment from pregnancy to the postpartum period (e.g., Heron et al., 2004). Heron et al. (2004) reported that depression symptoms were moderately stable across a 1.5-year period, with stronger correlations between depression symptoms when assessment intervals were short (e.g., at 18 weeks and 32 weeks of pregnancy) rather than longer (e.g., 18 weeks of pregnancy to 8 months postpartum).

Women's self-endorsement of being guilt prone or the tendency to self-blame excessively was predictive of antenatal depression level. Studies of depression in the general population highlight that individuals with depression exhibit certain cognitive bias such as self-blame, which are internal attributions compared to individuals who are not depressed who tend to make more situational or circumstantial external attributions for negative social events (e.g., Kinderman & Bentall, 1997). These results demonstrate the importance of cognitive variables, particularly women's attribution of events in accounting depression level during pregnancy.

The effects of perceived stress further contributed significantly to the prediction of antenatal depression level. The DASS Stress ≥ 15 is indicative of least mild levels of stress, which has been conceptualised as a persistent state of over-arousal associated with the difficulties in meeting life demands (Lovibond & Lovibond, 1995a). Bernazzani et al. (1997) also found that stress in response to major life events was associated with antenatal depression level.

Predictors of Postpartum Depression Symptom Level

The Role of Antenatal Factors

The most important antenatal predictors that were selected for postpartum depression level were the DASS Stress ≥ 15, the DASS Anxiety ≥ 8, a history of childhood abuse, and the major life event of moving house. However, the model accounted for a small proportion of the variance explained in postpartum depression level ($R^2 = 36.8\%$).

The finding that stress in pregnancy predicted the level of early postpartum depressive symptoms has been replicated in other studies that have used different conceptualisations of stress. Beck's (2001) meta-analysis of 16 studies yielded a moderate effect size ($r = .38 - .40$) for life stress in pregnancy and postpartum depression. In Gotlib et al.'s (1991) large prospective study, it was reported that women who developed depression at five weeks postpartum had higher levels of perceived stress at 23 weeks of pregnancy compared to those who did not become depressed. However, levels of perceived stress in pregnancy did not contribute significantly to the variance in postpartum diagnostic status (Gotlib et al., 1991). O'Hara et al. (1991) found that life stress as measured by stressful life events during pregnancy, childcare related stressors since delivery, and stressful events in the

peripartum contributed significantly to diagnoses of major depression at nine weeks postpartum compared to non-childbearing women.

O'Hara and Swain (1996) found that the country of study, the measurement of stress by self-report or a diagnostic interview, and the timing of assessments significantly explained differences in the strength of the relationship between life events and postpartum depression across studies. The findings of the present study highlight that stress during pregnancy was predictive of postpartum depression level, and the major life event of moving house contributed specifically. The impact of moving house as a major stressor only became significant after childbirth for the prediction of postpartum depression level and not during pregnancy. These results highlight that the occurrence of this chronic stressor after childbirth may result in the cumulative effects of stress on postpartum depression level, particularly as it involves the stresses associated with having unstable accommodation. It also suggests that stressors are associated with different levels of risk at different times during the transition to a new or growing family.

In recent studies, it has been reported that anxiety during pregnancy has contributed to the prediction of postpartum depression (Heron et al., 2004; Matthey et al., 2003; Sutter-Dallay et al., 2004). Heron et al. (2004) found that anxiety at 18 weeks and 32 weeks of pregnancy significantly predicted depression symptoms, as measured by the EPDS $\geq$ 13 at eight weeks and eight months postpartum. Importantly, it was highlighted that anxiety during pregnancy independently contributed to the risk of postpartum depressive symptoms even after controlling for concurrent depressive symptoms in pregnancy (Heron et al., 2004). In an Australian study, Matthey et al. (2003) found that primiparous mothers with co-morbid diagnoses of a depressive and anxiety disorder at six weeks postpartum had higher

antenatal EPDS scores than those with either an anxiety or depression disorder alone. Women with a lifetime history of an anxiety disorder were at greater risk for developing postpartum depression or anxiety compared to women with a lifetime history of depressive disorder (Matthey et al., 2003). These results highlight the need to include both anxiety and depression in antenatal screening to increase the prediction of postpartum depression. It is also the case however, that individuals with co-morbid disorders are at greater risk of a poorer prognosis (Sartorius et al., 1996).

The finding that a history of childhood abuse was significantly associated with the level of postpartum depression is consistent with Buist (1998), and Buist and Janson's (2001) study. Buist (1998) initially found that women who had been admitted to a mother-baby unit with a history of childhood abuse had more severe depression, as measured by the BDI than those without abuse histories in the early postpartum period. The findings of Buist and Janson's (2001) three-year follow-up study showed that women with a history of childhood sexual abuse had higher depression and anxiety scores, and more life stresses than those without an abuse history. These results, together with those of the present study highlight the importance of the early childhood environment in predicting the level of postpartum depression. Potentially, childhood abuse may be impacting on the quality of parenting (e.g., Gotlib et al., 1991).

The low predictive power of antenatal variables to predict postpartum depression level suggests that different aetiological factors are related to the onset of depression in pregnancy compared to the early postpartum period. In support of this position are findings from prospective studies such as Gotlib et al. (1989) who found that different socio-demographic variables were associated with diagnoses of depression in pregnancy compared to the postpartum period. Ross et al. (2004) used

structural equation modelling and found that a biopsychosocial model of depressive symptoms at 36-42 weeks of pregnancy did not adequately account for depressive symptoms at six weeks postpartum. Austin and Lumley (2003) suggest that the neglect of key risk factor domains such as personality, history of depression and childhood abuse may explain the low prediction of antenatal screening measures to accurately identify women with postpartum depression. They further emphasise the importance of postnatal events such as having an unsettled baby in the prediction of postpartum depression (Austin & Lumley, 2003).

The Contribution of Postnatal Factors

The strongest predictors of postpartum depression level using postnatal factors only in the model included the concurrent DASS Stress $\geq$ 15, a diagnosis of major depressive disorder, self-reported feelings of depression and being unable to cope since delivery, and difficulty managing with the baby. As a set, these predictors can be conceptualised within a stress-coping model in the development of early postpartum depression symptoms.

Similar to the finding that stress during pregnancy was an important predictor of antenatal depression level, perceived stress also largely accounted for the severity of postpartum depression. Stress is a multidimensional construct and has been measured by an individual's perception of the stress response and its specific stressors. Honey et al. (2003) in a sample of primiparous women found that maternal stress, as measured by the number of daily hassles during pregnancy and childcare stressors since delivery contributed significantly to the prediction of depressive symptoms at six weeks postpartum. In the present study, the level of perceived stress appeared to be both a predictor and concomitant of early postpartum depressive symptoms. A diagnosis of major depressive disorder contributed significantly to the

variance of EPDS total scores at eight weeks postpartum, which serves to corroborate the use of the EPDS in the early postpartum period as a measure of the severity of depression symptoms.

The predictors of self-reported feelings of depression and being unable to cope since the delivery and difficulty managing with the baby highlight that women's coping behaviour contributes to the level of postpartum depression. These results are consistent with Honey et al.'s (2003) findings that high postpartum EPDS scores were predicted by the use of maladaptive coping strategies such as avoidant behaviours, low social support, and high maternal stress (e.g., both daily hassles and postpartum events related to caring for the baby). As a set, the predictors are indicative of a number of stressors that contribute to depleting women's resources to cope in the early postpartum period.

The Contribution of Both Antenatal and Postnatal Factors

The inclusion of both antenatal and postnatal factors in the regression model to predict the level of postpartum depression resulted in the same set of best predictors as using postnatal factors only (i.e., Models 7 and 6). Taking into account these results and those of the low prediction of antenatal factors, it highlights that different aetiological factors are related to depression in pregnancy and the postpartum period. The importance of proximal factors in the prediction of postpartum depression level provides support for the conceptualisation of postpartum depression as an adjustment disorder with depressed mood (Whiffen, 1992). However, a longer postpartum assessment interval is required to assess whether the relationship between the importance of postnatal factors and the low contribution of antenatal factors to postpartum depression level will persist beyond the early postpartum period.

