EXPLORING ANTENATAL FACTORS IN POSTNATAL DEPRESSION

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ABSTRACT

Up to 20% of all new mothers may suffer from postnatal depression. This amounts to around 3,500 mothers each year in Auckland alone. The effects of postnatal depression are far reaching and can impact detrimentally on the lives of mothers and those close to them. To understand more about postnatal depression, British researchers Cooper, Murray, Hooper, and West (1996) developed a measure for identifying antenatally women who may be at risk of developing postnatal depression. The present study examined the predictive validity of Cooper et al.'s antenatal index in identifying mothers likely to develop postnatal depression in a New Zealand population. Ninety-eight Auckland mothers completed antenatal and postnatal questionnaires that included Cooper et al.'s predictive index, the GHQ-12 and the Edinburgh Postnatal Depression Scale. Results suggested that the predictive ability of Cooper et al.'s measure improved when including an antenatal measure of general wellbeing (the GHQ-12) into the regression equation. The results suggested that 6% of the variance in postnatal depression scores was attributed to the antenatal predictive index. The GHQ-12 added to the predictive ability by explaining an additional 19% of the variance in postnatal depression scores. Discriminant analysis showed that the percentage of cases correctly classified into depressed and non-depressed was 66% and the sensitivity, specificity and positive predictive value of the antenatal measures achieved comparable findings to that of Cooper et al. Recommendations for future research include using a different methodological approach and investigating the predictive power of the General Health Questionnaire further.

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INTRODUCTION

The birth of a baby is a life-changing experience and can be a stressful transition phase for a woman (Kendall-Tackett & Kantor, 1993). On average, 15% of all mothers will experience an episode of postnatal depression after the birth of their baby (Crisp, 1992). New Zealand research finds postnatal depression affecting as many as 20% of new mothers (McGill, Burrows, Holland, Langer, & Sweet, 1995). In Auckland, this amounts to around 3,500 mothers every year (Statistics New Zealand, Te Tari Tatau, 2000). Postnatal depression is a debilitating condition, characterised by exhaustion, despair, apathy, insomnia and anxiety attacks (Fowles, 1998). Appearing in the first few months after giving birth, postnatal depression commonly goes undetected and untreated (Kumar & Robson, 1984; Webster, Thompson, Mitchell, & Werry, 1994). Coupled with the adverse effects on those close to the mother, especially her baby, non-detection is of concern (Murray & Cooper, 1997). Detrimental effects on the children of mothers with postnatal depression include conduct behaviour problems, impaired infant developmental progress and hyperactivity (Beck, 1999; Field, 1998; Sinclair & Murray, 1998). Early identification and intervention are the keys to successful treatment of postnatal depression; some means of predicting which mothers are likely to be at risk is necessary (Leopold & Zoschnick, 1997).

Nicholson (1998) describes the postnatal period as being a major source of dispute with professional and lay childbirth experts engaging in interdisciplinary debates. Such "experts" emerge from disciplines including medical, midwifery, nursing, psychological and sociological and are concerned with what has gone wrong for a woman if she has become depressed. Nicholson (1998) stated that questions such as: "what causes postnatal depression?", "who gets it?", "can it be predicted?", "what is its incidence?", "will it happen more than once to the same woman?", are commonly asked. These questions have not and may not be satisfactorily answered for all engaged in the debate. However, for the mothers' sake continuing interest and research into postnatal depression is

crucial. Many differing explanations for the condition of postnatal depression abound; however, researchers meet on common ground with their focus on the mother and how increasing knowledge about this condition will ultimately be of benefit to her.

Postnatal depression is a very real problem existing in the community (McGill et al., 1995). The importance of research into the possible predictive determinants of postnatal depression with a view to reducing the effects is essential. Alleviation of months of suffering, including potentially harmful effects on children, is possible by early identification and commencement of treatment (Beck, 1996). If a simple, easy to administer predictive questionnaire were readily available at routine antenatal checkups, maternity caregivers could identify those potentially at risk of developing postnatal depression. Increased attention given to follow-up measures may then avoid needless suffering and detrimental psychological effects.

Researchers have outlined various antenatal factors thought to be predictive of postnatal depression. These factors include past or present depression, poor relationships with parents, marital problems, and lack of support (Appleby, Gregoire, Platz, Prince, & Kumar, 1994; Braverman & Roux, 1978; Posner, Unterman, Williams, & Williams, 1997; Stamp, Sved-Williams, & Crowther, 1996). Little consensus on antenatal predictive factors exists. As the biomedical model has dominated much research related to maternal mental health, this may explain the lack of consensus (Kearns, Neuwelt, Hitchman, & Lennan, 1997). Biomedical domination led to overlooking the importance of psychosocial factors in favour of biological factors in the search for likely origins of postnatal depression. Discounting external stressors by internalising and medicalising women's distress fails to acknowledge psychosocial factors. Psychosocial factors thereby remain undetected and unchanged (Kearns et al., 1997). There is a pressing need for further research on the psychosocial factors that contribute to a mother's experiences after birth (Collins, Dunkel-Schetter, Lobel, & Scrimshaw, 1993). This need is more evident when considering biological factors, including hormones and biochemical imbalances, are

considered to be poor predictors of adverse maternal health outcomes following birth (Cooper & Murray, 1998).

Earlier studies have shown that researchers often wait until after delivery to assess depression, relying instead on retrospective reports to evaluate predictive relations (Whiffen, 1988b). This might be because the label postnatal implies that the onset of depression occurs after delivery rather than during pregnancy (Gotlib, Whiffen, Wallace, & Mount, 1991). In contrast, a well-conducted prospective study would enable the gathering of information about what is happening in women's lives during pregnancy that might lead to the likelihood of developing postnatal depression.

New Zealand lacks research on the efficacy of an antenatal predictive index for postnatal depression. It would therefore seem timely to approach this by way of a prospective study on psychosocial predictors with a specific New Zealand focus. British researchers Cooper, Murray, Hooper, and West (1996), developed an antenatal predictive index for postnatal depression. The predictive index proved a useful tool in identifying women likely to experience postnatal depression. This is a promising development and it is pertinent to assess the validity of the index within a New Zealand population. A study from a New Zealand perspective will increase knowledge about PND in this country and may assist in drawing attention to a common, yet frequently overlooked illness.

CHAPTER ONE

LITERATURE REVIEW

1.1 Overview of postnatal depression

1.1.1 The course of pregnancy

For many women, the reality of pregnancy is that the experience does not live up to the idealised notion of impending motherhood. In pregnancy, a prospective mother often does not "blossom and exude happiness and vitality" (Dalton & Holton, 1996, p.6), and images of blissful contentment from conception to delivery appear to be a myth (Arieti & Bemporad, 1980).

A few of the physical experiences a prospective mother can be subjected to include varicose veins, stretch marks, chloasma (patchy discoloration of the skin, often on the face), tiredness, high blood pressure, swelling in hands and feet, gestational diabetes, along with the added discomfort of weight gain (Eisenberg, Murkoff, & Hathaway, 1992). In addition, there are hormonal changes taking place in the mother's body as it prepares to sustain another life for a period of around nine months. In particular, there is a rapid rise in oestrogen, progesterone and prolactin. The heart, bladder, and ribcage also expand to cater for an increased workload and enlarging uterus (Dalton & Holton, 1996; Kalat, 1995).

Emotional experiences during pregnancy include concerns about the foetus, financial and relationship changes, whether to continue employment and nearer to birth, fear of the actual birth process. Emotional reactions are likely to be more pronounced in certain mothers, such as those with existing illnesses whose

health can be further compromised by a pregnancy (Affonso, Chong-Yeu, & Mayberry, 1999; Arieti & Bemporad, 1980).

This interaction of physical and emotional factors will define the maternal environment for the prospective mother. How a mother feels during her pre-birth phase often impacts on her physical and emotional health (Laizner & Jeans, 1990).

1.1.2 The post-pregnancy environment

The birth of a baby is a life-changing experience and often a stressful transition phase in a woman's life (Kendall-Tackett & Kantor, 1993). Sometimes likened to a life crisis (Murray, 1992), dramatic changes in relationships, roles and routines occur (Gotlib et al., 1991). The emotional wellbeing of the mother is put at risk following birth (Horan-Smith & Gullone, 1998), and traumatic births have been implicated in the development of post-traumatic stress disorder (Allen, 1998).

In languages such as French and Italian, a common metaphor for the birth is 'the happy event' (Romito, Saurel-Cubizolles, & Lelong, 1999). Societal expectations are that a new mother will experience a sense of satisfaction and contentment with the birth of her baby. The average baby needs around five hours a day just for feeding and comforting (Romito, 1989, cited in Unterman, Posner, & Williams, 1990). When including bathing and changing, little time is left for attending to a mother's own needs or household tasks. The disruption brought by a newborn baby, particularly for a first-time mother, can amount to extreme psychological distress. For many mothers, the experience is accurately described as follows: "Childbearing per se has a particular and deleterious effect on the mental health of a substantial proportion of first-time mothers" (Kumar & Robson, 1984, p. 45). Some consider the condition postnatal depression to be a common consequence of pregnancy and childbirth (Cox, Murray, & Chapman, 1993; Terry, Mayocchi, & Hynes, 1996).

1.1.3 Postnatal depression defined

Experienced by between 10 and 20% of all mothers, postnatal depression (PND) is not uncommon (Fisch, Tadmor, Dankner, & Diamant, 1997; MacLennan, Wilson, & Taylor, 1996). The same variables seem to predict postnatal and non-postnatal depression (Whiffen, 1992). However, some have found PND has a better prognosis than depression in general and raise the possibility that children provide a buffering effect (Bell, Land, Milne, & Hassanyeh, 1995). The DSM-IV (American Psychiatric Association, 1995) does not classify PND as a specific disorder and specifies that symptomatology of postpartum major depressive disorders do not differ from symptomatology in non-postpartum mood episodes. PND is characterised by exhaustion, apathy, inability to sleep, despair, appetite loss and anxiety attacks similar to those experienced by people suffering from general depression (Fowles, 1998). The mother may experience the loss of happiness, pleasure, interest and enthusiasm, along with the ability to think clearly and concentrate (Crisp, 1992). A woman with PND is unlikely to develop a sense of herself as a competent and effective mother (Fowles, 1998). In addition, it is likely she will be unable to adequately care for her child. Nicholson (1998) confirms this view with the claim that suffering from PND will affect a woman's image of herself as a 'good mother'. If left untreated, the effects on the mother can be particularly disturbing and include severe depression, marital problems and in extreme cases, suicide (Nahas, Hillege, & Amasheh, 1999).

PND is not an affliction of today's mothers. In 460BC, Hippocrates was convinced that attacks of mania, delirium and agitation after childbirth ("puerperal fever"), were a direct result of suppressed discharge transported to the brain (Leopold & Zoschnick, 1997). This may seem amusing in a time where we consider ourselves far more enlightened. Unfortunately, although diagnostically terms have changed, limited progress in terms of predicting and preventing PND has occurred. (Unterman et al., 1990).

Three depressive disorders may occur in the postpartum period. The first and most severe is psychotic depression, or puerperal psychosis (Posner et al., 1997). Puerperal psychosis is a rare disorder affecting only 0.1-0.3% of women. Possibly linked to a prior psychiatric history, puerperal psychosis often involves delusions and hallucinations and commonly requires admission to hospital (Beck, 1996). The second is PND. Mothers seem likely to exhibit signs of PND around one to three months after birth (Kumar & Robson, 1984). The third disorder is postpartum blues, which includes tearfulness, irritability, dysphoric mood changes and emotional lability (O'Hara, Schlechte, Lewis, & Wright, 1991b). Postpartum blues is a mild, transitory syndrome, commonly affecting as many as 85% of all mothers in the first week after delivery. Due to postpartum blues being commonly experienced and similar to premenstrual tension, a hormonal basis is likely (Stein, Marsh & Morton ,1981, cited in O'Hara et al., 1991b).

Some have questioned the value of applying the label 'PND' to depression after birth, for reasons including the fact that depression may exist prenatally and continue after the birth and depression may have nothing to do with postpartum physiology (Nicholson, 1998). Postnatal mood disorders are thought by others to range in severity along a continuum with no clear dividing line (Talbot, 1998). Therefore, while it is possible to distinguish between 'the blues', postnatal depression and postpartum psychosis, at the boundaries mothers will be very similar to one another (O'Hara & Zekoski, 1988, cited in O'Hara, 1994).

1.1.4 Impact of postnatal depression

Postnatal depression affects the mother, those around her and in particular, her baby (Murray & Cooper, 1997; O'Hara, 1986; Sinclair & Murray, 1998; Whiffen, 1988b). A depressed mother often exhibits behaviour that interferes with optimal care-giving behaviour (Donovan & Leavitt, 1989). The types of behaviour include apathy, confusion and emotional unavailability. Adverse effects on the children include cognitive and behavioural deficits, impaired infant developmental progress, and delays in growth (Boyce, Stubbs, & Todd,

1993; Field, 1998; Murray & Cooper, 1997). In addition, babies born to depressed mothers typically have less contented expressions, are more fussy and display lower levels of activity (Field, 1999). The deleterious effects on the developing child may be the result of disturbances in the mother-child relationship in the first weeks after birth (Cooper & Murray, 1998). Table 1 gives a brief overview of the effect that PND can have on children.

Table 1

Effects on children born to mothers with postnatal depression

AUTHOR	FINDINGS	SAMPLE SIZE
(Beck, 1999)	More conduct behaviour problems in children aged 1-18 years with depressed mothers.	Meta-analysis of 33 studies.
(Cadzow, Armstrong, & Fraser, 1999)	Elevated Edinburgh Postnatal Depression Scale in the first 6 weeks postpartum was a risk indicator for child physical abuse.	151 mothers from 'at risk' families.
(National Institute of Child Health and Human Development..., 1999)	Children of mothers who reported feeling depressed performed more poorly on measures of cognitive-linguistic functioning. They were less co-operative and more problematic at 36 months.	1251 depressed and non-depressed mothers.
(Sinclair & Murray, 1998)	Longitudinal study at 3 months, 18 months and 5 years found evidence of more immaturity, emotional arousal and distractibility in children, especially from low SES families, who had mothers recently depressed. An increase in hyperactive behaviour, notably in boys, was evident.	100 depressed and non-depressed mothers.
(Whiffen, 1990)	Prospective study over 2 years showed early a correlation with PND and reports of infant crying and inability to be soothed. Among mothers of 2-year-old children, depression was associated with maternal reports that the child had an unsettled temperament, was unadaptable, dependent and unresponsive.	80 mothers and fathers (depressed and non-depressed).

The most enduring effects of PND are possibly on children living with mothers who have the disorder (Kendall-Tackett & Kantor, 1993). The possibility that children may suffer long-term and lasting effects is disturbing and highlights the necessity of accurate and early identification and treatment of mothers with PND.

1.1.5 Identifying mothers with postnatal depression

Identifying mothers antenatally who are likely to be at risk of PND should be a priority. In this way, caregivers can intervene to prevent serious problems for the mother and those close to her (Laizner & Jeans, 1990). PND is more widespread than usually thought and very often undiagnosed (Allen, 1993; Appleby et al., 1994; Cooper & Murray, 1998; MacLennan, Wilson, & Taylor, 1996; McIntosh, 1993; Webster et al., 1994). Non-diagnosis is possibly due to many women either being unaware that they are depressed (McGill et al., 1995), being unwilling to admit the fact due to the stigma attached to psychological illness (McIntosh, 1993), or attributing symptoms to exhaustion (Fossey, Papiernik , & Bydlowski, 1997). Often mothers feel guilty, confused and embarrassed if they do not conform to the happy maternal stereotypes and they tend to keep such feelings to themselves (Crisp, 1992; Horan-Smith & Gullone, 1998; Posner et al., 1997; Righetti-Veltema, Conne-Perréard, Bousquet, & Manzano, 1998; Unterman et al., 1990). Richards (1998) argued that the workload of the maternity caregiver, along with their unwillingness to use the Edinburgh Postnatal Depression Scale (a simple screening instrument), might also affect the likelihood of identifying mothers with PND. As Richards resides in Wales, this comment cannot be generalised to health caregivers in New Zealand without adequate investigation.