A diathesis stress model of perinatal depression is implicated in the findings of the risk factors from the antenatal to postnatal period. It is important to note that the presence of a risk factor only highlights an increased probability of a disorder associated with the established factor and does not indicate the mechanism that elicits the disorder (Ingram & Luxton, 2005). The risk factors for antenatal depression as indexed by a diagnosis, depression symptoms and level suggest a diathesis-stress relationship involving depression vulnerability (e.g., history of suicide attempt, prior depressive symptoms earlier in pregnancy, and depressive related personality traits) with elevated stress levels (e.g., daily hassles and high perceived stress) in the development of antenatal depression. In contrast, the risk factors for postnatal depression imply a diathesis-stress relationship involving coping resources (e.g., difficulty managing with the baby, feeling unable to cope), combined with heightened stress. It would be necessary in future studies to test the diathesis-stress interactions directly in models of perinatal depression. The findings from previous research have provided support for diathesis-stress interactions involving depression vulnerability and life stress events, and for stress resistance resources (e.g., social support) and coping in the onset of perinatal depression (Gotlib et al., 1991; O'Hara et al., 1991).

Methodological Considerations of the Study

Limitations

There are several methodological limitations of the study that have to be taken into account when interpreting the findings. First, the sample size at antenatal (n = 200) and postnatal assessment (n = 151) was small for undertaking a validation study of the EPDS and an investigation of predictors associated with perinatal depression. The small sample size heightened the risk of reporting spurious

relationships (e.g., Type I and Type II errors) and also precluded the full assessment of some predictors (e.g., type of childhood abuse), outcome variables (e.g., postpartum depression false positive results, postpartum diagnoses of major depression) and interrelationships (e.g., interaction terms between the level of depression and anxiety). However, given that the prevalence of depressive symptoms and major depressive disorder in pregnancy has been identified as ranging from 7.4% to 12.8% depending on the trimester of pregnancy (Bennett et al., 2004), the timeframe required to further recruit women with probable depression would have exceeded the resources of the present study. The small sample size was addressed by ensuring that sufficient statistical power was achieved to conduct the analyses and the statistical assumptions adhered to such as having the minimum requirement for the ratio of cases to predictor variables (Hosmer & Lemeshow, 1989; Tabachnick & Fidell, 2001). The results of the present study can inform future research directions involving larger samples or ideally, population-based studies.

Second, the study design consisted of limited measurement points, three during pregnancy and one for postpartum follow-up. Hence, the generalisability of the findings was limited primarily to the third trimester of pregnancy (M = 32 weeks) and the early postpartum period (M = 8 weeks), and not applicable to the course of pregnancy and postpartum adjustment. The findings from other studies report similarities and differences in predictors depending on gestational age such as differences in the level of stress during pregnancy (Da Costa, Larouche, Dritsa & Brender, 1999) and for the postpartum interval under investigation (O'Hara & Swain, 1996). A more comprehensive understanding of the predictors associated with the course of pregnancy and postpartum adjustment could be obtained by including at least one measurement point for each trimester of pregnancy and follow-up to 12

months postpartum. The inclusion of multiple measurement points during pregnancy would also allow for stronger causative conclusions to be drawn about the stability of predictors over the course of pregnancy.

Third, the sample was drawn from a public teaching hospital and was biased towards women of lower socio-economic status, which limit the generalisability of the results. The inclusion of women from multiple hospitals including private maternity hospitals would increase the generalisability of the results to the larger perinatal population in Western Australia.

Fourth, the interviewer was not blind to women's EPDS score. The concern is of potential interviewer bias on outcomes of the diagnostic interview. In the present study, it was ethically sound to have knowledge of women's EPDS score, as hospital protocol required the referral of women who scored EPDS ≥ 9. This methodological constraint could be addressed in future studies by employing an additional researcher to conduct the diagnostic interviews and/or recruit women into the study, which would have kept the two processes separate. The impact of interviewer bias would likely have been minimal due to the use of the MINI in the present study, which was a fully structured diagnostic interview requiring binary responses and minimal subjective interpretation compared to other studies that have used semi-structured interviews such as the SADS (Endicott & Spitzer, 1978).

It is acknowledged that analyses using EPDS ≥ 12 was not conducted in the present study, which was identified as the optimum cut-off score for the screening of depressive symptoms during pregnancy in the antenatal validation of the EPDS. It is likely that regression analyses using an EPDS ≥ 12 would have yielded different results compared to EPDS ≥ 9 (Model 2), as utilised in this study. This lower EPDS score was adopted to facilitate the clinical utility of the results for the setting where

women were recruited. However, it is highly likely that regression models based on EPDS $\geq$ 12 would have yielded similar predictors to a diagnosis of major depression (Model 1), as the majority of women with major depression scored above this threshold (i.e., only 6 out of 31 women with a MINI diagnosis of major depression scored EPDS < 12). It would be beneficial in future studies to explore possible changes in predictors associated with different EPDS cut-off scores during pregnancy.

Strengths

The limitations of the study should be considered with its strengths. First, although the total sample size was small, the sampling strategy enabled the recruitment of sufficient numbers of high-risk women with antenatal depression to conduct the analyses with adequate statistical power. For example, in the present study, the antenatal validation of the EPDS included 31 women with MINI diagnoses of major depressive disorder compared to Murray and Cox's (1990) validation study, which included six women with RDC diagnoses of major depressive disorder. Second, incorporating a structured diagnostic interview in the research design contributed to the understanding of risk factors associated with diagnoses of major depression during pregnancy. The majority of studies in perinatal health have used the EPDS, as a self-report measure of depressive symptoms with an acknowledgement that the results do not necessarily generalise to women who meet diagnostic criteria for major depression (e.g., Evans et al., 2001). The inclusion of both a diagnostic interview, the MINI and a self-report measure, the EPDS enabled conclusions to be drawn about the differences and similarities associated with predictors of major depression and depressive symptoms during pregnancy.

Third, the present study included a wide array of variables that have been relatively neglected in studies focusing on perinatal depression such as personality traits, childhood abuse, daily hassles, major life events, and importantly, stress and anxiety. The inclusion of these variables allowed for a more comprehensive understanding of their impact on depression in late pregnancy and the early postpartum period, and ultimately on the screening, identification and treatment of women with perinatal depression.

Fourth, the analytic strategy to separate antenatal and postnatal factors in the depression models has strong utility. The analysis of antenatal factors only with the inclusion of later postnatal factors facilitates an early intervention approach, as variables that contribute to antenatal depressive symptoms can be targeted for change. The identification of predictors associated with women who obtain an antenatal depression false positive result has not been extensively studied. These findings have important treatment implications in highlighting factors that need to be addressed for women who experience depressive symptoms, but do not necessarily meet the criteria for major depression.

Clinical Implications of the Study

There are a number of clinical implications of the study. The validation of the EPDS demonstrated that it had good classification accuracy for discriminating between women with and without depression during pregnancy. The results of the study yielded different levels of screening accuracy depending on the cut-off score, which could be utilised in other settings. An EPDS $\geq$ 12 provided the most optimum trade-off between sensitivity and specificity for the screening of major depression at 32 weeks of pregnancy. An EPDS $\geq$ 12 is recommended for the screening of depression during late pregnancy in a similar sample of Western Australian women.

As with the use of any self-report measure of depression for screening purposes, further assessment of women who screen positive is required for a diagnosis of major depression.

The results of the present study have yielded a number of binary logistic and multiple regression models that are applicable to different settings and purposes. Should routine antenatal screening of depressive symptomatology be the purpose for applied settings such as hospital antenatal clinics, then the model using EPDS ≥ 9 (Model 2) would be the most appropriate. For clinical settings with more limited resources such as community centres to address positive screens, then the model for the prediction of a diagnosis of major depressive disorder (Model 1) would be most appropriate. The timing of antenatal screening is also an important factor to take into consideration when applying the different models. The findings are presented for both antenatal and postnatal models of depression, and the predictors that are relevant for targeted early intervention and preventative efforts at both these time periods. Clinically, the results highlight that antenatal variables have a less prominent role in the early postpartum period when levels of stress, negative affect, difficulties managing with the baby and levels of coping become more relevant.

A main finding of the present study was that depression earlier in pregnancy was a strong predictor of depression in late pregnancy, as well as contributing to the severity of postpartum depressive symptoms. These findings serve to corroborate the importance of routine screening for depression during pregnancy in its own right, but also for its predictive contribution to postpartum depressive symptoms. The increased risk of major depression during pregnancy for women with co-morbid depression and anxiety highlights the importance of including anxiety in screening.