Many women are likely to be suffering alone and unaware that help is available. Many of the women identified by Webster et al. (1994) as depressed would likely have remained unidentified without the use of a screening measure. In fact, two of the most severely depressed women had not discussed their feelings with health workers, despite wanting help for their condition. Other researchers

concur with this finding, highlighting the lack of detection of PND by those in the health profession and the small number of depressed women voluntarily presenting for treatment (Boyce et al., 1993; Cooper & Murray, 1998; Nonacs & Cohen, 1998; Righetti-Veltema et al., 1998). According to Richards (1998), mothers may not wish to be referred for treatment or be willing to accept intervention from their caregiver. Whiffen and Johnson (1998) have found around 15% of women with new babies can experience symptoms severe enough to warrant a clinical diagnosis and as many as 1/3 of those suffering the effects of PND remain untreated (Glaze & Cox, 1991; Watson, Elliott , Rugg , & Brough, 1984). This gives cause for concern.

An effective means of identifying Auckland women with PND who may not otherwise be detected by medical professionals may be routine use of the Edinburgh Postnatal Depression Scale (Webster et al., 1994). Problems of non-identification also exist in Sweden, where routine screening with the Edinburgh Postnatal Depression Scale (EPDS) may be the most effective means of resolving this problem (Bågedahl-Strindlund & Monsen Börjesson, 1998). In addition, educating all health professionals to increase their awareness of PND is paramount (Crisp, 1992). Since women are generally unlikely to seek help from mental health professionals postnatally, identification via community screening programmes may allow intervention before the difficulties experienced by mothers with PND become more severe (Zelkowitz & Milet, 1995).

1.2 Models and theories of postnatal depression

The following models and theories provide plausible explanations for the condition of PND and aid understanding of a disorder with many potential correlational or causative factors.

1.2.1 Biological theories

A number of studies have been conducted resulting in a greater understanding of the role of biology in PND. For example, a study of identical and fraternal twins found the estimated genetic contribution to PND (38% heritability) was similar to estimates reported for depression in general (Treloar, Martin, Bucholz, Madden, & Heath, 1999). Most comprehensive attention has been given to hormonal factors associated with PND (Kendall-Tackett & Kantor, 1993). During pregnancy, levels of progesterone and oestradiol rise to several hundred times their normal level and then drop rapidly after delivery (Harris, 1994). Lower levels of oestradiol in late pregnancy and early in the puerperium (the period immediately following childbirth) have been found in postnatally depressed women (O'Hara, 1994).

Research into thyroid hormones has shown transient hypothyroidism and positive thyroid antibody status is associated with PND (Harris, 1994). No strong evidence for a purely biological basis to PND exists however (Kumar & Robson, 1984; O'Hara, 1994; O'Hara, Schlechte, Lewis, & Varner, 1991a; Treloar et al., 1999; Unterman et al., 1990). Harris (1994) suggested the disappointing results found in studies of hormonal influences on PND might be due to the failure to monitor mood and hormone changes during pregnancy and through the postnatal period. Hormonal factors such as changes in levels of progesterone, oestrogen, cortisol and β-endorphin, while seemingly playing a role in PND, affect only some women (Glover, 1992, cited in Treloar et al., 1999). In addition, a major hormonal influence is precluded by the persistence of PND after hormonal shifts have subsided and in the existence of a similar syndrome in fathers, grandparents and adoptive parents (Gitlin & Pasnau, 1989, & Asch & Rubin, 1974, cited in Unterman et al., 1990). This suggests some additional factor, or combination of factors need consideration when identifying predictors of PND.

Overall, research to date on biological factors thought to be predictive of PND is inconclusive (Cooper & Murray, 1997). Treating an illness effectively requires

acknowledging that social and psychological factors contributing to it have a bearing on the maintenance of poor health (Taylor, 1995). Social aspects include the impact of social relationships on health, while psychological factors include self-esteem and stress. Given the immense change occurring in a woman's life at the time of childbirth, including social and psychological factors, it is unlikely biological aspects alone are responsible for the disorder of PND. An interaction of biological, psychological, and social factors contribute to psychological disorders in general (Talbot, 1998). Such an interaction likely contributes to PND also (Mauthner, 1993).

1.2.2 A psychosocial model of postnatal depression

The psychosocial model emphasises external rather than internal stressors in the development of PND (Nicholson, 1990, cited in Kearns et al., 1997). Researchers emphasising the role of psychosocial factors in the development of postpartum disorders adopt the position of continuity between postnatal and other depression (Whiffen, 1992). Such researchers test etiological models derived from the general depression literature (Whiffen, 1992).

Studies have found that characteristics most consistently appearing in women with postnatal depressive symptomatology are those of a psychosocial nature and include an excess of adverse life events, lack of social support and a history of depression (Hickey, Boyce, Ellwood, & Morris-Yates, 1997). Postnatal depressive symptomatology also correlates more strongly with psychosocial stressors than with hormonal changes (Posner et al., 1997).

While there is support for a psychosocial model of postnatal depression (Hickey 1997), the importance of continuing research into psychosocial variables that may contribute to PND has also been stressed (Collins et al., 1993).

The use of conceptual frameworks may facilitate the development of additional theories and models of PND (Terry et al., 1996). Kearns et al. (1997) effectively demonstrate the use of a conceptual framework in New Zealand research.

Kearns et al.'s model suggests that socio-demographic characteristics such as age and income may influence aspects of the woman's pregnancy; in combination, these characteristics influence the experience of distress. Kearns and colleagues model further suggests that socio-demographic and pregnancy characteristics may shape the likelihood of certain types and levels of social support and that these sets of factors may act in combination to influence the severity of distress.

1.2.3 A biopsychosocial model

The biopsychosocial model takes the position that outcomes result from and interaction of biological, psychological, and social factors. Based on a systems theory of hierarchical structures, the biopsychosocial model includes interrelated processes from the micro to macro-level (Taylor, 1995). Interdependency, the essence of the theory, means that events occurring at one level e.g. cellular, can affect systems at other levels, for example personal experiences (Milgrom, Martin, & Negri, 1999).

Milgrom et al. (1999) developed a model of PND considering biological (genetic influences on personality), psychological (childhood family experiences and coping style) and social factors (role of relationships and societal expectations). Providing a coherent integration of factors, the model was developed out of clinical experience and a review of research literature.

Milgrom's (1999) model includes four factors:

1. Vulnerability: Susceptibility to PND for reasons such as personality traits, negative life events and psychological problems.

2. Precipitating: Stressful events, stress-moderating variables, (social support and coping skills) and biological factors (decrease in oestrogen levels).

3. Sociocultural: Impact via pathways of precipitating and exacerbating factors, such as lack of support in Western societies and cultural myths around the experience of motherhood as wholly positive.

4. Exacerbate and maintain: Reactions of partners, family and others may create additional stress or a reduction in support due to conflict and in this way exacerbate and maintain the disorder of PND.

Milgrom et al.'s (1999) model outlines the aggregation of stressors likely to increase the probability of PND. For example, low levels of precipitating factors would trigger PND in vulnerable women, while higher levels of precipitating factors are needed for PND to occur in less vulnerable women. The model also emphasises the importance of cognition throughout all stages as perceptions or cognitive appraisals, rather than objective reality, are what counts in a mother's life. Of the models under review, the biopsychosocial model, in addressing elements of all the theories is the most comprehensive approach to investigating PND.

In summary, the theories and models outlined above are not an exhaustive list. There are additional theories that may have applicability to PND (Abramson, Metalsky, & Alloy, 1988; Arieti & Bemporad, 1980; Beck, 1967; Seligman, 1975; Teti & Gelfand, 1997). However, the theories and models outlined relate specifically to PND and indicate that, for some mothers, a complicated interplay of factors may contribute to PND.

1.2.4 Treating postnatal depression

According to some, there has been little professional interest in treating PND (Nonacs & Cohen, 1998; Whiffen, 1988a). In addition, few reports exist on the efficacy of treatment programmes for women with PND (Meager & Milgrom, 1996). However, some treatment interventions may be effective in minimising the adverse effect of PND. These interventions include group treatment programmes (Stamp, Sved-Williams, & Crowther, 1995), counselling methods

(Holden, Sagovsky, & Cox, 1989), cognitive behaviour therapy (Buist, 1996), interpersonal therapy (Nonacs & Cohen, 1998), and prescribed medication (Goss, 1998).

Low attendance rates in group treatment programmes has resulted in the effectiveness of such programmes being difficult to establish. For example, Stamp (1995) found only 31% of 213 women attended their nondirective, practical and supportive group programme to reduce the frequency of PND. As a result, Stamp et al. found no difference in frequency of PND between attendees and a control group. Unless the mothers who need help actually attend, there is little point in holding group sessions. The effort involved in arranging to attend regular meetings may prevent attendance by mothers with PND. Reasons given by mothers for non-attendance at group counselling include difficulty in organising attendance, distance to travel and physical illness (Meager, 1996). It is possible the mothers in most distress are least able to attend.

Difficulty in attending group sessions may explain why programmes aimed at visiting mothers in their own homes have achieved greater success. For example, a teaching programme implemented by health visitors in the U.K. was successful with mothers who had PND (Holden et al., 1989). The health visitors, who held general nursing qualifications and had training in counselling for PND, visited mothers weekly for eight weeks. After three months, 18 of 26 women in the treatment group had fully recovered compared with nine of 24 in the control group. This form of visiting may aid in replacing practical and emotional support for mothers who lack such support from their own mothers (Holden et al., 1989).

Cognitive behaviour therapy (CBT), in contrast to group therapy, is a brief, problem-oriented approach aimed at helping people identify and modify dysfunctional thoughts, assumptions and patterns of behaviour (Enright, 1997). CBT may be helpful in the day-to-day management of PND (Buist, 1996). Reviewing 15 studies, Enright concluded cognitive behaviour therapy was at

least as effective as medication in treating depressed outpatients. This form of therapy may be useful for mothers who are reluctant to take antidepressant medication (Nonacs & Cohen, 1998).

Similarly, interpersonal psychotherapy (IPT) began as a short-term, weekly outpatient treatment for depressed people (Weissman & Markowitz, 1994). Dealing with current relationships, IPT focuses on the immediate social context and uses the connection between onset of depressive symptoms and current interpersonal problems as a treatment focus (Weissman & Markowitz, 1994). In a review of research on IPT, Nonacs (1998) found IPT used successfully to prevent recurrence of major depression in non-postpartum women. Nonacs concluded that IPT had the potential to be of use in treating women with PND also.

Finally, an additional treatment option is antidepressant medication, which is useful in treating PND (Goss, 1998). If commenced in the early postpartum period, antidepressants may reduce depressive relapse (Dalton & Holton, 1996). There is a wide range of antidepressant medication. The most popular are tricyclics including amitriptyline, nortryptiline, imipramine, chloripramine, trimipramine and dothiapin. Commonly used among breastfeeding women, tricyclics appear safe and effective (Austin & Mitchell, 1998; Dalton & Holton, 1996). Specific serotonin re-uptake inhibitors (SRRIs) are also in widespread use and include fluoxetine (Prozac), paroxetine and sertraline. SRRIs are designed to correct the brain-cell chemistry and the part played by the neurotransmitter serotonin (Austin & Mitchell, 1998).

A major concern with these types of medication is the potential effects on the baby if the mother is breastfeeding. While studies have shown that antidepressant excretion into breast milk is around 1/450 of the maternal dose, there is evidence in animal studies suggesting antidepressant concentrations in the developing brain achieve concentrations of up to 85% of that in the maternal brain (Lamburg, 1999). Seldom are detectable concentrations of drugs found in infants' blood (Wisner & Perel, 1996). However, it does not automatically

follow that concentrations are not in the brain and actual effects on the developing brain are unknown (Nonacs & Cohen, 1998). The lack of information about the safety of treatment with various antidepressant drugs during breastfeeding is of concern (Epperson, Anderson, & McDougle, 1997).

An additional problem with medication is failure to address the cause of the problem. When medication is finished, the cause may remain. If, as Whiffen (1998) suggests, marital difficulties are a common problem in PND, elevating a woman's mood with medication is unlikely to address the cause. This is where alternative therapies hold the greatest weight. In addressing why problems occur and assisting mothers in finding ways of overcoming them, such interventions can assist in making the changes necessary for recovery. On the other hand, many depressed women find medication effective. It is possibly easier for many women to take medication rather than attend group counselling. With an average of 4 ½ weeks of treatment for instance, all mothers receiving fluoxetine for PND made a complete recovery (Roy, Cole, Goldman, & Barris, 1993).

Medication is clearly of benefit to mothers. The long-term impact of medication on babies however, needs establishing, preferably by double blind, controlled studies (Roy et al., 1993). The risk-benefit ratio to both mothers and babies wants careful weighing up (Austin & Mitchell, 1998).

A combination of the therapeutic interventions outlined may be of most benefit to mothers with PND. Interventions recommended would likely be in accordance with the models and theories particular therapists adhere to. For example, antidepressant medication may be the treatment of choice for practitioners adhering to the biomedical model. Those with a psychosocial leaning may prefer group treatment and cognitive behaviour therapies. Eclectic practitioners in contrast, may choose a broader biopsychosocial approach and look for a combination of therapeutic interventions including antidepressant medication.

People in the best position to intervene and refer to relevant health professionals are those routinely participating in postnatal care (Nonacs & Cohen, 1998). In New Zealand, this would include midwives, general practitioners, specialist obstetricians and Plunket nurses. This is the target audience for research on predictors of PND and the people to whom mothers will turn to for help with PND.

1.3 Predictors of postnatal depression

Many researchers have had an interest in identifying predictors of PND (Kumar & Robson, 1984; Little et al., 1982; Nhiwatiwa, Patel, & Acuda, 1998; O'Hara, Rehm, & Campbell, 1982; Whiffen, 1988b). Predictors, or risk factors, equate to an increased likelihood of developing a disorder without necessarily suggesting causality. The most commonly identified predictors of PND are psychiatric history (Laizner & Jeans, 1990), marital conflict (Gotlib et al., 1991) and lacking a person to confide in (Campbell & Cohn, 1991). Researchers have differing views on the importance of predictors (Righetti-Veltema et al., 1998). It is most likely the case that a multiplicity of interacting factors result in some women developing PND (Beck, 1998).

Researchers have studied diverse aspects of PND including the association of depressive disorders and cessation of breast-feeding (Cooper, Murray, & Stein, 1993), maternal history of childhood sexual abuse in women with PND (Buist, 1997), unemployment in lone mothers with depression (Baker & North, 1999) and employment status, maternity leave and role quality as predictors of maternal mental health (Klein, Hyde, Essex, & Clark, 1998). In addition, phenomenological studies, such as the lived experience of Middle Eastern migrants with PND in Australia, enhance understanding of the disorder (Nahas et al., 1999). Meta-analyses are a useful means of assimilating such diverse information. A meta-analysis conducted by Beck in 1996 isolated several predictors significantly related to PND. The eight predictors Beck identified include variables that will be looked at in the present study, namely prenatal

depression, social support, prenatal anxiety, maternity blues, marital satisfaction and history of previous depression.

Table 2 outlines the predictors of PND under investigation in the current research. A positive feature of the research in Table 2 is the extensive use of prospective (searching forward in time) designs. During an episode of depression, personality is difficult to assess validly and after an episode, the episode and residual features of it may affect personality (Boyce, Hickie, & Parker, 1991). Using a prospective design separates in time potential correlational factors from the outcome for which they are meant to account, in this case PND (Boyce et al., 1991).

Table 2 highlights discrepancies in the findings obtained. For example, some researchers have found older mothers to be more at risk of depression (Astbury, 1994), while others have found that younger mothers are more at risk (Paykel, 1980; Webster, 1994). Discrepancies also exist between breast and bottle-feeding mothers. Warner (1996) found that mothers who bottle-fed were more likely to be depressed and Laizner (1990) found that breastfeeding and postnatal depressive reactions were associated. There are various reasons including methodological errors for discrepancies in research findings. Methodological errors can include measurement error, limited generalisability, sample size and inappropriate statistical analyses. An explanation for the inconsistent findings highlighted above may be the different samples studied. For example, there has been some variation in sample type including clinical samples, community samples, or high-risk samples (Webster et al., 1994). In addition, self-reports as well as clinically diagnosed depression come under the heading of depression (National Institute of Child Health and Human Development Early Child Care Research Network, 1999).

Table 2

Predictors of postnatal depression and related research findings.

Predictors	Relevant Findings	Author(s)
1. General Well-being	Strong correlation between postnatal distress and the GHQ-12.	(Romito et al., 1999)
2. Satisfaction with maternity care	Unhappiness with lack of choice in maternity care in NZ.	(Adair, Dixon, & Kruiswijk, 1999)
	Dissatisfaction with antenatal care associated with PND.	(Astbury, Brown, Lumley, & Small, 1994)
3. Parity (number of births a mother has had)	Significant relationship between primiparous (first-time mothers) women and PND at 6 months postpartum.	(Bridge, Little, Hayworth, Dewhurst , & Priest, 1985)
	More obstetrical and postpartum complications in multiparous women.	(Kumar & Robson, 1984)
	Greater antenatal distress found in multiparous women.	(Kearns et al., 1997)
	Unplanned pregnancy found to be a significant risk factor for PND.	(Warner, Appleby, Whitton, & Faragher, 1996)
	Women who had given birth to a second child were at higher risk of PND.	(Zelkowitz & Milet, 1995)
4. History of Depression	Only 3 out of 15 seriously depressed pregnant women did not also suffer PND.	(Bridge et al., 1985)
	63% of depressed mothers had received previous treatment for psychiatric symptoms.	(Paykel, Emms, Fletcher, & Rassaby, 1980)
	Women depressed during pregnancy were not the ones depressed after delivery.	(O'Hara, 1986)
	Significant association of PND with previous psychiatric history, scores on tests of neuroticism and psychiatric disorder in early pregnancy.	(Watson et al., 1984)
	The best predictor of PND level was antenatal depressive symptoms.	(Pfost, Stevens, & Lum, 1990)

5. Social Support	Greater incidence of PND in women without partners.	(Webster et al., 1994)
	Greatest victim of PND considered to be partner relationship.	(McGill et al., 1995)
	Social support may provide a protective function against PND by enabling a mother to perceive herself as more effective.	(Cutrona & Troutman, 1986)
	Depressed women described their relations generally as being more difficult with their partner and mother.	(Righetti-Veltema et al., 1998)
	Lower extent of marital satisfaction in depressed group in comparison to non-depressed group.	(Spangenberg & Pieters, 1991)
	Heightened risk for antepartum depression among single women without a cohabiting partner.	(Hobfoll, Ritter, Lavin, Hulsizer, & Cameron, 1995)
	Strong relationship between lack of support from friends and postnatal distress.	(Kearns et al., 1997)
	Women dissatisfied with prenatal support they received, especially from baby's father, were at greater risk of depressed mood during pregnancy and depressive symptomatology 6-8 weeks postpartum.	(Collins et al., 1993)
	Problems in relationships with partners found to precede PND.	(Gotlib et al., 1991)
	Life-stress and absence of social support found to be important factors in development of PND.	(Bågedahl-Strindlund & Monsen Börjesson, 1998)
	Loss of a mother before age 17 may increase risk of depression at a stressful time such as the birth of a baby.	(Bifulco, Brown, & Harris, 1987)
	Correlation between loss of a very close person and PND among primiparous women.	(Bridge et al., 1985)
	Depressed group felt significantly less satisfied than the non-depressed group with their perceived quality of social support.	(Spangenberg & Pieters, 1991)
	Postnatal but not control depression was associated with a poor relationship with a woman's own mother.	(Murray, Cox, Chapman, & Jones, 1995)
	Lower postnatal closeness to husband and greater deviations between important sources of support, expected and received, were predictors of PND.	(Logsdon, McBride, & Birkimer, 1994)
	Social support played a significant role in women's mental health eight weeks after delivery.	(Cutrona, 1984)
	Women experiencing PND reported more stressful life events and less support from spouses after delivery than women not experiencing PND.	(O'Hara, 1986)

6. Education	Higher educational qualifications decreased women's vulnerability to PND in a Christchurch study.	(McGill et al., 1995)
7. Employment	Having to leave a job against preference associated with PND but not control depression.	(Murray et al., 1995)
	Women who were not working were at higher risk of PND.	(Zelkowitz & Milet, 1995)
8. Housing	Being unhappy with housing increased score on EPDS.	(Webster et al., 1994)
9. Postnatal Experiences	Mothers with assisted deliveries (caesarean, forceps, ventouse extraction) were associated with increased odds of depression.	(Astbury et al., 1994)
	Relationship between maternal perceptions of infant temperament and PND.	(Mayberry & Affonso, 1993)
	Maternal perception of difficult infant temperament related to mothers' level of PND.	(Cutrona & Troutman, 1986)
	Both expectations and perceptions of infant crying were significant predictors of depression symptoms.	(Whiffen, 1988b)
	Difficult delivery was the strongest influence on depressed mood 5 days postpartum.	(Bergant, Heim, Ulmer, & Illmensee, 1999)
	Significant association between breastfeeding and postnatal emotional reaction among primiparas at 4-6 weeks postpartum.	(Laizner & Jeans, 1990)
	Women discharged within 72 hours had significantly increased risk for developing PND.	(Hickey et al., 1997)
	Depressed and non-depressed mothers could be distinguished in terms of ratings of infant temperament.	(Hopkins, Campbell, & Marcus, 1987)
	Postpartum blues were only associated with depression in the absence of life events, suggesting a small hormonal sub-group.	(Paykel et al., 1980)
	Depression was more common in women who were bottle-feeding.	(Warner et al., 1996)
10. Age	Maternal age over 34 was associated with increased odds of depression.	(Astbury et al., 1994)
	Older women with stress-free pregnancies were found to be more at risk of depression.	(Kumar & Robson, 1984)
	Depressed mothers were significantly younger (average of 24 as opposed to 28 years).	(Paykel et al., 1980)
	Strong tendency toward distress among younger, less affluent women.	(Kearns et al., 1997)
	Women less than 20 years old were more likely to suffer from PND in Auckland.	(Webster et al., 1994)

1.3.1 Postnatal depression in New Zealand mothers

Relating several of the antenatal predictors outlined in Table 2 specifically to New Zealand mothers will aid understanding of the issues faced by mothers in this country.

1.3.1.1 Satisfaction with maternity care

An amendment to New Zealand's Health and Disability Services Act in 1996 changed the provision of maternity services (Adair et al., 1999). Changes brought about a widespread departure of the family doctor from delivering babies, a rise in midwifery practice, and a considerable financial cost for private maternity care in group practices operated by general practitioners. A woman is required during pregnancy to choose a lead maternity caregiver. This maternity caregiver is defined as "the General Practitioner, Midwife or Obstetric Specialist who has been selected by the woman to provide her comprehensive maternity care including the management of her labour and birth" (Adair et al., 1999, p. 2). These changes have limited the options available to mothers, such as shared maternity care between a midwife and GP. In 1998, an Auckland newspaper article considered the maternity services scheme was out of control and highlighted the falling numbers of GPs left delivering babies. The lead maternity caregiver controls what money is spent on those helping in the antenatal and birth process. This system appeared to contribute to the apparent inability of midwives and doctors to work harmoniously. Once midwives were able to claim the same fees as GPs and worked independently, this seemed to encourage competition between what were once united fronts. For the mother caught in the middle, this provided additional pressure ("Squalling loudest," 1998).

A large number of women in a study undertaken in New Zealand to report on maternity services found women were unhappy with the lack of choice available to them (Adair et al., 1999). The same study also found that women considered the choice of their lead maternity carer to be an extremely important one. These

issues are not unique to New Zealand mothers. In Australia, Astbury et al (1994) noted that one of the key factors associated with increased odds of depression was dissatisfaction with antenatal care. It seems reasonable to argue that nine months spent feeling dissatisfied with, or lacking confidence in the care provided would exacerbate any feelings of anxiety or antenatal depressed mood.

1.3.1.2 Parity

Although a significant relationship between parity and PND has been noted, with some researchers finding that first-time mothers are more likely to become depressed postnatally (Bridge et al., 1985), these findings were not supported in New Zealand research. For example, Kearns et al. (1997) found that second-time mothers were more distressed and had less partner support than first-time mothers. However, by the postnatal period, significant differences in distress or support were no longer apparent. Bridge et al. (1985) found there was a significant relationship at six months postpartum between parity and PND. All four of the women Bridge et al. found seriously depressed at nine months were first-time mothers, as were four out of five seriously depressed at 12 months. Bridge et al. suggested that PND presents at a later stage for first-time than for second-time mothers, which may explain why studies such as Kearns et al.'s, which focus only on the puerperium find no association between parity and PND.

1.3.1.3 Education

Education appeared to play a role in New Zealand women's vulnerability to depression. Higher educational qualifications were associated with less vulnerability to PND, disputing the common assumption that higher levels of education equate to greater risk of PND (McGill et al., 1995). In fact, less than three years secondary education was associated with greater vulnerability to PND by McGill et al. Lower education also appeared as a predictor of antenatal distress in Kearns et al's (1997) research.

1.3.1.4 Housing

A major concern highlighted by Webster et al., (1994) was that Maori women are to be at greater risk of depressive symptoms. Webster et al. found Maori women more likely to be economically and educationally disadvantaged and have access to poorer housing. In support of these New Zealand findings, inadequate financial resources, housing difficulties and dissatisfaction with education were among factors that correlated positively with PND (Posner, Unterman, & Williams 1985, cited in Unterman et al., 1990).

1.3.1.5 Age

Kearns (1997) noted that younger women are less likely to be assertive about their needs for material and social support, are less likely to attend antenatal classes and are also more at risk of postnatal distress. This is particularly of concern in a New Zealand context where Pacific Island women not only have the highest fertility rate but also 60% of those becoming mothers are under the age of 20 (Baker, 1995, cited in Kearns et al., 1997). These findings do not find support in the wider research literature. For instance, Kumar and Robson (1984) found that PND occurred significantly more often in older women who seemed to have non-stressful pregnancies and independently in women who gave a history of trying to conceive for two or more years. This gave rise to their speculation about 'let-down' following achievement as many of Kumar and Robson's older participants had a history of trying to conceive for two or more years.

1.3.1.6 Length of hospital stay

Length of hospital stay might also have an association with PND in New Zealand mothers. Many mothers leave hospital as early as 48 hours after birth and some have felt pressured into early hospital discharge (Adair et al., 1999). In an Australian study, women discharged within 72 hours of birth had a significantly increased risk for developing PND (Hickey et al., 1997). Likewise,

variations in length of hospital stay is thought to have implications for maternal psychological outcomes, with women who felt their hospital stay to be too short experiencing significantly higher depression scores (Dowswell, Piercy, Hirst, Hewison and Lilford (1997).

1.3.1.7 Social support

The absence of social support, particularly from partners, is prominently featured in the research literature on PND. For example, women who experience postnatal depression report conflict in partner relationships and a lack of spousal support (Braverman & Roux, 1978; Kumar & Robson, 1984; O'Hara, 1986; Whiffen, 1988b). In New Zealand literature, Webster et al. (1994) reported a greater incidence of PND in women without partners. This concurs with Romans-Clarkson et al.'s (1988) findings in their study of general depression in women in Otago. McGill et al. (1995) found that the greatest victim of postnatal depression was the partner relationship. This is of concern when considering that partners are usually the most available people to call on for help (Spangenberg & Pieters, 1991). Perhaps partners may not be as useful a source of support as people outside the relationship may as partners are also experiencing a potentially stressful life transition (Terry et al., 1996). Support from friends also seems to have a bearing on PND. Kearns et al. (1997) identified a strong relationship between lack of support from friends and postnatal distress after childbirth. They stated: "this finding hints at unmet expectations of contact and empathy from friends following childbirth for urban (Pakeha) New Zealanders" (p. 305). Cutrona and Troutman (1986) suggested that social support provides a protective function against maternal depression by enabling the mother to perceive herself as more effective.

1.3.1.8 General wellbeing

Although no research specifically on the relationship between PND and general wellbeing exists in New Zealand, the 12-item General Health Questionnaire has ascertained the prevalence of postnatal distress (Romito et al., 1999). The GHQ-12 is a screening instrument that has been used extensively with new mothers and detects psychiatric disorders in community settings (Goldberg & Williams, 1988). Focussing on psychological components of ill-health, the GHQ-12 is a measure of general wellbeing. As it is likely PND falls under the umbrella of "psychiatric disorders", an antenatal measure of wellbeing may assist understanding of New Zealand mothers' experiences before birth. Mothers' sense of wellbeing may affect their likelihood of developing PND.

Locally conducted research identified a number of factors common to a New Zealand mother with PND (Adair et al., 1999; Kearns et al., 1997; McGill et al., 1995; Romans-Clarkson, Walton, Herbison, & Mullen, 1988; Webster et al., 1997; Webster et al., 1994). These factors are:

1. Dissatisfaction with the choices available for maternity care
2. Have at least one child
3. Unsatisfactory support from her partner or have no partner
4. Lack of support from friends
5. Less than three years of secondary education
6. Young mother
7. History of previous psychiatric hospitalisation
8. Low household income
9. Unhappy with housing
10. Maori mother
11. Pressured to leave hospital quickly after the birth
12. Not breastfeeding due to lack of advice and assistance
13. Not attended antenatal classes.

In summary, New Zealand mothers' antenatal and postnatal experiences have similarities with those of mothers outlined in overseas research. It is however, important to note the specific nuances that apply to mothers in this country, particularly regarding ethnicity and choices for antenatal care.

1.4 Predictive measures of postnatal depression

Identifying women antenatally who are likely to experience PND is an important issue for many researchers. Table 3 outlines research to date.

The following section highlights strengths and limitations of the studies outlined in Table 3.

1.4.1 Common predictors

While it is important to keep demographic differences in mind, it is clear in the five studies presented in Table 3 that commonalities exist in predictors across countries, ethnic groups and among multiparous women. Common predictors include previous history of depression and relationship problems. Although the Nhiwatiwa et al. (1998) study involves a vastly different population to the other Western studies in assessing Shona women in Zimbabwe, results obtained signify the transcultural nature of postnatal depressive symptomatology. The comparable performance in predictive ability and the percentage of mothers identified with PND further highlights the similarity in research findings.

Table 3

The development of antenatal predictive indexes for postnatal depression.

Author	Participants	Method	Results	Variables found to be predictive
Braverman & Roux, 1978 19-item 'yes/no' questionnaire.	120 women attending Canadian prenatal clinic.	Questionnaire administered during 5th – 6th month of pregnancy. Ward nurse completed observation sheet to classify emotional reaction at day 4 postpartum.	13% of women classified as having a postnatal reaction on day 4 and 6-weeks postpartum. Questionnaire had sensitivity of 95% and specificity of 85%.	• Often feeling unloved by partner • Undesired pregnancy/regret being pregnant • Unplanned pregnancy • Single or separated • Marital problems • Depressed or nervous after previous pregnancy
Appleby, Gregoire, Platz, Prince & Kumar, 1994 10-item questionnaire.	126 women attending Kings College Hospital in London.	Questionnaire administered during 8th month of pregnancy. EPDS administered at 12 weeks postpartum.	13% of women scored ≥ 12 on EPDS at 8 weeks postpartum. Questionnaire had sensitivity of 19%, specificity of 97% and positive predictive value of 44%.	• Past or present depression
Stamp, Sved-Williams, & Crowther, (1996) Modified antenatal screening questionnaire.	249 women attending Women and Children's Hospital in South Australia.	Questionnaire administered during ≥ 6th month of pregnancy. EPDS administered at 6 weeks postpartum.	17% of women scored ≥ 12 on EPDS at 6 weeks postpartum. Questionnaire had sensitivity of 73%, specificity of 43% and positive predictive value of 17% for major and 34% for minor depression.	• Lack of support.