Another main clinical implication of the findings is the importance of assessing women's affective and psychosocial functioning both during pregnancy and in the early postpartum period for its contribution to the prediction of depressive symptoms. Aspects which would be important to assess include women's past and pregnancy experience of depression, the identification of daily stressors, perceived levels of stress and anxiety, expectations of support, particularly from the partner, personality characteristics such as the tendency to worry or self-blame excessively, a traumatic history of child abuse or suicide attempt, and levels of coping. The findings suggest that preventive interventions that target anxiety and stress management, cognitive distortions, improved coping skills, couple/relationship counselling, and fostering supportive networks could be beneficial for those most at risk of perinatal depression.

Future Research Directions

Further prospective studies of major depression and depression symptoms are required, which involve multiple measurement points beginning in the first trimester of pregnancy and continuing to at least one year postpartum to assess the stability of predictors over the course of pregnancy and postpartum adjustment. The findings of the present study highlight the different contribution of predictors associated with late pregnancy and the early postpartum period, which underscore the need to examine the predictors of antenatal depression to integrate with the extensive findings of postpartum depression. A clearer understanding of the interrelationships (direct and indirect influences) among predictors that contribute to both antenatal and postnatal depression could be gained from statistical analyses using path analysis. In particular, additional research is required to investigate the role of anxiety and stress

to determine their effects as a precursor, concomitant or consequence of perinatal depression.

The findings of the present study demonstrate the importance of anxiety and stress in pregnancy for predicting the severity of postpartum depression symptoms. The shift to include anxiety and stress in studies of perinatal depression is further strengthened by recent research which report that maternity anxiety in pregnancy exhibits long-term independent effects on children's behavioural adjustment at four years of age (O'Connor, Heron, Golding, Beveridge & Glover, 2002). More research is also required to test theoretical models such as the cognitive vulnerability and stress coping models implicated by risk factors in the present study for facilitating the understanding of the onset, maintenance and recovery of depression in perinatal period.

Conclusion

The findings of the present study has contributed to research in the perinatal field by providing an antenatal validation of the EPDS in Western Australia on a sample for which the scale is used. It has focused on a relatively neglected area of research by developing predictive models of diagnoses of major depression, depression symptoms and level, and false positive results in pregnancy. The study had a number of limitations such as the small sample size, limited measurement points, sample generalisability, and potential interviewer bias. These limitations should be considered with its strengths, which include the sampling strategy, inclusion of a diagnostic interview, sampling of a wide array of risk factors, and the separation of antenatal and postnatal factors in the statistical analysis. The findings highlighted an EPDS $\geq$ 12 to be optimum for the clinical screening of major depression during pregnancy in a sample of Western Australian women. Pregnancy

and the early postpartum period are prime opportunities for preventive and early intervention efforts due to the frequency of women's perinatal contacts. The present findings highlight the importance of other affective states of anxiety and stress, as well as psychosocial functioning and coping skills as preventative targets for improving the outcomes of mothers with perinatal depression.

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Appendix A

The National Postnatal Depression Program

DEMOGRAPHICS QUESTIONNAIRE

Thank you for taking the time to complete the following background information. Your responses will help us to understand how different groups of women experience pregnancy and having a baby. Your responses will remain confidential.

SECTION 1 – ***Please answer some personal details asked below. This page will be stored separately in order to maintain your confidentiality.***

1. Name: ..... (Surname / Given / Middle Initial)
2. Address: ..... (Street / Suburb / Postcode)

   Email: .....
3. Home Phone No: ..... 4. Mobile Phone No: .....
5. Date of birth: ..... 6. Age: .....
7. Estimated weeks of pregnancy: ..... 8. Due date: .....
9. ***For the purpose of referral, if you consent, please provide the contact details of your GP:***

   Name: ..... (Surname / Given / Middle Initial)

   Address: ..... (Street / Suburb / Postcode)

   Phone Number: .....
10. ***Please provide the name and contact details of your partner:***

    Name: ..... (Surname / Given / Middle Initial)

    Address: ..... (Street / Suburb / Postcode)

    Phone Number: .....

Please provide the name and contact details of two people who will know your whereabouts if you move:

Name: ..... (Surname / Given / Middle Initial)

Address: ..... (Street / Suburb / Postcode)

Phone Number: ..... Relationship: .....

Name: ..... (Surname / Given / Middle Initial)

Address: ..... (Street / Suburb / Postcode)

Phone Number: ..... Relationship: .....

Office Use Only:

Date Administered: ..... *Location ID:* .....

0	1	2	3	4	5	6	7	8	9	
o	o	o	o	o	o	o	o	o	o	o Hospital Midwife
o	o	o	o	o	o	o	o	o	o	o Research Midwife
o	o	o	o	o	o	o	o	o	o	o Member of National PND Program
o	o	o	o	o	o	o	o	o	o	o Maternal Child Health Nurse
o	o	o	o	o	o	o	o	o	o	o GP
o	o	o	o	o	o	o	o	o	o	o Clinical Nurse
o	o	o	o	o	o	o	o	o	o	o Obstetrician

Please colour in the appropriate circles to indicate your response to the following questions.

11. Marital status: Never married O Widowed O Divorced O Separated O Married/Defacto O

12. Country of birth: ..... 13. Main language spoken at home: .....

14. Are you an Aboriginal or Torres Strait Islander? O Yes O No

15. Occupation (prior to pregnancy if have ceased): .....

16. Partner's occupation: .....

17. Please indicate your highest level of education completed:

- O Did not finish school
- O Advanced Diploma/Diploma
- O Graduate Diploma/Graduate Certificate
- O Apprenticeship
- O Other (please specify): .....
- O Certificate Level
- O Bachelor Degree
- O Postgraduate Degree
- O High School (Year 7–12)

18. Please indicate your family income per year (you plus partner):

- O Up to $20,000
- O $20,001-$40,000
- O $40,001-$60,000
- O $60,001-$80,000
- O Greater than $80,001
- O Do not wish to divulge

19. Number of children: 1 O 2 O 3 O 4 O 5 O 6 or more O

20. Number of pregnancies (including current pregnancy): 1 O 2 O 3 O 4 O 5 O 6 or more O

21. Have you experienced any of the following problems **with this pregnancy**?

- ○ None
- ○ Excessive vomiting
- ○ Diabetes
- ○ High blood pressure
- ○ Varicose veins, haemorrhoids or similar
- ○ Bladder or kidney infection
- ○ Bleeding / threatened miscarriage
- ○ Other (please specify): .....

SECTION 2 – *Please answer questions regarding your mood.*
Colour in the appropriate circles to indicate your response.

22. **Before this pregnancy** did you ever have a period of **2 weeks or more** when you felt particularly miserable or depressed? ○ Yes ○ No *(please go to Question 23)*

	Not at all		Somewhat		To a large extent
If **YES**, did this:	1	2	3	4	5
a) interfere with your work?	○	○	○	○	○
b) interfere with your relationship with family and friends?	○	○	○	○	○

c) did you seek professional help? ○ Yes ○ No

23. Have you ever been **diagnosed** with any of the following psychiatric or psychological conditions?

- ○ None
- ○ Minor Depression
- ○ Major Depression
- ○ Anxiety
- ○ Other (please specify): .....

24. Have you had any other emotional problems **during this pregnancy**?

- ○ None
- ○ Depression
- ○ Anxiety
- ○ Eating disorder
- ○ Difficulty accepting being pregnant
- ○ Other (please specify): .....

If **YES**, during pregnancy have you received:

- ○ Counselling or psychological therapy
- ○ Antidepressants
- ○ Other (please specify): .....

SECTION 3 – *Please provide us with some information about your current and past experiences. Colour in the appropriate circles to indicate your response.*

23. On **average**, how many standard drinks alcoholic drinks at present do you consume?

O None	O Less than 1 drink / day	O 1 drink / day
O 2 drinks / day	O 3 drinks / day	O 4 drinks / day
O 5 or more drinks / day		

26. When you were growing up, did you feel your mother was emotionally supportive of you?

Not at all		Somewhat		Very	Didn't know mother
1	2	3	4	5	6
O	O	O	O	O	O

27. Is your relationship with your partner an emotionally supportive one?

Not at all		Somewhat		Very	No partner
1	2	3	4	5	6
O	O	O	O	O	O

28. On average, how would you rate the level of your daily hassles?

Very low		Moderate		Very high
1	2	3	4	5
O	O	O	O	O

29. Are you hoping more for a: O Boy baby or O Girl baby or O Either equally

30. Have you had any of the following **major life events** that distressed you **in the last twelve months or so?**

O None	O Domestic violence	O Financial difficulties
O Separation	O Death of someone close	O Physical illness
O Miscarriage	O Unemployment	O Alcohol/Drug addiction
O Moving house	O Eating disorder	
O Other (please specify):		

31. In **general**, would you say that you **usually**:

	Yes	No
Become upset if you do not have order in your life (eg. Regular time table, organized)	O	O
Are a worrier	O	O
View situations negatively (look for problems)	O	O
Are optimistic (look on the positive side of things)	O	O
Can achieve what you want to	O	O
Are guilt prone (blame yourself too often)	O	O
Are a perfectionist (want everything to be just right)	O	O

32. Do you think there are people you can depend on for practical/emotional support when you go home with your baby? ○ Yes ○ No *(please go to Question 33)*

If **YES**, please indicate below how supported you think you will be:

Not enough		Reasonably		Very
1	2	3	4	5
○	○	○	○	○

If **YES**, who is the most likely person to support you? *(please choose only one)*

- ○ Partner
- ○ Parent/s
- ○ Parents-in-law
- ○ Sibling
- ○ Friend
- ○ Other (please specify): .....

33. How do you expect you will be able to manage your baby?

Very easily		Reasonably		With great difficulty
1	2	3	4	5
○	○	○	○	○

34. Did you experience abuse when you were growing up? ○ Yes ○ No

If **YES**, was it:

- ○ Emotional abuse (being put down constantly, told you were no good, etc.)
- ○ Sexual abuse (subjected to sexual activity with an adult)
- ○ Physical abuse (being physically hurt, neglected or punished)

Note: **If this question is distressing to you, please discuss it with your midwife or doctor.**

Thank you very much for completing this questionnaire.

Additional material for this questionnaire was kindly provided by Dr Marie-Paule Austin, Dept Liaison Psychiatry, Prince of Wales Hospital, NSW.

Appendix B

EDINBURGH POSTNATAL DEPRESSION SCALE (EPDS)

JL Cox, JM Holden, R Sagovsky (1987)

We would like to know how you are feeling. Please **COLOUR IN ONE CIRCLE** for each question which comes closest to how you have felt **IN THE PAST 7 DAYS**, not just how you feel today.

Here is an example, already completed.

I have felt happy:

Yes, all the time	○
Yes, most of the time	●
No, not very often	○
No, not at all	○

This would mean: "I have felt happy most of the time" during the past week.
Please complete the other questions in the same way.

IN THE PAST 7 DAYS:

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

As much as I always could	○
Not quite so much now	○
Definitely not so much now	○
Not at all	○

2. I have looked forward with enjoyment to things:

As much as I ever did	○
Rather less than I used to	○
Definitely less than I used to	○
Hardly at all	○

3. I have blamed myself unnecessarily when things went wrong:

Yes, most of the time	○
Yes, some of the time	○
Not very often	○
No, never	○

4. I have been anxious or worried for no good reason:

No, not at all	○
Hardly ever	○
Yes, sometimes	○
Yes, very often	○

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

Yes, quite a lot	○
Yes, sometimes	○
No, not much	○
No, not at all	○

6. Things have been getting on top of me:

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

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

Yes, most of the time	○
Yes, sometimes	○
Not very often	○
No, not at all	○

8. I have felt sad or miserable:

Yes, most of the time	○
Yes, quite often	○
Not very often	○
No, not at all	○

9. I have been so unhappy that I have been crying:

Yes, most of the time	○
Yes, quite often	○
Only occasionally	○
No, never	○

10. The thought of harming myself has occurred to me:

Yes, quite often	○
Sometimes	○
Hardly ever	○
Never	○

Total Score:.....

Appendix C

DASS

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

The rating scale is as follows:		**Did not apply to me at all**	**Applied to me to some degree, or some of the time**	**Applied to me to a considerable degree, or a good part of the time**	**Applied to me very much, or most of the time**
		0	1	2	3
1	I found myself getting upset by quite trivial things	O	O	O	O
2	I was aware of dryness of my mouth	O	O	O	O
3	I couldn't seem to experience any positive feeling at all	O	O	O	O
4	I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	O	O	O	O
5	I just couldn't seem to get going	O	O	O	O
6	I tended to over-react to situations	O	O	O	O
7	I had a feeling of shakiness (eg, legs going to give way)	O	O	O	O
8	I found it difficult to relax	O	O	O	O
9	I found myself in situations that made me so anxious I was most relieved when they ended	O	O	O	O
10	I felt that I had nothing to look forward to	O	O	O	O
11	I found myself getting upset rather easily	O	O	O	O
12	I felt that I was using a lot of nervous energy	O	O	O	O
13	I felt sad and depressed	O	O	O	O
14	I found myself getting impatient when I was delayed in any way (eg, lifts, traffic lights, being kept waiting)	O	O	O	O
15	I had a feeling of faintness	O	O	O	O
16	I felt that I had lost interest in just about everything	O	O	O	O
17	I felt I wasn't worth much as a person	O	O	O	O
18	I felt that I was rather touchy	O	O	O	O
19	I perspired noticeably (eg, hands sweaty) in the absence of high temperatures or physical exertion	O	O	O	O
20	I felt scared without any good reason	O	O	O	O
21	I felt that life wasn't worthwhile	O	O	O	O

Please turn the page ☞

Reminder of rating scale:		Did not apply to me at all	Applied to me to some degree, or some of the time	Applied to me to a considerable degree, or a good part of the time	Applied to me very much, or most of the time
		0	1	2	3
22	I found it hard to wind down	O	O	O	O
23	I had difficulty in swallowing	O	O	O	O
24	I couldn't seem to get any enjoyment out of the things I did	O	O	O	O
25	I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	O	O	O	O
26	I felt down-hearted and blue	O	O	O	O
27	I found that I was very irritable	O	O	O	O
28	I felt I was close to panic	O	O	O	O
29	I found it hard to calm down after something upset me	O	O	O	O
30	I feared that I would be "thrown" by some trivial but unfamiliar task	O	O	O	O
31	I was unable to become enthusiastic about anything	O	O	O	O
32	I found it difficult to tolerate interruptions to what I was doing	O	O	O	O
33	I was in a state of nervous tension	O	O	O	O
34	I felt I was pretty worthless	O	O	O	O
35	I was intolerant of anything that kept me from getting on with what I was doing	O	O	O	O
36	I felt terrified	O	O	O	O
37	I could see nothing in the future to be hopeful about	O	O	O	O
38	I felt that life was meaningless	O	O	O	O
39	I found myself getting agitated	O	O	O	O
40	I was worried about situations in which I might panic and make a fool of myself	O	O	O	O
41	I experienced trembling (eg, in the hands)	O	O	O	O
42	I found it difficult to work up the initiative to do things	O	O	O	O

Appendix D

Postnatal Questionnaire

Thank you for taking the time to complete the following information. Your responses will help us to understand how different groups of women experience having a baby. Your responses will remain confidential.

Please colour in the appropriate circles to indicate your response, like this: ● Yes O No

1. Name: .....
2. Today's date: .....
3. Your baby's date of birth: .....
4. Your baby's gender: O Boy O Girl
5. Your baby's birth weight (grams): .....
6. How many weeks pregnant were you when your baby was born? .....
7. Did you have: O One baby O Twins O Triplets
8. Was your pregnancy planned? O Yes O No
9. How was your baby delivered?
   - O Spontaneous vaginal birth
   - O Assisted vaginal birth (e.g., forceps, vacuum extraction)
   - O Elective caesarean section
   - O Emergency caesarean section
10. What type of pain relief did you have during the labour and birth?
    - O None
    - O Inhalation gas (e.g., nitrous oxide & oxygen)
    - O Pethidine injection
    - O Epidural anaesthetic
    - O General anaesthetic
    - O Other (please specify):.....
11. Did you experience any complications of labour and birth? O Yes O No

    If **YES**, please specify: .....
12. Please indicate the answer that best describes your feelings about the **labour** experience.

Very disappointed	Slightly disappointed	Feel neutral	Slightly positive	Very positive
1	2	3	4	5
O	O	O	O	O

13. Please indicate the answer that best describes your feelings about the **birth** experience.

Very disappointed	Slightly disappointed	Feel neutral	Slightly positive	Very positive
1	2	3	4	5
O	O	O	O	O

14. How many days did you stay in hospital after the birth?

    O Less than 1 day O 1 day O 2 days O 3 days
    O 4 days O 5 days O More than 5 days

15. How prepared/ready did you feel for discharge home with your baby?

Not at all		Prepared		Very prepared
1	2	3	4	5
O	O	O	O	O

16. In the first week after the birth, did you have the "baby blues", a period of crying or feeling extra sensitive?

O Yes O No

If **YES**, how many days did this last? .....