Posner, Unterman, Williams, & Williams, (1997) 24-item questionnaire.	250 women attending Maimonides Medical Centre, New York.	Questionnaire administered during 3rd – 6th month of pregnancy. Beck Depression Inventory (BDI) administered at 1,6, & 12 weeks postpartum.	15% of women had postpartum depressive symptoms at 12 weeks postpartum. Questionnaire had sensitivity of 80-82% and specificity of 78-82%.	• Relationship with partner • Relationship with parents • History of emotional instability and PND • Poor self-image • Insufficient income • Lack of satisfaction with educational status • Severe or absent nausea and vomiting during pregnancy • History of dysmenorrhoea.
Nhiwatiwa, Patel, & Acuda, (1998) An indigenous psychiatric questionnaire of non-psychotic psychological morbidity.	500 women residing in impoverished area on outskirts of Harare, Zimbabwe.	Questionnaire administered during 8th month of pregnancy. Shona version of the Revised Clinical Interview Schedule at 6 – 8 weeks postpartum.	Prevalence of postnatal mental illness was 16% at 6-8 weeks postpartum. Questionnaire had sensitivity of 81.5%, specificity of 66% and positive predictive value of 46%.	• Antenatal psychological morbidity associated with: • ≥ 3 children at home • marital disharmony • physical illness • having a mother who lived in rural area.

1.4.2 Timing of administration

Timing of questionnaire administration varied in the studies outlined in Table 3. Mothers' stage of pregnancy when filling in the antenatal questionnaire ranged from three to eight months. The time of filling in the postnatal questionnaire also varied from six to 12 weeks. Overall, variation in timing did not seem to impact the results obtained as the rates of possible depression ranged from 13 – 17%. This is within the expected prevalence rate of around 15% for diagnosed depression (Buist, 1998; Goss, 1998; Kendall-Tackett & Kantor, 1993). Therefore, it does not appear necessary for timing of administration to be held constant.

1.4.3 Control groups

A lack of control groups with which to compare findings exists in the research outlined in Table 3. The possibility that this may have resulted in a limitation of the research is an important consideration. However, a study by Cox et al (1993) found no difference in prevalence rates of depression six months after delivery between postnatal and control mothers. This supports Fowles (1998) suggestion that the experience of PND is similar to the experience of depression and Whiffen's (1992) statement that the same variables likely predict PND and depression. Therefore, it is possible that the use of a control group of mothers would provide little additional information on differences between women with PND and women with depression.

1.4.4 Identifying postnatal depression

Two studies in Table 3 used the Edinburgh Postnatal Depression Scale (EPDS) to identify potential cases of PND (Appleby et al., 1994; Stamp et al., 1996), whereas Posner et al. (1997) used the Beck Depression Inventory (BDI). The BDI may be an unsatisfactory screening measure for PND due to containing a number of somatic items common to many postpartum women (Whiffen, 1988b; Zelkowitz & Milet, 1995). In a study evaluating the convergence of BDI

classifications with Research Diagnostic Criteria diagnoses of depression in a sample of postpartum women, Whiffen found that the BDI detected fewer than half the diagnosed cases. Whiffen stated this likely resulted from the high rate of minor depression found among postpartum women, to which the BDI is particularly insensitive. Posner et al., (1997) provided clinical confirmation of the BDI results by psychiatric interview using the Schedule for Affective Disorders and Schizophrenia instrument, which added weight to their results (Spitzer, Endicott, & Robbins, 1978, cited in Posner et al., 1997).

The 10-item EPDS on the other hand, is in extensive use in the U.K. as an effective screening tool to identify PND (Cox, Holden, & Sagovsky, 1987; Glaze & Cox, 1991; Hannah, Adams, Lee, Glover, & Sandler, 1992). It is also used as a screening instrument in Australia and New Zealand (Barnett, Matthey, & Boyce, 1999; Boyce et al., 1993; Holt, 1994; Webster et al., 1994). Webster et al. (1994) noted that a cut-off score of greater than 12 was highly specific and sensitive for major depressive disorders after validation with a 30 minute semi-structured clinical interview with New Zealand mothers. The EPDS has satisfactory validity and split-half reliability (Cox et al., 1987). It is also sensitive to changes in the severity of depression over time. In addition, Cox et al. found that the EPDS was well received by childbearing women and was usually completed within five minutes.

1.4.5 Sensitivity and specificity

Carothers and Murray (1990) stress the importance of providing information on sensitivity and specificity of the instruments used. They note that on some occasions prevalence rates have been based on the number of subjects with a high score on the primary screening instrument, without taking into account the instrument's specificity and sensitivity. All the studies reviewed in Table 3 gave estimates of sensitivity and specificity. Most studies showed accuracy in identifying mothers with PND. Overall, sensitivity averaged 80%, although Appleby et al.'s questionnaire did not identify mothers with PND accurately, having only 19% sensitivity. Specificity on the other hand, was limited in

Stamp et al.'s study, meaning mothers without PND were not accurately identified.

1.4.6 Methodological issues

Appleby et al.'s (1994) index evolved out of risk factors from a study of first-trimester primiparous women in a middle-class area in London. The wisdom of using information obtained from primiparous women in a study of both multiparas (mothers with more than one child) and primiparas is questionable and was possibly an implicating factor in the disappointing results Appleby obtained. These included non-significant results and unsatisfactory predictive ability of their questionnaire. Appleby et al. concluded that assumptions about applicability of risk factors to different populations might be wrong. This conclusion highlighted that important distinctions likely exist between first and second-time mothers.

Posner et al.'s (1997) study involved an original 61-item questionnaire reduced by stepwise linear regression to 24-items. Validation studies included retrospective validation on the original sample and prospective validation on a second group of mothers. Posner et al.'s study had the highest rate of sensitivity (80-82%) and specificity (78-82%). Overall, findings indicated it was a successful predictive index for identifying women at risk for PND. However, stepwise multiple regressions require the cases-to-independent variables ratio to be substantial or the solution will be meaningless. A cases-to-independent variable ratio of 40 to 1 is recommended (Tabachnick & Fidell, 1989). As only 125 women filled in the 61-item questionnaire (a ratio of 2:1), generalisability in Posner et al.'s study is limited and the meaningfulness of their solution is questionable.

In contrast to Posner et al.'s (1997) research, Stamp and colleagues (1996) modified a measure that did not have any published validation information available. Modifying an unvalidated measure is not always wise and as Stamp et al. found, can lead to unsatisfactory results. They concluded that further

studies might enable the development of a screening test with higher specificity and greater positive predictive value than that found in their Modified Antenatal Screening Questionnaire (MASQ).

Braverman and Roux's (1978) study provided further examples of methodological limitations. Their study lacked a screening instrument to assess possible PND. Rather, ward nurses completed observation sheets on the fourth postpartum day and again at a six-week postnatal check-up. As it is unclear whether mothers were aware they were under observation or had given consent to be observed, ethical considerations need addressing. It is also likely that behaviour observed in a ward setting would differ from that exhibited by a mother in her home environment.

The type of nursing observation outlined in Braverman and Roux's (1978) study seems problematic for several reasons, including a lack of interrater reliability checks. Interrater reliability checks would have provided an empirical index of observer agreement (Bordens & Abbott, 1996). Failing to mention how many mothers the nurses were observing is also a problem as a large number of observations may reduce the accuracy of reporting. Many of the classification criteria would require extensive monitoring of the mother to answer adequately. For example, criteria such as consistent anorexia and/or insomnia; does not eat or sleep for 48 hours; nurse feels attitude and behaviour and/or that in relation to child is not normal in comparison to most mothers taking into consideration normal personality variations. Aside from subjective reporting, answers to these types of questions would be difficult to establish without clear guidelines of normal personality variations and extensive knowledge of each woman's usual personality and behaviour. Direct observation may reduce problems associated with self-report questionnaire measures such as ambiguity (Coolican, 1996) and socially desirable responses (Bordens & Abbott, 1996). However, direct observation also creates problems such as inferring intentions behind the behaviours observed, most notably in the case of how the nurse *feels* about whether the behaviour is normal or not.

It seems commonplace for researchers to conclude with statements such as "further research is necessary using a larger sample" when this problem could be eliminated by adequate preparation and forethought as to required sample sizes necessary for validation purposes. For example, Cohen and Cohen (1975, cited in Howell, 1992) have addressed the issue of sample size from the direction of statistical power. A reasonable amount of power requires a moderately sized sample. It is therefore possible in advance to determine the number of respondents necessary for worthwhile research.

A positive feature of the studies examined in Table 3 is that they all sampled both primiparous and multiparous women. It is easier and theoretically more beneficial to separate out distinctions between these two groups after the data are collected rather than eliminating a large proportion of the population at the outset. Studies that assess primiparous women only, are limited in the generalisability of the findings (Zelkowitz & Milet, 1995).

In summary, despite their various methodological problems, the studies tentatively point to similar conclusions; namely, it is possible to predict with varying degrees of accuracy, women likely to experience PND.

1.5 Cooper et al.'s (1996) antenatal predictive index

Cooper et al. (1996) developed an antenatal predictive index with sufficient utility to be of use to researchers and clinicians attempting to identify high-risk samples. After consideration of the research literature highlighted in Table 3, there were several reasons for choosing Cooper et al.'s index in the present study. The reasons included an impressive sample size of nearly 5000 women obtained over a 3-year period. In addition, Cooper et al. conducted rigorous statistical analyses such as obtaining a large validation sample, conducting a series of logistic regressions to refine the variable set from 40 to 17 items, establishing weightings for each variable and assessing predictive performance at various scores. These factors identified Cooper et al.'s study as different from the other research in both design and results obtained. The index also included

factors isolated as problematic for New Zealand mothers experiencing episodes of postnatal distress (Adair et al., 1999; Kearns et al., 1997; McGill et al., 1995; Romans-Clarkson et al., 1988; Webster et al., 1997; Webster et al., 1994). These factors include a lack of support, no partner, less than three years education, a history of psychological problems and unhappiness with housing conditions. Finally, ethnic and sociocultural similarities likely exist between Britain and New Zealand (Romans-Clarkson et al., 1988).

A problem apparent with the index is the limited sensitivity and specificity. However, despite this limitation, the index was a sufficient improvement over the 1:9 (11%) base rate for PND to be of use in identifying women likely to experience PND (Cooper et al., 1996). For example, assuming a base rate of 10-15% for PND, Cooper et al. showed predictive improvement by using the index. At a score of 23 on the index, the risk of depression was 26% and 59% of those who were to become depressed scored in this range (Cooper et al., 1996).

Cooper et al.'s (1996) antenatal predictive provides a comprehensive list of variables commonly found to be predictive of PND; the reasons for choosing it in the present study are:

- Team of researchers taking three years to collect data
- Reduction of original questionnaire by logistic regressions
- Primiparous and multiparous sample
- EPDS administered at 6-8 weeks postpartum using a cut-off score of ≥9
- Adequate sample size
- Substantial validation study using 1916 women
- Those identified as possible 'cases' of PND by EPDS score interviewed using the Structured Clinical Interview for DSM diagnoses covering major depressive disorder.

1.6 The purpose of the research

1.6.1 Aims and objectives

The aim of this study is to determine if antenatal factors can predict mothers likely to experience PND. Evidence exists that antenatal prediction of mothers likely to suffer from PND is possible (Nhiwatiwa et al., 1998; Posner et al., 1997; Righetti-Veltema et al., 1998). The present research will determine whether an antenatal predictive index (antenatal risk factors) developed by Cooper and colleagues (1996) in the U.K. is valid for New Zealand women. In addition, measures of general wellbeing (the GHQ-12), satisfaction with maternity care and postnatal experiences will expand on the information sought in the antenatal predictive index. The EPDS will be used as an outcome measure, with a score ≥ 9 indicating possible PND (Cox et al., 1987).

1.6.2 Rationale

In Auckland in 1999, 18,063 mothers gave birth (Statistics New Zealand, Te Tari Tatau, 2000). Approximately 20% of New Zealand mothers are likely to experience PND; therefore, around 3,500 mothers, their babies and others close to them are likely to suffer the effects of PND each year in Auckland alone (McGill et al., 1995).

There is a lack of research in New Zealand on accurate antenatal identification of mothers likely at risk of PND (see Kearns et al., 1997; McGill et al., 1995; Romans-Clarkson et al., 1988; Webster et al., 1994). Furthermore, there is a lack of identification of PND by those in the health profession (Boyce et al., 1993) resulting in mothers not obtaining treatment for PND and remaining undiagnosed (Spangenberg & Pieters, 1991). Mothers may feel unable to seek help due to a fear of the stigma attached to psychological disorders, (Crisp, 1992). An Auckland study found women reluctant to speak about PND to their health caregivers despite wanting and needing help (Webster et al., 1994).

If a reliable, effective screening devise for PND existed that was easy to administer, quick to fill in and simple to score were available, it could benefit maternity caregivers by enabling them to incorporate this devise in antenatal checkups. Mothers could then be routinely tested before birth to assess their likelihood of developing PND. Early intervention could then minimise the effects of PND along with enhancing mothers' awareness of a problem common after the birth of a baby.

Identifying high risk mothers to whom scarce resources could be targeted would be a further benefit of an antenatal predictive index for PND (Cooper et al., 1996). A lack of money for depressed mothers in the Auckland area had reached crisis point in the middle of 1999, with new referrals turned away due to lack of funds (Masters, 1999). Ultimately, a reliable and valid screening instrument may assist in identifying those for whom primary prevention could become a realistic possibility (Fossey et al., 1997). Prevention of PND is infinitely preferable to treatment (Unterman et al., 1990).

CHAPTER TWO

METHOD

2.1 Participants

Mothers of ≥ 20 weeks gestation residing in the greater Auckland area were eligible to participate in the study, providing there were no language or other difficulties affecting their ability to fill in the two questionnaires.

Four hundred and fifty questionnaires were distributed to midwives, antenatal classes, Doctor's surgeries and private maternity clinics to offer to mothers attending for antenatal visits. In addition, a newspaper advertisement was placed in five community newspapers. The advertisement outlined the study and provided an incentive in the form of newborn nappies for those participating. Thirty-four mothers replied to the advertisement. Of those, 31 required a questionnaire posted out and 28 (90%) returned the questionnaire.

In total, one hundred and thirty five mothers volunteered for the study and completed the antenatal questionnaire. Ninety-eight returned the postnatal questionnaire (73% of the antenatal respondents but only 22% of the total questionnaires distributed).

Sixty-two of the participants were first-time mothers; the remaining 36 already had at least one child. Ages ranged from ≤ 20 to over 40 years. Seventy-one mothers were aged between 26 and 35 years and 80 were Pakeha. Only one mother did not have a partner.

Table 4 shows the breakdown of first-time mothers, range of ages and ethnic grouping.

Table 4

Percentage of first-time mothers, range of ages and ethnicity

N = 98	Frequency	Percentage
First-time mother		
Yes	62	63.3
No	36	36.7
Age range		
≤ 20	2	2.0
21-25	12	12.2
26-30	37	37.8
31-35	34	34.7
36-40	12	12.2
>40	1	1.0
Ethnic group		
European	87	89%
Maori	9	9%
Asian	1	1%
Pacific Island	1	1%

The sample was not representative of the pregnant population in Auckland as ethnic groups were not adequately represented. Maori and Pacific Island births made up 41% of the total Auckland births in 1999 (Statistics, 2000). However, only 10% of the present sample of mothers represents these ethnic groups (see Appendix B, Tables B4 and B5). In addition, a limited number of young mothers and single mothers were obtained. Although an effort was made to cover the greater Auckland area and responses were obtained from mothers living in North, South, East and Western suburbs, over half lived in suburbs

north of the city. Figure 1 outlines the percentage of mothers in this study dwelling in different regions of Auckland.