17. Since the birth, have you had any of the following?

O None	O Thyroid dysfunction	O Separation from baby (e.g., neonatal unit)
O Difficulties passing urine	O Anaemia	O Baby's feeding, sleeping or settling difficulties
O Back, neck & shoulder pain	O Pain during sexual intercourse	O Difficulty adjusting to parenting
O Excessive vaginal bleeding	O Painful or infected episiotomy/caesarean scar	O Feelings of depression/unable to cope
O High blood pressure	O Baby ill-health	O Excessive feelings of tiredness/fatigue

O Other (please specify): .....

18 Have you experienced any breastfeeding difficulties? O Yes O No O I didn't breastfeed

If **YES**, please specify: .....

19. Have there been people you could depend on for practical/emotional support when you got home with your baby? O Yes O No

If **YES**, please indicate below how supported you think you are:

Not enough		Reasonably		Very
1	2	3	4	5
O	O	O	O	O

If **YES**, who is the most likely person to support you?

O Partner O Parent/s O Parents-in-law

O Sibling O Friend O Other (please specify): .....

20. Since the birth, has your mother been emotionally supportive of you?

Not at all		Somewhat		Very	No contact
1	2	3	4	5	6
O	O	O	O	O	O

21. Since the birth, is your relationship with your partner an emotionally supportive one?

Not at all		Somewhat		Very	No partner
1	2	3	4	5	6
O	O	O	O	O	O

22. How do you feel about yourself as a mother?

Strongly negative	Slightly negative	Uncertain	Slightly positive	Strongly positive
1	2	3	4	5
O	O	O	O	O

23. How have you been able to manage your baby?

With great difficulty		Reasonably well		Very easily
1	2	3	4	5
O	O	O	O	O

24. Is your experience of your baby's behaviour like what you expected it to be?

Not at all		Somewhat		Very
1	2	3	4	5
O	O	O	O	O

25. On average, since the birth, how would you rate the level of your daily hassles?

Very low		Moderate		Very high
1	2	3	4	5
O	O	O	O	O

26. Have you sought assistance from anyone to help you cope since the birth of your baby? O Yes O No

If **YES**, what led you to seek help in the first instance? *(please fill in as many as applicable)*

O Feelings of depression/unable to cope
O Your sleeping difficulties
O Couple/relationship difficulties
O Financial difficulties
O Feeling isolated
O Baby's feeding, sleeping or settling difficulties
O Not coping with household or work chores
O Difficulty adjusting to parenting
O Someone else's advice
O Other (please specify): .....

27. If **YES**, from whom did you seek help? *(please fill in as many as applicable)*

O Spouse/partner
O Family
O Friends
O Local doctor/GP
O Psychologist
O Psychiatrist
O Social worker
O Telephone counselling service
O Community Nurse or Midwife or Child Health Nurse
O Play group or mother's group
O Other (please specify): .....

28. If **YES**, how would you rate your satisfaction with the assistance you received?

	Very low 1	2	Moderate 3	4	Very high 5
Spouse/partner	O	O	O	O	O
Family	O	O	O	O	O
Friends	O	O	O	O	O
Local doctor/GP	O	O	O	O	O
Psychologist	O	O	O	O	O
Psychiatrist	O	O	O	O	O
Social worker	O	O	O	O	O
Telephone counselling service	O	O	O	O	O
Community Nurse or Midwife or Child Health Nurse	O	O	O	O	O
Play group or mother's group	O	O	O	O	O
Other (please specify):.....	O	O	O	O	O

Thank you very much for completing this questionnaire.

Appendix E

INFORMATION SHEET
Western Australian Antenatal and Postnatal Screening Study

1. Invitation to Participate

You are invited to take part in a National research project for women during pregnancy and following the birth of your infant. This information sheet explains the purpose of the research as openly and clearly as possible, and includes details about the procedures involved in the project before you decide whether or not to take part in it.

Please read this information and feel free to ask questions of the research midwife. Once you understand what the project is about and if you agree to take part in it, you will be asked to sign a consent form, indicating that you have read and understood the information and give your consent to participate in the research project. You may keep a copy of the information to refer to at a later stage.

2. Description of the Project

The main purpose of this project is to identify women who might be depressed during pregnancy and after having a baby. Previous research has shown the incidence of depression can be quite high at this time in a women's life, and if untreated, can impact on her and her family. It is expected that the results of this research will help us understand more about depression at this time, and help us work with health professionals to identify these problems earlier and how to intervene appropriately.

Approximately 100,000 women across Australia (15,000 in WA) will participate in this project between 2002 and 2005. All women participating in this project will be involved in completing questionnaires during their pregnancy. These will take about 15-20 minutes. You will be asked to complete one of the questionnaires (about 5 minutes) again by your child health nurse at about 6 and/or 12 weeks after you have your baby.

If your results indicate that you may be depressed, the research midwife will discuss this with you at the time. Your general practitioner (GP) may be notified by mail, with your permission, so as to monitor your well-being and offer treatment if appropriate. After the birth, your child health nurse will discuss the results with you.

3. Possible Benefits

Those who participate will be given a Community Resources sheet to keep, with information about available services. If you become depressed or experience difficulties, your participation will ensure you are identified as early as possible. General Practitioners, Midwives and Child Health Nurses will be offered ongoing education about these issues and will be encouraged to monitor your well-being.

4. Possible Risks

It is possible that you could feel distressed when filling out the questionnaires. If this occurs, you are encouraged to discuss this at the time with the research midwife.

5. Confidentiality and Disclosure of Information

Any information obtained in this project that can identify you will remain confidential. It will only be disclosed with your permission, as required by law. If you complete the forms as requested, the scores will be entered on a National database using a numerical code instead of your name. No publication arising from these data will identify any individual involved and only the researchers will have access to the database.

6. New Information Arising During This Project

During the research project, new information about the risks and benefits of the project may become known to the researchers. If this occurs, you will be told about the new information.

7. Results of the Project

Results of the project will be made public via the media and medical journals, and will be provided to participating hospitals.

8. Further Information or Any Problems

This project is the result of collaboration between Edith Cowan University and the Women and Infants Research Foundation, and has been funded by *beyondblue: the National Depression Initiative.*

For further questions or comments please contact either:

beyondblue Research Office
tel. (08) 9340-1387
beyondblue@obsgyn.uwa.edu.au

OR

Assoc Professor Sherryl Pope
tel. (08) 9400-5194
s.pope@ecu.edu.au

9. Participation is Voluntary

Participation in any research project is voluntary. If you do not wish to take part, you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage. Your decision whether or not to take part, or to take part and then withdraw, will not affect your routine treatment or your relationship with King Edward Memorial Hospital.

Please read carefully this information about the project and complete the questionnaires if you are happy to participate.

10. Ethical Guidelines

This project will be carried out according to the National Statement on Ethical Conduct in Research Involving Humans (June 1999) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

Thank you for your interest.

Appendix F

FORM OF CONSENT

I .....,
Given Names Surname

have read the information explaining the study entitled:

Western Australian Antenatal and Postnatal Screening Study (as part of the National Postnatal Depression Prevention and Early Intervention Program).

I have read and understood the information given to me. Any questions I have asked have been answered to my satisfaction.

I understand I may withdraw from the study at any stage and withdrawal will not interfere with my routine care.

I agree that research data gathered from the results of this study may be published, provided that names are not used.

Dated.....day of.....20.....
Month Year

Signature.....

I,.....have explained the above to the signatory who
(Recruiting Research Midwife / Assistant's full name)

stated that she understood the same.

Signature.....

Appendix G

INFORMATION SHEET

The Prediction of Antenatal and Postnatal Depression in a Sample of Western Australian Women
(as part of the Western Australian Antenatal and Postnatal Screening Study)

My name is Debbie Lien and I am a Doctor of Psychology student at Edith Cowan University.

I would like to invite you to take part in a study that will assess the emotional experiences of women during pregnancy and after having a baby. It will require you to complete three questionnaires, which will take about 15 minutes. You will be asked to complete these questionnaires during the third trimester of your pregnancy and at six to eight weeks after the birth of your baby. I will also telephone you during these two times to ask how you have been feeling.

The study will increase awareness of the range of emotional experiences faced by women during pregnancy and after having a baby. It will also assess the usefulness of a questionnaire in recognising women who may become distressed during this time period. If you feel uncomfortable about some questions asked of your thoughts and feelings, you are encouraged to discuss this openly with your midwife or general practitioner. If your results indicate that you may be depressed, the research midwife will discuss this with you at the time. Your general practitioner will be notified by mail, with your permission, so as to monitor your well-being and offer treatment if appropriate.

Please be assured that any information you provide will be held in strict confidence. The data will be coded by numbers, not names. Also, the data will only be reported in group form. The study conforms to guidelines proposed by the Edith Cowan University Committee for the Conduct of Ethical Research. The study has been approved by the Ethics Committees of Edith Cowan University and King Edward Memorial Hospital. Your participation is voluntary, and it will in no way jeopardise the level of service or relationship you have with King Edward Memorial Hospital. You are free to withdraw from the study at any time.

Questions about the study can be directed to the Researcher, Ms Debbie Lien on [redacted] the Research Ethics Officer at Edith Cowan University on 6304 2170, or Dr Joanne Ludlow, Acting Director of Obstetric Services, King Edward Memorial Hospital on 9340 2222.

Thank you for your interest.

Appendix H

CONSENT FORM

I .....,
Given Names Surname

have read the information explaining the study entitled:

The Prediction of Antenatal and Postnatal Depression in a Sample of Western Australian Women (as part of the Western Australian Antenatal and Postnatal Screening Study).

I have read and understood the information given to me. Any questions I have asked have been answered to my satisfaction.

I understand I may withdraw from the study at any stage and withdrawal will not interfere with my routine care.

I agree that research data gathered from the results of this study may be published, provided that names are not used.

I understand that I will be interviewed and the interview may be randomly selected to be audio-taped to ensure the integrity of questions asked. I will be informed prior to the interview being recorded and understand that the recording will be erased after it has been checked.

Dated.....day of.....20.....
Month Year

Signature.....

I, Debbie Lien have explained the above to the signatory who stated that she understood the same.

Signature.....

Appendix I

COMMUNITY RESOURCES

GENERAL INFORMATION	Telephone
Health Direct (24 Hour Service)	1800 022 222
Mental Health Direct (24 Hour Service)	1800 022 222
Health Information Resource Service (KEMH)	9340 1100
or Country Callers	1800 651 100
EMERGENCY TELEPHONE SUPPORT	
Parenting Line	9272 1466
or Country Callers Freecall	1800 654 432
Crisis Care	9223 1111
or Country Callers Freecall	1800 199 008
Lifeline	131 114
WOMEN'S HEALTH SERVICES	
Women's Health Care House (Northbridge)	9227 8122
(Midland)	9250 2221
Fremantle Women's Health Centre	9430 4545
Rockingham Community Health	9527 8221
Gosnells Women's Health Care Place	9490 2258
Ishar: Multicultural Women's Health	9345 5335
Granny Spiers Community House	9401 7021
HOME HELP	
(Volunteer based assistance in times of crisis or special need)	
Clan (Family Support)	9228 9006
Red Cross (Family Support)	9325 5111
Wanslea	9245 2441
PREGNANCY AND FAMILY SERVICES	
Nursing Mothers Association of WA	9309 5393
Parent Help Centre (Department for Community Development)	9272 1466
or Country Callers Freecall	1800 654 432
Ngala Family Resource Centre	9368 9368
Family Planning Association of WA (contraception)	9227 6177
Stillbirth and Neonatal Death Support Group	9382 2687
Multiple Birth Association of WA	9340 1536
Postnatal Depression Support Association	9340 1622
Sexual Assault Referral Centre	9340 1828
Domestic Violence Services	9223 1111
Derbal Yerrigan	9421 3888
RELATIONSHIP HELP	
Relationships Australia	9362 0362
Kinway	9321 5801
Anglicare	9321 7033
Centrecare	9325 6644

Appendix J

National Postnatal Depression Program - *beyondblue*
Women & Infants Research Foundation
Carson House
King Edward Memorial Hospital
374 Bagot Road
SUBIACO WA 6008

Dear .....,

Thank you for agreeing to participate in the study entitled "The Prediction of Antenatal and Postnatal Depression in a Sample of Western Australian Women" *(as part of the National Postnatal Depression Prevention and Early Intervention Program).*

In order to complete the final phase of the study, we would like to gather information regarding your birth experience and your emotional well-being since the birth of your baby. Could you kindly complete the enclosed questionnaires, and return to us using the replied paid envelope *within seven days.* We will also contact you shortly for a follow-up telephone interview, similar to the one in which you participated during your pregnancy. It is envisaged that the questionnaires will take approximately 15 minutes to complete, and the telephone interview approximately 10 minutes.

Please be assured that any information you provide will be held in strict confidence. However, should the results of your questionnaires and interview be elevated, we have a duty of care to notify relevant King Edward Memorial Hospital staff as part of your ongoing care. We will always endeavour to discuss the results with you prior to making a referral.

Your time and efforts have been truly appreciated. Should you have any queries, please do not hesitate to contact us at the beyondblue office on Tel: (08) 9340 1387 or Mob: 041 357 6157.

Yours sincerely,

Debbie Lien
Research Assistant

Appendix K

MINI Diagnoses in the Antenatal and Postpartum Period

Table K1

MINI Diagnoses of Major Depression and Anxiety Disorders at 32 Weeks of Pregnancy (N = 200)

Diagnoses	*n*	% of sample	% of responses
Major depressive episode	31	15.5	44.9
Agoraphobia without history of panic disorder	10	5.0	14.5
Social phobia	10	5.0	14.5
Generalised anxiety disorder	6	3.0	8.7
Panic disorder with agoraphobia	5	2.5	7.2
Panic disorder without agoraphobia	3	1.5	4.3
Posttraumatic stress disorder	3	1.5	4.3
Obsessive-compulsive disorder	1	0.5	1.4
One disorder[a]	27	13.5	
Comorbidity[b]	19	9.5	
Any disorder	46	23.0	

Note. [a]Includes major depressive episode only $n = 15$ and anxiety disorder only $n = 12$. [b]Includes criteria met for two disorders $n = 15$ and criteria met for three disorders $n = 4$.

Table K2

MINI Diagnoses of Major Depression and Anxiety Disorders at Eight Weeks Postpartum (N = 151)

Diagnoses	*n*	% of sample	% of responses
Major depressive episode	22	14.6	45.8
Agoraphobia without history of panic disorder	3	2.0	6.3
Social phobia	7	4.6	14.6
Generalised anxiety disorder	9	6.0	18.8
Panic disorder with agoraphobia	1	.7	2.1
Panic disorder without agoraphobia	1	.7	2.1
Posttraumatic stress disorder	5	3.3	10.4
One disorder	12	7.9	
Comorbidity	15	9.9	
Any disorder met	27	17.9	

Appendix L

Binary Logistic Regression and Multiple Linear Regression Analyses

Table L1
Logistic Regression Analyses of Significant Univariate Predictors of Antenatal Major Depression (N = 200)

Variable		*n*	Odds ratio	(95% CI)
Demographic				
Marital status	Never married	37	2.73	(1.14 – 6.51)*
	Married/defacto	159	1.00	
Education completed	≤ High school	104	4.81	(1.07 – 21.55)
	Technical	56	3.17	(0.64 – 15.79)*
	University	40	1.00	
Partner employed	No	29	3.56	(1.46 – 8.69)**
	Yes	163	1.00	
Family income	≤ $20,000	40	2.70	(1.02 – 7.13)*
	$20,000 – $40,000	43	1.58	(0.56 – 4.47)
	> $40,000	91	1.00	
Pregnancy				
Excessive vomiting	Yes	50	4.24	(1.91 – 9.41)***
	No	150	1.00	
Self-reported depression	Yes	49	15.70	(6.34 – 38.88)***
	No	150	1.00	
Self-reported anxiety	Yes	39	4.71	(2.06 – 10.75)***
	No	160	1.00	
Any psychiatric treatment	Yes	39	8.06	(3.49 – 18.62)***
	No	160	1.00	
Partner support	Low	33	2.86	(1.19 – 6.84)*
	High	159	1.00	
Daily hassles		200	2.89	(1.82 – 4.58)***
Financial difficulties	Yes	71	4.91	(2.16 – 11.19)***
	No	127	1.00	
Unemployment	Yes	28	4.85	(1.99 – 11.82)**
	No	170	1.00	
Past history				
Self-reported depressed mood	Yes	71	5.99	(2.58 – 13.92)***
	No	129	1.00	
Professional help sought	Yes	46	4.94	(2.20 – 11.08)***
	No	154	1.00	
Self-reported minor depression	Yes	37	5.23	(2.27 – 12.02)***
	No	163	1.00	
Self-reported major depression	Yes	28	4.92	(2.02 – 11.98)***
	No	172	1.00	
Suicide attempt in lifetime	Yes	34	8.95	(3.80 – 21.09)***
	No	166	1.00	
Childhood abuse	Yes	49	5.20	(2.32 – 11.63)***
	No	151	1.00	