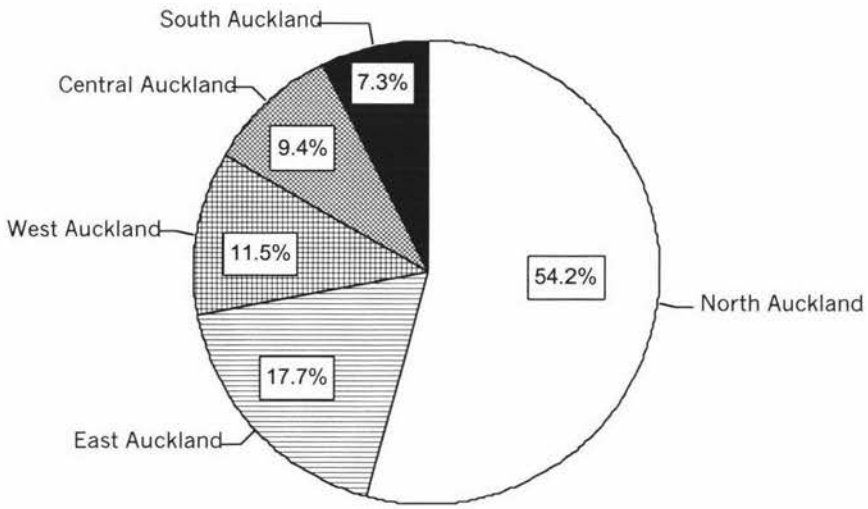

Figure 1: Percentage of mothers from different Auckland regions

2.2 Design of the research

A fixed-choice questionnaire design (see appendix A3 and A5) enabled participants to complete it at a time and location convenient to them. The only requirement was filling in the antenatal questionnaire before the baby was born. This type of survey design was chosen because the questionnaires contained items of a personal nature and it was felt that mothers may be more likely to answer honestly if they were not in an interview situation. The questionnaire also resulted in less time commitment from the mothers than an interview.

2.3 Timing of administration

Researchers have reported a peak prevalence of PND at six weeks postpartum (Paykel et al., 1980; Watson et al., 1984), with the period one to three months after delivery being the time mothers are most likely to manifest the symptoms

of PND (Kumar and Robson, 1984). Six weeks after delivery seemed the optimal point at which to ask mothers to fill in the postnatal questionnaire in the present study. In addition, predictive ability for later depressed mood did not depend on the stage of pregnancy mothers were at when filling in an antenatal questionnaire (Little et al., 1982). Therefore, keeping stage of pregnancy constant for all mothers filling in the antenatal questionnaire was considered unnecessary.

2.4 Measures

The 39-item antenatal questionnaire was comprised of three sections including Cooper et al.'s (1996) 17-item predictive index (antenatal risk factors), Goldberg and Williams (1988) General Health Questionnaire-12 (antenatal wellbeing) and questions relating to satisfaction with maternity care (maternity satisfaction). In addition, demographic information including ethnicity, age, gestation (how many weeks pregnant) and the baby's due date was obtained. It was decided to group ages into ranges, for example, 20 or under, 21-25, 26-30, 31-35, 36-40 and over 40, in case mothers felt a direct question of "what is your age" was impolite and declined to respond.

2.4.1 The 17-item antenatal predictive index (Cooper, Murray, Hooper and West, 1996).

The 17-item index (antenatal risk factors) was derived from a 40-item questionnaire distributed to around 5000 women in the England. It includes questions about pregnancy experiences, previous depression, previous PND, relationships with partner and mother, area lived in and working during pregnancy (Cooper et al., 1996). The index clusters into items concerned with emotional and physical experience of pregnancy, previous experience of mood disorder and quality of close relationships. By placing aside every third participant, along with a final sample of 397 participants, the final form (see Appendix A3, first 17 items), was validated on a sample of nearly 2000 women. The validation sample enabled testing the predictive performance of the index at various scores. Cooper et al. noted the usefulness of the index by its

improvement over a base rate of 1:9 for PND. For example, assuming a base rate of PND of 10-15%, prediction improved using the index. At a score of 27 out of a maximum 78, the risk of PND was 35%, and more than 1/3 who were to become depressed scored in this range. At a score of 27, positive predictive value was 35%, sensitivity (proportion of depressed mothers who are identified) was 35% and specificity (proportion of non-depressed mothers accurately identified) was 87%. Cooper et al. also suggested improving predictive performance by assessing postpartum blues and infant behaviour. Questions along these lines have thus been included in the postnatal questionnaire.

2.4.2 General Health Questionnaire (Goldberg, 1978).

The GHQ (Goldberg & Williams, 1988), was designed to assess general wellbeing or mild psychiatric morbidity (Martin, 1999) and can be used as a screening device for psychological disorders (Epstein, Fullerton, & Ursano, 1994). Used extensively with new mothers, it is easy to administer, acceptable to respondents and short (Goldberg & Williams, 1988). Kumar & Robson (1984) followed 119 first-time mothers during pregnancy and postnatally. Mothers' scores on the GHQ-30 six-weeks after birth supported a diagnosis of PND.

Questions on the GHQ-12 include "have you recently lost much sleep over worry?" and "have you recently been feeling unhappy and depressed?" High scores on the items indicate a lower level of wellbeing. In the present study the GHQ-12 was treated as a multiple-response (Likert) scale where 0 = less than usual, 1 = no more than usual, 2 = rather more than usual, and 3 = much more than usual.

Validation studies have found that the GHQ-12 has sensitivity of 71-91% and specificity of 71-93% (Banks, 1983, Radavonovic & Eric, 1983, Bellantuono et al., 1987, Shamasundar et al., 1986, cited in Goldberg & Williams, 1988). Principal components analysis showed two significant components accounting for 44% of the variance; in addition, each item distinguished between groups

with and without mental illness (Goldberg & Williams, 1988). Items also appeared to be valid indicators of present psychological status as measured by a research interview (Goodchild & Duncan-Jones, 1985, cited in Goldberg & Williams, 1988).

Split-half reliability of the GHQ-12 was .95, with internal consistency reliabilities of α = .82 and α = .90 (Goldberg & Williams, 1988). There is no test-retest reliability information on the GHQ-12, although the test-retest reliability for the GHQ-28 was .90 for stroke patients administered the questionnaire on two occasions eight months apart. Additionally, no cut-off score for Likert scoring was available in the manual for the GHQ-12. However, a cut-off score for Likert scoring on the GHQ-60 was 39/40 out of a possible score of 180 (Goldberg & Williams, 1988). Dividing 39/40 by 180 gave a ratio of .22. The cut-off score of $\geq$ 8 used in the present study was arrived at by multiplying the GHQ-12, which has a possible total score of 36, by .22, thereby using the same scoring ratio as the GHQ-60.

The 31-item postnatal questionnaire was comprised of three sections, including the Edinburgh Postnatal Depression Scale, the GHQ-12 (postnatal wellbeing) and nine additional questions relating to the mother's experiences after birth (postnatal experiences).

2.4.3 Satisfaction with maternity care (maternity satisfaction)

These questions reflect concerns raised in New Zealand in the last four years relating to changes in maternity care options available to women (Adair et al., 1999). The six questions relate to Auckland mothers' experiences with antenatal care and include "are you satisfied with the choices currently available for maternity care?" and "how happy are you with the maternity care you have at the moment?"

2.4.4 Additional postnatal questions

According to Cooper et al. (1996), improvement of their index is possible by adding questions relating to postnatal experiences, thus postnatal questions were included in the present study. Some postnatal questions such as "Is your baby experiencing any health problems?"; "If you chose to breastfeed, did you have problems feeding your baby?"; "Are you having problems with your baby sleeping?", "Would you consider your baby irritable, fussy, and difficult to console?" and "Did you experience periods of crying, depression and irritability during the first week after delivery?" were taken directly from Beck's (1998) postpartum depression predictors inventory, developed from a meta-analysis of PND predictors. Although not designed as a self-report inventory, Beck's items were similar enough in format to use with Cooper et al.'s index.

2.4.5 Edinburgh Postnatal Depression Scale (Cox, Holden & Sagovsky, 1987).

Developed specifically as a screening instrument, The Edinburgh Postnatal Depression Scale (EPDS) alerts healthcare workers to the possibility that a mother may be suffering from a depressive illness (Barnett et al., 1999). The EPDS was designed by Cox et al. (1987) to improve on the usefulness of similar scales by eliminating somatic symptoms such as fatigue, sleeplessness or eating disturbances. The reason behind elimination was that all new mothers, not just mothers with PND, commonly experience such somatic symptoms (Barnett et al., 1999). The EPDS is a screening instrument, identifying probable cases of PND, rather than a diagnostic instrument (Lovestone & Kumar, 1993). Confirming a diagnosis of depressive illness is therefore not possible using the EPDS (Warner et al., 1996); rather, confirmation of the EPDS diagnosis by clinical assessment is desirable (Cox et al., 1987).

The EPDS consists of a 10-item self-report scale and includes questions such as "In the past seven days I have been anxious or worried for no good reason" and "In the past seven days the thought of harming myself has occurred to me". Items are on a four-point scale with a greater score indicating increased severity

of the symptom and minimum and maximum scores being 0 and 30 (Cox et al., 1987). Scoring involves reversing the negative items and summing with the positive items to form a total score. The EPDS takes about five minutes to complete. When compared to a diagnosis of major depression made through a psychiatric interview, the EPDS achieved sensitivity of 68 to 95% and specificity of 78 to 96% using a cut-off point of 12/13 (Harns, Huckle & Thomas, 1989, cited in Zelkowitz & Milet, 1995). A lower cut-off point of 9/10 would increase sensitivity for the purposes of community screening and routine use by health care workers (Cox et al., 1987). A score of 9 or more requires further investigation and thorough screening for major and minor depression and a cut-off score of 9/10 is likely to reduce the failure to detect cases to less than 10% (Cox et al., 1987). Cox et al. (1993) have divided scores on EPDS responses into high (9-30) and low (0-8). In Cooper et al.'s (1996) study, they moved the EPDS threshold to nine after rarely finding depression amongst those scoring eight. This resulted in sensitivity of 84 to 100% and specificity of 82 to 88%.

The EPDS has undergone vigorous validation procedures over many years within various cultural groups and has been found to have good evidence of reliability and validity (Ray & Hodnett, 1999). The EPDS has been validated against the research diagnostic criteria for depressive illness obtained from Goldberg's Standardised Psychiatric Interview, against criteria for major depression according to DSM III, and by the use of logistic regression (Astbury et al., 1994). In addition, it is an easily administered and effective measure (Boyce et al., 1993; Clifford, Day, Cox, & Werrett, 1999; Cox et al., 1987; Ghubash, Abou-Saleh, & Daradkeh, 1997; Glaze & Cox, 1991; Green, Snowdon, & Statham, 1991). The EPDS was found to significantly increase the number of identified cases of PND in a Swedish population (Bågedahl-Strindlund & Monsen Börjesson, 1998). The EPDS also identifies women who are experiencing suicidal ideation (Milgrom et al., 1999). A score of two or more on the item "thought of harming herself" can be regarded as clinically significant (Milgrom et al., 1999). Further investigation is therefore of utmost importance with high scores on this item.

2.5 Procedure

Massey University Human Ethics Committee and the Health Funding Authority gave permission to distribute antenatal and postnatal questionnaires to mothers in Auckland. The Heath Funding Authority required that any mother who scored highly (>12) on the Edinburgh Postnatal Depression Scale be contacted by phone or if unable to be contacted, sent a letter informing them of their score and requesting they contact their general practitioner or maternity care provider (see Appendix A6).

Counterbalancing of the questions reduced the potential for confounding order effects (Dunham, 1988). One-third of the participants received white questionnaires containing Cooper et al.'s (1996) questions first, one-third received yellow questionnaires containing the General Health Questionnaire first, and one-third received green questionnaires containing the additional questions first. Questionnaires were colour-coded for ease of identification.

Various distribution methods resulted in 450 questionnaires given out. A number were sent to midwives to cover regions north, south, east and west of the city. These regions included Warkworth, Glenfield, Drury, Wiri, Pukekohe, Papatoetoe, Hillsborough, St Heliers, Ponsonby, New Lynn, Remuera, Waiheke Island, Waimauku, Howick, Pakuranga, Kaukapakapa, Hellensville and Henderson. On average, 19 midwives each received 13 questionnaires. Antenatal co-ordinators from the Parents' Centre (an organization running private antenatal classes) were approached and questionnaires were made available for distribution to the mothers attending on the night of a PND session. The antenatal classes were in the suburbs of Pakuranga, Birkenhead, Glenfield, Hibiscus Coast and Hillsborough. In addition, Doctor's surgeries, hospital midwives and private maternity clinics distributed questionnaires.

An advertisement placed in five suburban Auckland newspapers invited mothers' participation in the study and offered an incentive of newborn nappies to those participating (see Appendix A7). An outline of the research project

along with copies of ethical approval was sent to the general manager of Kimberly Clark New Zealand. Kimberly Clark, a New Zealand distribution agency for Huggies products, provided 100 newborn twin-pack samples to offer to the mothers participating. Each mother received a twin-pack and entered a draw to win 150 nappies. A mother from North Auckland won the supply of nappies.

Confidentiality was maintained by ensuring none of the mothers identifying details were reported in the results and also by ensuring the researcher alone had access to this information. Personal information was to be destroyed upon completion of the study. Anonymity was maintained by offering mothers a choice of using a code name or initials or a box number to send the postnatal questionnaire to.

Each antenatal (pregnancy) questionnaire (see Appendix A3) included an information sheet, consent form (Appendix A1 and A2) and a freepost return envelope. Mothers noted due date and gestation in the questionnaire and whether they would like a copy of the results. Approximately six weeks after their due date, mothers received postnatal questionnaires (Appendix A5). Included with the questionnaire was a letter reminding them of the second part of the study (Appendix A4).

2.6 Data analysis

Prior to analyses, data will be screened to check accurate recording and to assess normality of distributions. Power analyses will determine sample sizes and effect sizes necessary for meaningful results. All data will be analysed with SPSS/PC statistical software.

Firstly, demographic information will be reported, followed by frequency of responses obtained for each of the predictors. Descriptive analyses will highlight the frequency of responses obtained for predictive variables and high scores on the antenatal measures (GHQ-12, Cooper et al.'s antenatal predictive

index, and the EPDS). A 2x2 chi-square analysis will be conducted for goodness of fit to determine whether the percentage of depressed mothers in the sample fits the expected percentage of depressed mothers in the population. Additional 2x2 chi-square tests (previous depression/no previous depression x high/low EPDS scores and first-time mother/second-time mothers x high/low EPDS scores) will then be conducted for relatedness to analyse the relationship between these categorical variables.

T-tests follow, with a repeated measures *t*-test evaluating mothers' GHQ-12 scores antenatally and postnatally and an independent groups *t*-test evaluating mean differences in the PND screening measure (the EPDS) for mothers who have and have not had PND before. A one-way ANOVA will look at differences in mean EPDS scores between level of education, employment and hospital stay, while correlations will establish the strength of relationships among the measures EPDS, satisfaction with maternity care (maternity satisfaction), GHQ-12 (antenatal wellbeing), GHQ-12 (postnatal wellbeing), postnatal experiences and antenatal risk factors.

Multivariate analyses include factor analyses, internal consistency reliability estimates, multiple regression and discriminant analysis. Factor analyses will look at the underlying structure of the GHQ-12 (antenatal wellbeing and postnatal wellbeing) and the EPDS. Internal consistency reliabilities will look at the intercorrelations among the items from the measures maternity satisfaction, antenatal wellbeing and postnatal wellbeing, antenatal risk factors, postnatal difficulties and the EPDS. Multiple linear regressions will determine the amount of variability in PND scores accounted for by the measures maternity satisfaction, antenatal wellbeing and antenatal risk factors. Discriminant analysis will assess whether the measures maternity satisfaction, antenatal wellbeing and antenatal risk factors can predict membership into depressed and non-depressed groups.

Finally, sensitivity, specificity and positive predictive value will give the frequency with which a positive test signifies PND and provide information on

the ability of the antenatal measures (GHQ-12 and antenatal risk factors) to single out people with possible PND and accurately classify mothers who do not have PND.

CHAPTER THREE

RESULTS

3.1 Data screening

Before analyses were conducted, a manual check of 10% of the data ensured accurate recording. Two respondents failed to fill in one item; these values were replaced with the mean for each item (Tabachnick & Fidell, 1996). A decision not to eliminate outliers or conduct transformations was due to the purpose of the study being to identify mothers with possible PND. If some mothers scored highly enough on the EPDS to be outliers, this would likely suggest a higher level of PND. It would not have served the purpose of the analysis to eliminate such mothers from the study. However, outliers were checked to determine input error had not occurred. The outliers were few in number and not extreme. To determine if any outliers were influential, means and standard deviations of the scores on all measures were checked with and without the outliers and were not found to vary substantially (see Table 5).

An alpha level of .05 was used for statistical tests. The conventional alpha of .05 was adhered to despite the researcher's belief that increasing alpha to .10 would be more appropriate to reduce type II errors. Costs and benefits of decisions made based on statistical testing can result in adjusting alpha (Frick, 1996). In the present case, avoiding missing mothers with depression is arguably more important than wrongly identifying mothers as depressed. The reason behind adhering to alpha of .05 in the present study is that most journals will not publish a finding unless it is significant at the $p < .05$ level (Bordens & Abbott, 1996).

Table 5

Mean scores for measures with and without outliers

Measure (N = 98)	Mean	Standard Deviation
Maternity satisfaction		
With outliers	2.33	.76
Without outliers	2.27	.65
Antenatal risk factors		
With outliers	22.80	8.77
Without outliers	22.12	7.42
Antenatal wellbeing		
With outliers	10.58	3.91
Without outliers	10.42	3.72
Postnatal wellbeing		
With outliers	10.96	4.98
Without outliers	10.13	3.86
EPDS		
With outliers	5.97	4.16
Without outliers	5.37	3.31
Postnatal experiences		
With outliers	12.76	1.86
Without outliers	12.76	1.31

3.2 Power analyses

The purpose of performing power analyses was to determine the probability that the analyses conducted would correctly identify an existing effect. Sample size estimates for various tests using power of .80 and medium effect sizes, in accordance with Cohen's (1988) criteria are highlighted next.

3.2.1 Two-tailed independent samples t-test and repeated measures t-test

$\alpha = .05$, $d = .5$, power = .80, $N = 64$ per group.

3.2.2 Pearson Product Moment correlation

$\alpha = .05$, $r = .30$, power = .80, $N = 84$ (two-tailed).

3.2.3 Chi-square test (2x2)

$\alpha = .05$, $w = .30$, power = .80, $N = 90$.

3.2.4 One-way ANOVA

$\alpha = .05$, $f = .25$, $u = 4$, power = .80, $N = 39$ per group.

3.3 Assessing normality of distributions

Examination of histograms, stem-and-leaf plots and boxplots suggested non-normal distributions, with the majority of measures showing a slight positive skew. A Kolmogorov-Smirnov statistic for testing normality was then produced using the normal probability and detrended probability plots. This statistic uses a significance level of >.05 for assuming normality. None of the antenatal or postnatal measures came close to reaching significance. However, the law of large numbers states that if the sample is sufficiently large (≥50) then the normality assumption can be relaxed for the population due the Central Limit Theorem applying (Sirkin, 1995). In the case of *t*-tests, a sample size of (≥30) is sufficient to yield relatively accurate p-values even if the normality assumption is violated (Green, Salkind, & Akey, 1997). In light of their robustness in terms of violations of distributional assumptions, parametric tests were conducted where appropriate.

3.4 Comparison of demographic data

Although sample sizes varied greatly, Table 6 outlines the similarities between the samples in Cooper et al.'s (1996) study and the present in terms of demographic characteristics.

Table 6

Demographic data

N = 98	British demographic data	New Zealand demographic data
Age in years	*(M)* 28.2 *(SD)* 4.9	(*mode*)* range = 26 –30
Proportion of first-time mothers	62%	63%
Proportion with education level of degree or higher	23%	24%
Proportion with a partner	95%	99%

* Mode reported due to grouping of ages into 6 age ranges.

The following section gives a brief description of the predictors outlined earlier in Table 2 as having a potential relationship with PND. Separating items from Cooper et al.'s (1996) index enabled individual analysis of items identified as predictors. Frequency information from the present sample is also given.

3.5 Satisfaction with maternity care

3.5.1 Satisfaction with choices available for maternity care

Seventy-two (72%) mothers were satisfied with the choices available in New Zealand for maternity care, 13 (13%) were not satisfied and the remaining 13 were undecided.

3.5.2 Satisfaction with maternity caregiver

Of the 69 mothers who had a midwife as their lead maternity caregiver, 53 (77%) reported being very happy with their caregiver, while the remainder reported being mostly happy. In contrast, of the 18 mothers who had a general practitioner, seven (39%) were very happy, nine (50%) were mostly happy and two (11%) were undecided. Specialist care had a wider range of responses with five mothers being very happy, one mostly happy, one mostly unhappy and one very unhappy. Finally, both hospital based care and combined care elicited 'mostly happy' responses from the three mothers concerned.

3.5.3 Type of maternity care preferred by second-time mothers

A small percentage of the 36 second-time mothers (11%) reported that they preferred the maternity care they had with their previous pregnancy, while 36% preferred their current maternity care and 6% were undecided. The majority (47%) had the same type of maternity care previously.

3.6 History of depression

Forty-six (46.9%) mothers reported suffering previous depression at a time other than after the birth of a baby. Of these, 21 (45.7%) had received professional help for their depression, 25 (54.3%) had not.

Table 7 presents mothers with high and low scores on the Edinburgh Postnatal Depression scale in relation to the predictive variables of parity, previous PND, antenatal anxiety and antenatal depression.

Table 7

Scores on EPDS by parity, previous postnatal depression, antenatal anxiety and antenatal depression

	N	Frequency of scores ≥ 9	%
Parity			
First-time mothers	62	12	19
Second-time mothers	36	9	25
Previous PND			
Yes	14	6	43
No	22	3	14
Antenatal anxiety			
A lot	5	2	40
A little	72	18	25
No anxiety	21	1	5
Antenatal depression			
Yes	10	4	40
No	88	17	19

Scores ≥ 9 shown in Table 7 indicate mothers are more likely to be experiencing PND. Depression is more likely in second time mothers who have previously had PND. Antenatally, mothers experiencing a lot of anxiety along with depression are more likely to experience subsequent PND.

3.7 Social support

Table 8

Relationships with mothers, partners and others

	Frequency	%
N = 98 **Length of time with partner**		
No partner	1	1%
Less than 1 year	2	2%
1-2 years	4	4%
2-5 years	32	33%
More than 5 years	59	60%
N = 98 **Relationship with partner**		
Close, warm	65	66%
A few tensions	27	28%
Moderate friction	3	3%
Constant friction	2	2%
N = 97 **Relationship with mother**		
No mother	4	4%
Close, warm	60	61%
Fair, reasonably warm	31	32%
Poor	2	2%
Very poor	1	1%
N = 98 **Someone to confide in other than mother or partner**		
Yes	6	6%
No	6	94%

Table 8 gives an overview of social support information obtained from the mothers. All the mothers apart from one had partners. The one mother without a partner did not have a high score on the EPDS. Five mothers had a poor partner relationship and one of these mothers scored highly on the EPDS. Four of the 98 participants did not have a mother; none had lost their mother before the age of 11 however. The majority (94%) had someone other than their mother or partner to confide in.

Due to the high level of social support found in the sample, it was not possible to make assumptions about a lack of social support and subsequent depression. Bivariate analyses were therefore not attempted for social support.

3.8 Housing

Overall, mothers were happy with the areas in which they lived. Sixty-eight (69%) mothers described the area they lived in as very satisfactory, 28 (29%) described the area they lived in as reasonably satisfactory and only two (2%) described the area they lived in as rather unsatisfactory.

3.9 Employment

Twenty-three (24%) of the mothers were not working. Seventeen (81%) of these were mothers who already had children. Table 9 highlights mothers' feelings about giving up work. As noted, only three of the sample of 98 mothers were reluctant to stop work, while five did not intend to stop working. Most of the mothers had mixed feelings.

Table 9

Employment status

N = 98	Frequency	Percentage
Not working	23	24
Keen to stop	20	20
Mixed feelings	47	48
Reluctant to stop	3	3
Don't intend to stop	5	5

3.10 Education

Figure 2 outlines the level of education attained by the mothers.

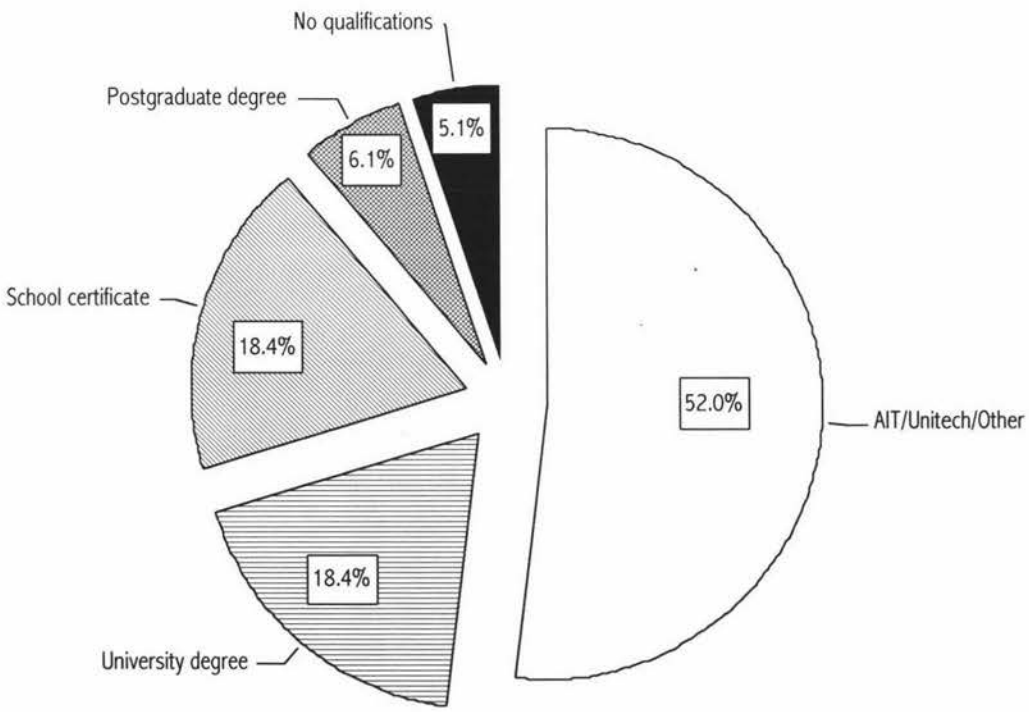

Figure 2: Educational qualifications

Nearly three-quarters of the mothers had further educational qualifications, mostly consisting of AIT or Unitech qualifications as shown in Figure 2.

3.11 Postnatal experiences

Table 10

Postnatal experiences

N = 98	Frequency	Percentage
Length of hospital stay		
Home birth	6	6.1%
<24 hours	11	11.2%
24 hours	8	8.2%
24-48 hours	11	11.2%
>48 hours	62	63.3%
Difficulty breastfeeding		
No	54	55.1%
Yes	39	39.8%
Not applicable	5	5.1%
Signs of postpartum blues		
No	46	46.9%
Yes	52	53.1%
Irritable baby		
No	63	64.3%
Yes, some of the time	32	32.7%
Yes, most of the time	3	3.1%

Table 10 highlights relevant findings concerning postnatal experiences. The majority of mothers stayed longer than 48 hours in hospital after the birth. More than half of the mothers showed signs of postpartum blues and one-third found their baby irritable.

3.12 Scores on antenatal predictive measures of PND

Table 11 outlines the percentage of mothers scoring highly on each of the measures, GHQ-12 antenatal (antenatal wellbeing), GHQ-12 postnatal (postnatal wellbeing) Cooper et al.'s antenatal predictive index (risk factors) and the Edinburgh Postnatal Depression Scale (EPDS).

Table 11

Percentage of mothers with high scores on the antenatal measures

N = 98	Range of scores	Percentage	M	SD
Antenatal wellbeing	**4-23**			
Score ≤7		27.6	6.11	1.05
Score ≥8		72.4	12.24	3.21
Postnatal wellbeing	**3-26**			
Score ≤7		20.4	5.10	1.17
Score ≥8		79.6	12.46	4.44
Antenatal risk factors	**3-47**			
Score ≤ 26		73.5	18.49	4.93
Score ≥ 27		26.5	34.73	5.29
EPDS	**0-18**			
Score ≤8		78.6	4.34	2.55
Score ≥9		21.9	11.95	3.37

The frequencies and percentage of high scorers on measures used in this study and highlighted in Table 11 indicates that more mothers had low perceived general wellbeing both antenatally and postnatally. Most mothers however, had lower scores on the EPDS and antenatal risk factors. This suggested most mothers were not depressed and experienced few antenatal risk factors.

3.13 One-sample chi-square test assessing goodness of fit

A one-sample chi-square test was conducted to assess the proportion of mothers who were depressed and non-depressed after the birth of their baby.

Approximately 15% of new mothers in the population are likely to have PND based on previous research findings (Crisp, 1992). Therefore, out of a sample of 98, 15 are likely to be depressed and 83 are unlikely to be depressed. The analysis showed that observed proportions (21 and 77) did not differ significantly from the hypothesized proportions χ^2 (1, N=98) = 3.17, p = .075. With a critical χ^2 value of 3.84, the observed value was less than expected, therefore there was no significant difference between the expected levels of depression amongst mothers postnatally and that obtained from the sample of 98. This suggested the sample was comparable to the population from which it came.

3.14 Chi-square tests for relatedness

The Edinburgh Postnatal Depression scores were split into high and low using the recommended cut-off score of ≥ 9 (Cox et al., 1993). Whether a mother had been previously depressed, had antenatal depression or was a first or second-time mother did not significantly affect PND scores (see Table 12). A table of expected and observed frequencies is available in Appendix B, Table B1.

Table 12

Chi-square tests for parity, history of depression and antenatal depression

	df	N	χ^2	p
Parity	1	98	.43	.51
History of Depression	1	98	.005	.94
Antenatal depression	1	98	2.28	.13

3.15 T-tests

3.15.1 General wellbeing (GHQ-12 antenatal and postnatal)

A repeated-measures *t*-test evaluated the mean difference in mothers' wellbeing scores on two occasions (antenatally and postnatally) with an intervening birth between the tests. The results indicated that the mean score for postnatal wellbeing (M = 10.58, SD = 3.91) was not significantly different from the mean score for antenatal wellbeing (M = 10.96, SD = 4.98), t (27) = .87, p >.05. Therefore, general wellbeing did not appear significantly affected by the birth of a baby. Table B2 in Appendix B shows the time lapse between filling the first and second questionnaires.

3.15.2 Previous postnatal depression

An independent groups t-test determined differences between mothers with and without previous PND. The Levene test for homogeneity of variance was non-significant (p >.05) meeting the assumption of equality of variance. The test was significant, t (34) = 1.99, p = .05, with a small effect size (d = .33). There was a significant difference in scores on the measure of PND between mothers with and without previous PND. Inspection of the means suggested that mothers with previous PND (M = 7.57, SD = 5.02) on average had higher

scores on the PND measure than mothers without previous PND ($M = 4.45$, $SD = 4.25$).

3.16 Analysis of Variance

Results of the analyses of variance showed no significant difference in PND scores for the variables age, employment, education level and length of hospital stay (see Appendix B, Table B3).

3.17 Correlations

Pearson Product Moment correlations assessed the strength of the relationship between antenatal and postnatal measures. Scatterplots showed homoscedasticity (see Appendix B, Figure B1). Uniform clustering of scores and linear relationships were evident for all measures apart from satisfaction with maternity care. The highest correlation was obtained between the EPDS and postnatal wellbeing $r = .774$, $p < .01$. This showed that 60% of the variation in depression scores was accounted for by its linear relationship with low postnatal wellbeing. Nine of the 15 correlations were statistically significant and were $\geq .20$. All of the measures apart from satisfaction with maternity care had significant correlations with the EPDS (see Table 13).