Personality characteristics				
Worrier	Yes	113	2.52	(1.07 – 5.96)*
	No	87	1.00	
Guilt prone	Yes	82	5.36	(2.26 – 12.72)***
	No	118	1.00	
Optimistic	Yes	156	1.00	
	No	42	2.41	(1.05 – 5.55)*
Can achieve what you want to	No	31	3.33	(1.38 – 8.04)**
	Yes	168	1.00	
Affective functioning scales				
EPDS total score at 22 weeks		200	1.21	(1.12 – 1.31)***
EPDS total score at 32 weeks		200	1.46	(1.28 – 1.66)***
DASS Depression total score		197	1.33	(1.22 – 1.46)***
DASS Anxiety total score		197	1.27	(1.17 – 1.38)***
DASS Stress total score		197	1.22	(1.14 – 1.31)***

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table L2

Model 1: Logistic Regression Analysis of Antenatal Diagnoses of Major Depression (N = 196)

Variable	Odds ratio	(95% CI)
Step 1		
DASS Depression total score	1.33	(1.22 – 1.45)***
Step 2		
DASS Depression total score	1.32	(1.20 – 1.44)***
Suicide attempt in lifetime – yes vs. no	5.65	(1.80 – 17.73)**
Step 3		
DASS Depression total score	1.30	(1.19 – 1.43)***
Suicide attempt in lifetime – yes vs. no	7.00	(2.04 – 24.02)**
Anxiety during pregnancy – yes vs. no	4.15	(1.24 – 13.94)*

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table L3
Logistic Regression Analyses of Significant Univariate Predictors of Antenatal EPDS ≥ 9 (N = 200)

Variable		*n*	Odds ratio	(95% CI)
Demographic				
Partner employed	No	29	1.00	
	Yes	163	2.67	(1.18 – 6.02)*
Family income	≤ $20,000	40	3.23	(1.49 – 6.99)**
	$20,001-$40,000	43	1.27	(0.60 – 2.68)
	> $40,000	91	1.00	
Pregnancy				
Baby gender preference	Yes	63	1.98	(1.08 – 3.62)*
	No	137	1.00	
Excessive vomiting	Yes	50	2.03	(1.06 – 3.88)*
	No	150	1.00	
Self-reported depression	Yes	49	17.08	(7.09 – 41.15)***
	No	150	1.00	
Self-reported anxiety	Yes	39	5.14	(2.38 – 11.11)***
	No	160	1.00	
Any psychiatric treatment	Yes	39	5.14	(2.38 – 11.11)***
	No	160	1.00	
Partner support	Low	33	2.54	(1.18 – 5.47)*
	High	159	1.00	
Daily hassles	Low	99	1.00	
	Moderate	74	3.13	(1.65 – 5.93)***
	High	27	4.77	(1.94 – 11.74)**
Financial difficulties	Yes	71	5.71	(3.03 – 10.76)***
	No	127	1.00	
Death of someone close	Yes	27	3.34	(1.42 – 7.89)**
	No	171	1.00	
Unemployment	Yes	28	5.36	(2.16 – 13.33)***
	No	170	1.00	
Support when home with baby	Low	42	2.67	(1.33 – 5.38)**
	High	155	1.00	
Past history				
Self-reported depressed mood	Yes	71	3.54	(1.93 – 6.50)***
	No	129	1.00	
Professional help sought	Yes	46	2.56	(1.31 – 5.01)**
	No	154	1.00	
Self-reported minor depression	Yes	37	2.90	(1.39 – 6.05)**
	No	163	1.00	
Self-reported major depression	Yes	28	5.46	(2.20 – 13.57)***
	No	172	1.00	
Mother supportive growing up	Low	59	2.46	(1.32 – 4.58)**
	High	138	1.00	
Suicide attempt in lifetime	Yes	34	3.79	(1.73 – 8.32)**
	No	166	1.00	
Childhood abuse	Yes	49	4.29	(2.16 – 8.54)***
	No	151	1.00	

Personality characteristics				
Upset if not have order in life	Yes	74	2.64	(1.46 – 4.78)**
	No	125	1.00	
Worrier	Yes	113	7.88	(3.97 – 15.63)***
	No	87	1.00	
View situations negatively	Yes	41	3.71	(1.80 – 7.66)***
	No	158	1.00	
Optimistic	Yes	156	1.00	
	No	42	3.40	(1.67 – 6.93)**
Can achieve what you want to	No	31	3.78	(1.67 – 8.55)**
	Yes	168	1.00	
Guilt prone	Yes	82	8.48	(4.45 – 16.17)***
	No	118	1.00	
Perfectionist	Yes	89	1.93	(1.09 – 3.42)*
	No	110	1.00	
Affective functioning scales				
Major depression diagnosis	Yes	31	19.88	(5.79 – 68.26)***
	No	169	1.00	
EPDS at 22 weeks		200	1.37	(1.25 – 1.50)***
DASS Depression total score		197	1.53	(1.34 – 1.75)***
DASS Anxiety total score		197	1.27	(1.17 – 1.39)***
DASS Stress total score		197	1.30	(1.21 – 1.41)***

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table L4

Model 2: Logistic Regression Analysis of Antenatal EPDS ≥ 9 (N = 197)

Variable	Odds ratio	(95% CI)
Step 1		
DASS Depression total score	1.53	(1.34 – 1.75)***
Step 2		
DASS Depression total score	1.55	(1.33 – 1.79)***
Worrier – yes vs. no	9.82	(3.68 – 26.16)***
Step 3		
EPDS total score at 22 weeks	1.20	(1.08 – 1.34)**
DASS Depression total score	1.45	(1.25 – 1.67)***
Worrier – yes vs. no	7.30	(2.62 – 20.36)***

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table L5
Logistic Regression Analyses of Significant Univariate Predictors of Antenatal False Positives (N = 200)

Variable		*n*	Odds ratio	(95% CI)
Baby gender preference	Yes	63	1.97	(1.03 – 3.77)*
	No	137	1.00	
Depression during pregnancy	Yes	49	2.16	(1.08 – 4.31)*
	No	150	1.00	
Mother support growing up	Low	59	2.40	(1.236 – 4.67)*
	High	138	1.00	
Daily hassles	Low	99	1.00	
	Moderate	74	2.55	(1.29 – 5.01)**
	High	27	0.90	(0.30 – 2.67)
Financial difficulties	Yes	71	2.53	(1.33 – 4.81)**
	No	127	1.00	
Death of someone close	Yes	27	2.94	(1.28 – 6.77)*
	No	171	1.00	
Support when home with baby	Low	42	2.48	(1.21 – 5.07)*
	High	155	1.00	
Friend most likely support	Yes	45	2.20	(1.09 – 4.45)*
	No	155	1.00	
Upset if not have order in life	Yes	74	1.97	(1.04 – 3.73)*
	No	125	1.00	
Worrier	Yes	113	5.74	(2.61 – 2.59)***
	No	87	1.00	
View situations negatively	Yes	41	2.40	(1.16 – 4.95)*
	No	158	1.00	
Guilt prone	Yes	82	4.35	(2.24 – 8.45)***
	No	118	1.00	
EPDS Total Score at 22 weeks		200	1.15	(1.07 – 1.22)***
DASS Anxiety Total Score		197	1.03	(0.98 – 1.07)
DASS Stress Total Score		197	1.07	(1.03 –1.11)**

Note. $*p < .05$. $**p < .01$. $***p < .001$.