Cooper et al. (1996) noted that their predictive index could be improved by adding postnatal questions. Therefore, postnatal experiences and Cooper et al.'s index (antenatal risk factors) were combined. The combination resulted in a slight improvement in Pearson's r (from $r = .362$ [$r^2 = 13.10$] to $r = .406$ [$r^2 = 16.48$], $p < .01$) adding an additional 3.5% of the variance in PND scores. In other words, 16.5% of the variance in PND scores is predictable from the variance in antenatal risk factors and postnatal experiences in comparison to 13% of the variance with antenatal risk factors alone.

Table 13

Correlations

	EPDS	Maternity Satisfaction	Antenatal wellbeing	Postnatal wellbeing	Postnatal Experiences	Antenatal risk factors
EPDS	1.000	-.062	.445**	.774**	.330**	.362**
Maternity satisfaction		1.000	-.176	-.125	-.038	.001
Antenatal wellbeing			1.000	.469**	.151	.262**
Postnatal wellbeing				1.000	.229*	.210*
Postnatal experiences					1.000	.204*
Antenatal risk factors						1.000

** $p < .01$ (2-tailed).

* $p < .05$ (2-tailed).

3.18 Principal Components Analysis and Factor Analysis

3.18.1 Principal Components Analysis of the GHQ-12 antenatal questionnaire (antenatal wellbeing)

To uncover underlying dimensions rather than reducing to a smaller subset, factor analysis would be the appropriate choice (Hair, Anderson, Tatham, & Black, 1995). However, to maintain consistency with previous research, and in keeping with the recommended guidelines of Goldberg & Williams, (1988) for comparability of studies, firstly a principal components analysis was conducted. Oblimin rotation was chosen as it was expected that the variables would be correlated.

Sample size of 98 was barely adequate for Principal Components Analysis, although sample size allowed >5 subjects per variable. According to Goldberg (1988), a sample size of 60 is adequate for factor analysis of the GHQ-12. Twelve variables for two factors enabled good definition. The distribution was on a 4-point scale. The means showed that mothers were scoring low in general as a number of means were <1.00. Standard deviations ranged from .3 to .7, with no evidence of extreme skew. The simple correlations ranged from .01 to .6 showing a range of correlations. In addition, there were a number of correlations >.30 adding weight to the appropriateness of factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy was .78, (close to "meritorious") which suggested good multivariate structure. The lowest MSA for a particular variable was .65 (between "mediocre" and "middling") and the highest was .83 (meritorious). Therefore, variables seemed well enmeshed in the overall data structure. Partial correlations indicated interrelationships among variables and adequate correlational structure to provide a basis for factor analysis.

The first factor picked up 32% of the total variance; the second picked up 13% and the third factor an additional 10%. Three factors had eigenvalues >1 although a fourth factor was close at .98. The scree test indicated three factors be retained. The communalities suggested that particular variables, i.e. item 8

"able to face up to problems" (.20), item 7 "able to enjoy day to day activities"(.21) and item 12 "reasonably happy, all things considered" at (.22), were not well embedded in the factor structure. In contrast, item 1 "able to concentrate" had more in common with the other variables with a communality figure of .69. The iterations were high (>25), suggesting too complex a structure. Removing the third factor resulted in convergence in 8 iterations, along with 45% of the variance accounted for by the two factors.

Over half (59%) of the residuals were >.05, showing poor fit. Using a cut-off score of .4, at least three variables defined both factors. However, two items appeared in two factors so the solution fell short of simple structure. The items were "felt constantly under strain", and "reasonably happy, all things considered". As factors were not highly correlated according to the correlation matrix (r = .27), the analysis was re-run using varimax rotation in keeping with previous research (Goldberg & Williams, 1988). This resulted in an improvement in iterations with convergence in three and also a clearer factor structure, with factor 1 defined by six variables and factor 2 defined by four. Again, simple structure was not apparent with two items loading on two factors. These items were "felt couldn't overcome difficulties" and "felt constantly under strain". Factor 1 was comprised of items seeming to identify "anxiety/dysphoria" while factor 2 seemed to capture "coping" (see Table 14). Overall, the findings were in line with previous research that indicated two components accounting for 44% of the variance in the GHQ-12 (Goldberg & Williams, 1988).

3.18.2 Factor analysis of the GHQ-12 antenatal questionnaire (antenatal wellbeing)

Following principal components analysis, factor analysis identified underlying dimensions in the variables.

The overall KMO measure of sampling adequacy was between middling and meritorious at .78, suggesting adequate multivariate structure. The individual MSA's identified one variable (feeling unhappy and depressed) at .48, which did

not meet the necessary threshold for sampling adequacy. The others ranged from .54 to .88 (miserable to meritorious) showing reasonable correlational structure to provide a basis for factor analysis. Partial correlations were all low and showed good drops in magnitude from simple correlations. For example, "felt constantly under strain" and "felt couldn't overcome difficulties" dropped from .52 to .19, showing evidence of a good relationship with other variables.

Final communalities suggested that particular variables especially questions 2,3,7,8 and 12, were not well embedded in the factor structure. The other communalities ranged from .41 to .55, showing a substantial portion of the variance in the variables unaccounted for by the factors. The reproduced correlation matrix did an adequate job of reproducing the original correlation. Although 33% of residuals were > .05, this was not excessively high. The rotation converged in 10 iterations, which was slightly high but acceptable. Using a cut-off of .4, factor one, clearly defined by seven items, identified an "anxiety/dysphoria" construct. On the other hand, factor 2, while clearly defined by two items as "coping", had a third item with a loading of .2. In addition, a problem in the factor structure was apparent by question 6 ("felt constantly under strain") appearing in two factors. The solution therefore fell short of simple structure. There was a slight increase in the correlation between variables (.32) compared to Principal Components Analysis. As a result, only an oblique solution was attempted. Table 15 shows an outline of the factor loadings.

3.18.3 Factor analysis of the GHQ-12 postnatal questionnaire (postnatal wellbeing)

Twelve variables for three factors enabled good definition. The distribution was on a 4-point scale. The means showed limited variability, and the standard deviations ranged from .32 to .83. The simple correlations ranged from .1 to .7 showing a range of correlations and there were a number over .3. The KMO statistic at .86 was between marvellous and meritorious. However, three items did not meet the necessary threshold for sampling adequacy and had MSA values under .50. These items were "felt couldn't overcome difficulties",

"losing confidence in yourself" and "reasonably happy, all things considered". The partial correlations were low indicating underlying factors; in addition, there were substantial drops from simple to partial correlations. The drop between Q9 and Q19 (from .5 to .1) for example, showed evidence of a good relationship with other variables. In summary, there was sufficient correlational structure to provide a basis for factor analysis although some problems in data structure were apparent.

The final communalities ranged from .24 to .78 showing some reasonable relationships with other variables in the 3-factor structure. A reasonable fit was indicated with 27% of residuals > .05. As convergence took 13 iterations suggesting too complex a structure, the analysis was re-run without factor 3. This resulted in 7 iterations and a clearer factor structure. A change in final communalities resulted, ranging from .35 to .59, suggesting relationships between other variables were not great. In addition, 37% of the residuals had a value > .05, so the reproduced correlation matrix was not reproducing the original correlation matrix well.

Using a cut-off of .4, at least three variables defined both factors (see Table 16). Factor 1 identified factors relating to "anxiety/dysphoria" and factor 2 captured self-esteem. Both factors were correlated in excess of .6, therefore oblimin solution was justified.

3.18.4 Factor analysis of the EPDS

Sample size was adequate with >5 per variable. Ten variables for two factors enabled good definition.

The distribution was on a 4-point scale. There was limited variability in the means and the standard deviations ranged from .3 to .9. The simple correlations ranged from .2 to over .5, showing a range of correlations and a substantial number were > .30, adding weight to the appropriateness of factor analysis.

The overall KMO statistic fell between meritorious and marvellous at .84. Good multivariate structure was therefore apparent. Examination of the MSA values for each variable identified three variables: "laugh and see the funny side of things", "felt sad or miserable" and "so unhappy have been crying", which all had values under .50 and did not meet the necessary threshold of sampling adequacy. The others were respectable, ranging from mediocre to middling. There were notable drops in magnitude from the simple to partial correlations indicating interrelationships among variables.

The conclusion was a reasonably factorable set of data. A large drop between "blamed myself unnecessarily when things went wrong" and "felt scared or panicky for no good reason" (from .5 to .1) showed evidence of a good relationship with other variables.

The final communalities showed the question "thought of harming myself", at .17 was not well embedded in the factor structure. The final communalities ranged from .39 to .74, showing some good relationships with other variables in the 2-factor solution. Forty-two percent of residuals > .05 highlighted some problems with the extraction. Simple structure was apparent as no variables appeared in two factors. Five variables appeared in each factor at a cut-off of .4 and converged in seven iterations. Factor 1 was composed of items relating to low mood, while factor 2 seemed to relate to anxiety (see Table 17). Justifying the use of an oblique solution, the factor matrix showed a correlation of .63 between factors.

Table 14:

Rotated Component Matrix for the GHQ-12 antenatal questionnaire (antenatal wellbeing)

	COMPONENT	
ITEM	**1**	**2**
Thinking of yourself as worthless	.764	
Feeling unhappy and depressed	.740	
Losing confidence in yourself	.641	
Felt playing a useful part in things	.624	
Felt couldn't overcome difficulties	.612	.364
Lost much sleep over worry	.547	
Felt constantly under strain	.525	.498
Been able to enjoy day-to-day activities	.450	
Able to concentrate		.813
Felt capable of making decisions about things		.747
Been able to face up to problems		.442
Reasonably happy, all things considered		.400

Table 15:

Factor Matrix for the GHQ-12 antenatal questionnaire (antenatal wellbeing)

	FACTOR	
ITEM	**1**	**2**
Thinking of yourself as worthless	.752	
Feeling unhappy and depressed	.729	
Felt couldn't overcome difficulties	.624	
Losing confidence in yourself	.604	
Felt playing a useful part in things	.536	
Felt constantly under strain	.488	.337
Lost much sleep over worry	.452	
Been able to enjoy day-to-day activities	.359	
Reasonably happy, all things considered	.255	
Able to concentrate		.778
Felt capable of making decisions about things		.587
Been able to face up to problems		.235

Table 16:

Factor Matrix for the GHQ-12 postnatal questionnaire (postnatal wellbeing)

	FACTOR	
ITEM	**1**	**2**
Been able to enjoy day-to-day activities	.822	
Felt constantly under strain	.595	
Lost much sleep over worry	.576	
Feeling unhappy and depressed	.564	
Felt couldn't overcome difficulties	.521	
Reasonably happy, all things considered	.587	
Felt capable of making decisions about things	.463	
Been able to face up to problems	.455	
Able to concentrate	.311	
Losing confidence in yourself		-.938
Felt playing a useful part in things		-.495
Thinking of yourself as worthless		-.629

Table 17:

Factor Matrix for the EPDS

	FACTOR	
ITEM	**1**	**2**
So unhappy have been crying	.780	
Felt sad or miserable	.771	
Looked forward with enjoyment to things	.705	
Laugh and see funny side of things	.660	
Things have been getting on top of me	.587	
Anxious or worried for no good reason		.728
Felt scared or panicky for no good reason		.716
So unhappy I have had difficulty sleeping		.601
Blamed myself unnecessarily when things went wrong		.576
Thought of harming myself has occurred to me		.400

3.19 Reliability

Internal consistency reliability estimates using coefficient alpha assessed the degree of correlation among items for each of the measures (see Table 18). Measures with different response scales, such as maternity satisfaction, Cooper et al.'s index and postnatal difficulties required standardising of scores. Z-scores for 14 of Cooper et al.'s 17 items were created; the remaining three items had zero variance due to the weighted scoring method used by Cooper et al. The differential weightings given to Cooper et al.'s index meant accurate internal consistency reliability estimates were not possible and findings must be interpreted with caution. The GHQ-12 (antenatal and postnatal) and the EPDS had the highest reliability estimates (around .80).

Table 18

Reliability scores for measures

N = 98	Number of items	Mean	Standard deviation	SEM	Cronbach's α
Maternity satisfaction	3	0.00	1.00	0.93	.14*
Antenatal wellbeing	12	10.55	3.91	1.79	.79
Antenatal risk factors	17	0.00	1.00	0.68	.54*
Postnatal wellbeing	12	10.96	4.98	1.80	.87
Postnatal difficulties	9	0.00	1.00	0.82	.33*
EPDS	10	5.97	4.16	1.61	.85

* Standardised item alpha

3.20 Multiple Regression

The use of multiple linear regression enabled assessment of the predictive validity of the three antenatal predictive measures (maternity satisfaction, antenatal wellbeing and antenatal risk factors). Sample size was adequate for regression as there were 98 cases for 3 predictors, a ratio of 33 to 1. The patterning of the bivariate correlations suggested the possibility of confounding and therefore the need for multivariate analyses. Although the correlation was low, antenatal wellbeing and antenatal risk factors were interrelated (r = .262, p <.05). Maternity satisfaction had a higher relationship with poor antenatal wellbeing (r = -.176) than with the PND measure. However, upon checking the tolerance statistics, no multicollinearity was apparent. Tolerances were high (>.90) and corresponding variance inflation factors were low (close to 1.0). The Durbin-Watson test was close to 2 (1.67); therefore, no correlations among residuals were apparent. An examination of the Mahalanobis distance values indicated that there were no multivariate outliers among the independent variables. The critical value of χ^2 for 3 predictor variables at α = .001 is 16.266. Multivariate normality was assumed as no distances exceeded this critical value.

The scatterplot of residuals against predicted values showed no clear relationship between the residuals and the predicted values, consistent with the assumption of linearity. The normal plot of regression standardized residuals for the dependent variable (EPDS score) also indicated a normal distribution with no cases lying outside the normal –3 to +3 range (see Appendix B, Figures B2 & B3).

The simple correlations showed high EPDS scores (probable PND) were more common in mothers with low general wellbeing and a high level of antenatal risk factors. There was a barely discernable, non-significant negative relationship between satisfaction with maternity care and level of depression (r = -.06). None of the relationships was particularly strong in magnitude. Low general wellbeing (r = .45) and antenatal risk factors (r = .36) explained 20%

and 13% of the variance in EPDS scores, respectively. These two significant associations were unlikely to be due to chance ($p < .05$).

Antenatal wellbeing, antenatal risk factors and maternity satisfaction explained 24% of the variance in PND scores. This statistically significant relationship was unlikely to be due to chance (adj. $R^2 = .239$, $F[3,94] = 11.18$, $p < .05$). The strongest determinant of PND was found to be antenatal wellbeing ($\beta = .38$, $p < .05$), followed by antenatal risk factors ($\beta = .26$, $p < .05$). Maternity satisfaction had virtually no predictive value ($\beta = .004$, $p > .05$). This showed that as the number of risk factors increased, there was a corresponding increase in depression scores. Similarly, a higher antenatal wellbeing score (indicating lower levels of wellbeing) corresponded with an increase in EPDS scores.

To determine the extent of the effect of antenatal risk factors over and above those due to poor antenatal wellbeing, a hierarchical multiple regression was then conducted with antenatal wellbeing entered at step 1 and antenatal risk factors entered at step 2. Maternity satisfaction was no longer included in analysis. This was due to its poor performance and the fact that it did not increase the predictive ability of the other two variables by its inclusion in the equation. Standardised rates of change were the same as in the standard regression equation ($\beta = .38$, $p < .05$, for antenatal wellbeing and $\beta = .26$, $p < .05$ for antenatal risk factors). Results of the analysis showed the percentage of variation in depression scores was increased at step 2 (R^2change $= .065$, $p < .001$). Overall, antenatal wellbeing explained 19% of the variance in PND scores (adj. $R^2 = .190$, $F[1,96] = 11.18$, $p < .001$) in step 1 and antenatal risk factors explained a further 5.7% of the variance (adj. $R^2 = .247$, $F[1,95] = 8.33$, $p < .05$) in step 2.

3.21 Discriminant Analysis

Conducting a discriminant analysis enabled assessment of whether the antenatal predictive measures classified mothers into depressed and non-depressed groups. Initially, assumptions were tested. Robustness of the test was

guaranteed as there was a sample size of >20 cases per cell. Scatterplots of pairs of predictor variables showed there was no serious non-linearity. In addition, multivariate outliers were examined using Mahalanobis distance and multivariate normality was assumed as no distances exceeded the critical χ^2 value of 16.266 at $\alpha = .001$.