Table L6
Model 3: Logistic Regression Analysis of Antenatal False Positives (N = 197)

Variable	Odds ratio	(95% CI)
Step 1		
EPDS total score at 22 weeks	1.17	(1.09 – 1.25)***
Step 2		
EPDS total score at 22 weeks	1.12	(1.04 – 1.21)**
Worrier – yes vs. no	3.87	(1.69 – 8.90)**
Step 3		
EPDS total score at 22 weeks	1.13	(1.05 – 1.22)**
Daily hassles – moderate vs. low	2.46	(1.14 – 5.33)*
Daily hassles – high vs. low	0.40	(0.12 – 1.35)
Worrier – yes vs. no	4.87	(2.05 – 11.57)***

Note. $*p < .05$. $**p < .01$. $***p < .001$.

Table L7

Multiple Linear Regression Analyses of Significant Univariate Predictors of Antenatal EPDS Total Scores (N = 200)

Variable	*B*	*SE B*	*β*
Demographic			
Partner employed – no vs. yes	2.66	1.04	.18 *
Family income ≤ $20,000 vs. > $40,000	2.57	0.98	.21 *
Family income $20,000 – $40,000 vs. > $40,000	0.48	0.96	.04
Pregnancy			
Baby gender preference – yes vs. no	2.35	0.79	.21 **
Excessive vomiting – yes vs. no	2.49	0.85	.20 **
Self-reported depression – yes vs. no	6.77	0.73	.55 ***
Self-reported anxiety – yes vs. no	4.38	0.90	.33 ***
Any psychiatric treatment – yes vs. no	5.27	0.87	.40 ***
Partner support – low vs. high	3.82	0.97	.28 ***
Daily hassles – moderate vs. low	2.57	0.75	.24 **
Daily hassles – high vs. low	5.96	1.06	.39 ***
Financial difficulties – yes vs. no	4.42	0.72	.40 ***
Death of someone close – yes vs. no	2.93	1.08	.19 **
Unemployment – yes vs. no	4.06	1.04	.27 ***
Support with baby – no vs. yes	0.09	0.03	.20 **
Manage with baby – difficulty vs. easily	2.16	0.76	.20 **
Past history			
Self-reported depressed mood – yes vs. no	4.00	0.73	.36 ***
Professional help sought – yes vs. no	3.38	0.86	.27 ***
Self-reported minor depression – yes vs. no	3.06	0.94	.26 **
Self-reported major depression – yes vs. no	3.94	1.04	.26 ***
Mother supportive – no vs. yes	2.98	0.79	.26 ***
Suicide attempt in lifetime – yes vs. no	3.97	0.96	.28 ***
Childhood abuse – yes vs. no	4.00	0.82	.33 ***
Personality characteristics			
Upset if not have order in life – yes vs. no	3.27	0.74	.30 ***
Worrier – yes vs. no	4.89	0.67	.46 ***
View situations negatively – yes vs. no	4.27	0.88	.33 ***
Optimistic – no vs. yes	3.84	0.88	.30 ***
Can achieve what you want to – no vs. yes	4.59	0.99	.32 ***
Guilt prone – yes vs. no	5.32	0.66	.50 ***
Affective functioning scales			
Major depression diagnosis – yes vs. no	8.13	0.86	.56 ***
EPDS at 22 weeks ≥ 9 vs. < 9	5.55	0.64	.53 ***
DASS Depression ≥ 10 vs. < 10	8.74	0.76	.64 ***
DASS Anxiety ≥ 8 vs. < 8	7.31	0.76	.57 ***
DASS Stress ≥ 15 vs. < 15	7.98	0.70	.64 ***

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Table L8
Multiple Linear Regression Analyses of Significant Univariate Antenatal Predictors of Postpartum EPDS Total Scores (N = 151)

Variable	*B*	*SE B*	*β*	
Pregnancy				
Self-reported depression – yes vs. no	4.87	1.02	.37	***
Self-reported anxiety – yes vs. no	4.38	1.02	.33	***
Any psychiatric treatment – yes vs. no	3.91	1.05	.29	***
Daily hassles – moderate vs. low	1.40	0.92	.13	
Daily hassles – high vs. low	4.17	1.36	.25	**
Financial difficulties – yes vs. no	3.08	0.91	.27	**
Unemployment – yes vs. no	2.73	1.30	.17	*
Moving house – yes vs. no	2.92	0.87	.27	**
Support with baby – low vs. high	.13	0.03	.34	***
Manage with baby – difficulty vs. easily	2.47	0.86	.23	**
Past history				
Self-reported depressed mood – yes vs. no	3.48	0.86	.31	***
Professional help sought – yes vs. no	2.79	0.98	.23	**
Self-reported major depression – yes vs. no	4.34	1.27	.27	**
Mother supportive – low vs. high	2.17	0.96	.19	*
Suicide attempt in lifetime – yes vs. no	3.70	1.22	.24	**
Childhood abuse – yes vs. no	4.67	1.00	.36	***
Personality characteristics				
Upset if not have order in life – yes vs. no	2.64	0.89	.24	**
Worrier – yes vs. no	2.72	0.85	.25	**
Can achieve what you want to – no vs. yes	3.15	1.23	.21	*
Guilt prone – yes vs. no	3.34	0.86	.30	***
Affective functioning scales				
Major depression diagnosis – yes vs. no	6.28	1.18	.40	***
EPDS at 22 weeks ≥ 9 vs. < 9	2.84	0.85	.27	**
EPDS at 32 weeks ≥ 9 vs. < 9	4.49	0.83	.40	***
DASS Depression at 32 weeks ≥ 10 vs. < 10	5.27	1.20	.34	***
DASS Anxiety at 32 weeks ≥ 8 vs. < 8	6.44	0.98	.48	***
DASS Stress at 32 weeks ≥ 15 vs. < 15	6.84	1.02	.49	***

Note. $^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Table L9

Multiple Linear Regression Analyses of Significant Univariate Postnatal Predictors of Postpartum EPDS Total Scores (N = 151)

Variable	*B*	*SE B*	*β*	
Delivery				
Gestational age at delivery	-.64	0.24	-.22	**
Elective caesarean section – yes vs. no	2.64	1.30	.17	*
Inhalation gas – yes vs. no	-1.78	0.89	-.16	*
Feelings about birth – disappointed vs. positive	4.77	1.23	.31	***
Feelings about birth – neutral vs. positive	.31	1.08	.02	
Psychosocial risk factors				
Support when home with baby – low vs. high	2.91	0.91	.26	**
Mother support – not enough vs. high	3.47	1.25	.23	**
Mother support – somewhat vs. high	-.79	1.46	-.05	
Partner support – low vs. high	4.99	0.97	.40	***
Self-reported baby blues – yes vs. no	2.78	0.85	.26	**
Feelings as mother – uncertain vs. positive	8.20	1.13	.51	***
Managing with baby – difficulty vs. easily	5.79	0.86	.48	***
Baby's behaviour– somewhat vs. quite	2.84	0.85	.27	**
Daily hassles – moderate vs. high	2.94	0.89	.28	**
Daily hassles – low vs. high	5.41	1.26	.36	***
Difficulties since delivery				
Back, neck & shoulder pain – yes vs. no	2.27	0.86	.21	**
Baby's feeding, sleeping or settling – yes vs. no	2.82	0.87	.26	**
Excessive feelings of tiredness – yes vs. no	4.96	0.80	.45	***
Depression/unable to cope – yes vs. no	7.46	0.83	.59	***
Baby ill-health – yes vs. no	3.80	1.38	.22	**
Difficulty adjusting to parenting – yes vs. no	3.98	1.47	.22	**
Help sought – yes vs. no	4.51	0.80	.42	***
Reason/s for seeking help				
Baby's feeding, sleeping or settling – yes vs. no	2.15	0.92	.19	*
Not coping with household/work chores – yes vs. no	3.01	1.04	.23	**
Depression/unable to cope – yes vs. no	7.30	0.93	.54	***
Sleep difficulties – yes vs. no	3.94	1.17	.27	**
Someone else's advice – yes vs. no	3.61	1.20	.24	**
Feeling isolated – yes vs. no	7.71	1.23	.46	***
Couple/relationship difficulties – yes vs. no	9.49	1.35	.50	***
Affective functioning scales				
Major depression diagnosis – yes vs. no	10.31	0.90	.68	***
DASS Depression $\geq$ 10 vs. < 10	11.22	0.86	.73	***
DASS Anxiety $\geq$ 8 vs. < 8	9.96	1.11	.59	***
DASS Stress $\geq$ 15 vs. < 15	9.44	0.81	.69	***

Note. $*p < .05$. $**p < .01$. $***p < .001$.