The correlations between variables were low, ranging from .013 to .210 indicating multicollinearity was not a problem. The means suggested that there was an increase in antenatal risk factors and poor antenatal wellbeing from non-depressed to depressed groups. The means for maternity satisfaction were almost identical suggesting little difference between non-depressed and depressed mothers in terms of satisfaction with maternity care. The *F* tests indicated that only antenatal wellbeing showed a significant group difference ($F = 13.78$, $p < .001$), so the group means were not likely to be the same for this variable. Antenatal risk factors came close to reaching significance ($F = 3.78$, $p = .055$). Antenatal wellbeing had the strongest link with depression as it explained 14% of the variance. The data for maternity satisfaction did not warrant the conclusion that the population means for the groups differed.

The canonical discriminant function accounted for 13.7% of the total variance in depression scores (scores on the EPDS) and was significantly different from 0 ($p < .05$). A similar rank ordering among the standardized and structure coefficients indicated that no confounding among the variables was evident. General wellbeing had the most discriminating power followed by antenatal risk factors, then satisfaction with maternity care. Box's M tested for multivariate normality of the independent variables and for the equality of their correlations across the two depression groups. No assumption violation occurred as significance was not obtained ($p > .05$).

Discriminant analysis was able to predict correct group membership for 66.3% of the cases. To take account of different group sizes, weighting by group size altered equal prior probabilities. The best hit-rate occurred in the depressed group where there was an approximate 31% increase in hit rate when using the

discriminating information provided by the antenatal predictive measures. The non-depressed group showed poor discrimination with a 9% decrease in hit-rate over base rate meaning that this group was performing worse than chance. Although it was possible to correctly assign mothers to the depressed group, the hit-rates indicated that the predictive measures discriminated poorly between the two groups. This highlighted potential problems in the criteria for determining depressed and non-depressed mothers' scores.

According to the standardized coefficients, satisfaction with maternity care did not contribute to the analysis suggesting it would be useful to drop this out. Despite the marginal *p* value of .055 for antenatal risk factors, the standardized coefficient was .313 showing a small contribution from this measure; it was therefore left in the analysis. After re-running the analysis with satisfaction with maternity care removed, results obtained were identical. This suggested that the satisfaction with maternity care measure did not detrimentally affect the overall analysis and no change in hit rates occurred with its deletion.

As assessing the predictive ability of Cooper et al.'s index was a primary aim of this research, the discriminant analysis was re-run with antenatal risk factors alone. This gave a result of 62.2% of the cases correctly classified. Using prior probabilities weighted by group size, the best hit-rate occurred in the depressed group where again there was an approximate 31% increase in hit rate when using the discriminating information provided by antenatal risk factors. The non-depressed group showed poor discrimination with a 14% decrease in hit rate over base rate meaning that this group was performing worse than chance.

3.22 Sensitivity, specificity and positive predictive value of the antenatal predictive measures

The following section provides information about the ability of the antenatal measures to make correct and incorrect classifications of PND. This information is useful as misclassification is inevitable with any test (Gehlbach, 1988).

The positive predictive value of the antenatal measures (Cooper et al.'s antenatal predictive index, the GHQ-12 and satisfaction with maternity care) was 32%. This gives the frequency with which a positive test actually signifies that the mother has PND. The specificity and sensitivity are better. The test was able to accurately identify 70% of mothers who did not have possible depression (specificity) and 52% of the mothers who had possible depression (sensitivity). The efficiency of a test is the test's ability to correctly identify mothers' scores on the PND measure and in this case equals 66% (Gehlbach, 1988). Scores ≥ 9 were seen in 23 of the 77 mothers (30%) without possible PND. These scores are false positives – mothers the test falsely assigned the label postnatally depressed. Scores ≤ 8 were seen in 10 of the 21 (48%) mothers with possible PND. These scores are false negatives – mothers the test wrongly identified as not having PND.

Table 19 compares Cooper et al.'s (1996) research and the current research. As shown, the proportion scoring greater than 23 on the index was larger in the present study than in Cooper et al's study. In the present study, out of the 43 mothers scoring ≥ 23 on Cooper et al.'s (1996) index, 12 were potentially depressed, 31 were not. Six of the twelve mothers were correctly identified as depressed; six were incorrectly classified as non-depressed (false negatives). Therefore, sensitivity of the test was 50%. Specificity was worse than Cooper et al.'s result at 45%. Therefore, 14 mothers who were not depressed were accurately identified, and 17 were wrongly identified as having possible PND (false positives). Positive predictive value identifies the frequency with which a positive test actually signifies PND. Positive predictive value was 26%. As seen, sensitivity and specificity are lower than figures obtained by Cooper et al., while positive predictive value is the same. Overall, the two sets of findings are not widely divergent.

Table 19

Comparison of performance of Cooper et al.'s antenatal predictive index (antenatal risk factors)

Antenatal risk factors score ≥ 23	Proportion scoring at or above this score (%)	Sensitivity (%)	Specificity (%)	Positive Predictive value (%)
Cooper et al.'s study	37	59	67	26
Present study	43	50	55	26

3.23 Supplementary analyses

Following final analyses, supplementary analyses assessed the classification ability of the antenatal measures (antenatal wellbeing and antenatal risk factors) at different cut-off points for the Edinburgh Postnatal Depression Scale. Table 20 outlines findings. The sensitivity, specificity and positive predictive values are substantially improved at a lower cut-off point of ≥ 8 for the EPDS. However, at a higher cut-off point of ≥ 12, performance is much worse. The proportion of mothers scoring ≥ 8 (33%) is greater than the 15 – 20% prevalence rate of PND (Crisp, 1992; McGill et al., 1995), while the number of mothers scoring ≥ 12 (9%) is somewhat lower.

Table 20

Results obtained at different cut-off points for the EPDS

EPDS score ≥ 8	Proportion scoring at or above this score (%)	Sensitivity (%)	Specificity (%)	Positive Predictive value (%)
Present study	33	69	73	55
EPDS score ≥ 9	**Proportion scoring at or above this score (%)**	**Sensitivity (%)**	**Specificity (%)**	**Positive Predictive value (%)**
Present study	21	52	70	32
EPDS score ≥ 12	**Proportion scoring at or above this score (%)**	**Sensitivity (%)**	**Specificity (%)**	**Positive Predictive value (%)**
Present study	9	44	66	12

3.24 Post-hoc power analyses

Following statistical analyses, estimations of power were made to enable comparisons with power calculated before the study.

3.24.1 Independent samples t-test (two-tailed).

A *t*-test of previous PND and PND scores, where 14 second-time mothers had experienced previous PND and 22 had not. With $n_A \neq n_B$, $n' = 17.1$, $\alpha = .05$, $d = .33$, power is slightly greater than .13. As well as $n_A \neq n_B$, it was also the case that $\sigma_A \neq \sigma_B$; these conditions suggested that the values from the tables provided by Cohen (1988) were likely to be greatly in error. Therefore, an accurate estimate of power was not made. However, in light of the small number of second-time mothers and even less who had experienced previous PND, power is likely to be severely lacking. For $d = .30$, sample size would need to equal 90 per group to obtain power of .80.

3.24.2 Pearson Product Moment Correlation

Table 21 outlines the findings for a two-tailed test.

Table 21

Post hoc power analyses for correlations (two-tailed)

Measure	r	α	Power
Antenatal wellbeing	.445	.05	.98
Postnatal wellbeing	.774	.05	>.995
Postnatal difficulties	.330	.05	.85
Antenatal risk factors	.362	.05	.85

3.24.3 Multiple Regression (Standard)

$u = 3$, $v = 94$, $f = .35$, $\lambda = 34.3$, $\alpha = .05$, power = >.995.

3.24.4 Multiple Regression (Hierarchical)

Using power values obtained by linear interpolation, the following values were obtained.

$u = 3$, $v = 94$, $f = .09$, $\lambda = 8.8$, $\alpha = .05$, power = .66.

As shown, power analyses are acceptable for most of the analyses performed.

CHAPTER FOUR

DISCUSSION

This study assessed the predictive validity of antenatal measures in identifying mothers with PND in New Zealand. Cooper et al.'s (1996) antenatal predictive index was the primary focus of the research. Expanding on the work of Cooper et al., the GHQ-12 and questions concerning satisfaction with maternity care were included as additional antenatal measures. Scores on the EPDS, a screening device for PND, identified mothers likely to be depressed.

4.1 Sample

The sample size is satisfactory for the statistical methods used. Given the time constraints and difficulty in accessing members of the public, it is creditable that 98 mothers filled in antenatal and postnatal questionnaires over a period of six months. A strength of this study is the collection of data from both first and second-time mothers. Studies that assess only first-time mothers limit the generalisability of the findings to all mothers (Zelkowitz & Milet, 1995).

The sample obtained is however, a convenience sample and mothers volunteered to participate. Therefore, the study is subject to the limitations of this type of sample including the inability to accurately generalise to the population at large (Dunham, 1988). Limitations are noted in the present study by overrepresentation of Pakeha mothers, overrepresentation of mothers with good support networks and the overrepresentation of mothers living on the North Shore and Central Auckland. The North Shore and Central Auckland are generally considered affluent areas (Kearns et al., 1997).

4.2 Questionnaires

Overall, the minimal amount of missing data (two items in total) suggests the mothers answered the questionnaires easily. An important aspect of this study is that 73% of mothers filled in the postnatal questionnaire. Mothers may have been less likely to fill in the second questionnaire if they felt the study was not worthwhile or was unrelated to the purpose of the study.

4.3 Power analyses

Strong power (averaging >.8) was obtained in the multivariate analyses, meaning there is a good balance between the possibility of Type I and Type II errors. However, low power was obtained in the independent samples *t*-test. As only 36 out of the 98 mothers are second-time mothers, group size is limited. Dividing second-time mothers into those suffering previous PND creates a further reduction in numbers. Interestingly, despite low power, the results of the *t*-test are in keeping with previous research findings of a history of PND and current PND (Posner et al., 1997). Increasing sample size to 90 per group for an effect size of .30 is a means of confirming the present findings. Low power might also have resulted in the inability to detect an effect in the chi-square and ANOVA tests.

4.4 Individual predictive variables of PND

Analysing individual predictors outlined in Table 2 in an attempt to compare previous research findings on predictive variables proved difficult in the present study. Generally, non-significant findings were observed in the analyses. This may stem in part from lack of power (Cohen, 1988); however, there are other possible reasons for non-significant findings. These reasons are briefly considered under the predictive variable headings parity, history of depression, previous PND, partners and social support, level of education, housing conditions, employment and age.

4.4.1 Parity

No relationship exists between being a first or second-time mother and PND in the present study. Previous researchers such as Bridge et al (Bridge et al., 1985) find being a first time mother is associated with PND; others such as Zelkowitz et al (Zelkowitz & Milet, 1995) find being a second-time mother associated with PND. These different findings suggest there may be additional factors influencing parity and PND. Perhaps moderating variables are operating that increase the likelihood of PND. For example, being a first-time mother might only be correlated with PND if a mother has a low level of social support. Perhaps being a second-time mother will only be correlated with PND if the mother does not have a partner. As mothers in the present study had both high levels of social support and partners, this might explain the lack of relationship between parity and PND.

4.4.2 History of depression

Mothers with a history of depression did not have higher scores on the EPDS than mothers without a history of depression. Therefore, the findings of Paykel et al., (1980) and Watson et al., (1984) were not supported. It was interesting that only 21 out of the 46 mothers in the present study reporting a history of depression had received professional help. Although mothers considered they had suffered from depression, perhaps a clinical diagnosis would not have confirmed this. This highlights potential problems in self-report measures, including the fact they are less reliable than clinical interviews (Boyce et al., 1991).

4.4.3 Previous PND

Previously suffering PND shows a significant positive relationship with PND scores in the present study. This supports earlier research that finds mothers who have had PND after previous births are more likely to experience PND again (Braverman & Roux, 1978) (Posner et al., 1997). Researchers who

distinguish between previous non-postpartum depressive episodes and previous PND have found significant relationships between previous PND and present PND (Spangenberg & Pieters, 1991). Findings in the present study also support this distinction. Clearly, the distinction between previous depression and previous PND should have consideration in planning future research.

4.4.4 Partners and social support

All the mothers in the present study, with one exception, had partners and stated they had good relationships with them. In addition, most mothers reported a high level of social support in the form of satisfying relationships with their mothers and additional people to confide in. The present sample therefore seems unique in relation to satisfaction with partner relationship and high levels of supportive relationships. Previous studies have found women with PND reporting marital conflict and lack of support from partners or other people (Braverman & Roux, 1978; Kumar & Robson, 1984; O'Hara, 1986; Whiffen, 1988b). The uniqueness of the present sample may have prevented the possibility of any association between lack of support and PND being found. Another issue relating both to the sampling method and social support is that mothers who volunteer to participate have greater support and are therefore in a better position to be able to fill in questionnaires.

4.4.5 Level of education

Less than three years secondary education was associated with greater vulnerability to PND and higher educational qualifications were associated with less vulnerability to PND in McGill et al.'s (1995) study. Insufficient numbers in each of these groups (no formal qualifications and postgraduate degree) in the present study meant that comparable findings were unable to be made. When combining mothers with university degrees and postgraduate degrees, mothers with higher educational qualifications did not differ from the other mothers.

4.4.6 Housing conditions

Although Webster et al. (1994) found being unhappy with housing increased Auckland mothers' scores on the EPDS, the majority of mothers in the present study found the area they lived in very satisfactory. Only two mothers found the area they lived in 'rather unsatisfactory'; substandard living conditions were not a problem facing this sample of mothers. It would be useful to include additional questions to try to identify housing conditions that may have a bearing on overall psychological and physical wellbeing in mothers. These types of questions would likely have more relevance to mothers living in less affluent areas of Auckland.

4.4.7 Employment

Previous research has found that women having to leave a job against their preference and women who were not working, were at greater risk of PND (Murray et al., 1995; Zelkowitz & Milet, 1995). In the present study however, no significant findings were obtained between employment and PND scores. As only three of the mothers in the present study reported they were reluctant to stop working, this may explain the lack of a relationship. In addition, the 23 mothers who were not working did not appear to have a greater risk of developing PND. This is in contrast to Zelkowitz and Milet's (1995) findings. Again, specific demographic characteristics may have had an impact on results. Perhaps the mothers had chosen not to work in which case they might enjoy being at home. If the sample of mothers obtained in the current research is more affluent than the majority of Auckland mothers, they may not have the pressure of needing to return to a job they do not enjoy for financial reasons.

4.4.8 Age

Discrepancies appear in research on age and PND. Some researchers have found mothers over 34 years more at risk (Astbury et al., 1994), others have found younger mothers more at risk (Kearns et al., 1997; Paykel et al., 1980;

Webster et al., 1994). In particular, Webster et al. noted that women less than 20 years old were more likely to suffer from PND in Auckland. Only two mothers in the present study were less than 20. They both obtained scores ≥ 9 on the EPDS; one obtaining the highest score of all mothers in the sample. Making assumptions based on two mothers is not possible. However, as the findings support those of Webster et al., it would be prudent to investigate teenage mothers and PND further.

Despite being unable to successfully isolate individual antenatal predictive variables for PND, apart from previous PND, multivariate analyses of the predictive measures provided positive results. These results are discussed in the following section (4.5).

4.5 Antenatal predictive measures for PND

4.5.1 GHQ-12 (antenatal wellbeing)

Mothers generally reported poor general wellbeing both antenatally and postnatally. This suggests the cut-off score of ≥ 8 may need revising. This cut-off score meant that those scoring ≥ 8 were considered to have poor general wellbeing and those scoring ≤ 7 were considered to have good general wellbeing. It is difficult to know if the cut-off score of ≥ 8 on the GHQ-12 is too high or whether mothers expecting babies and caring for babies in general feel less well. In addition, the standard error of measurement for the measures gives evidence that the true scores were somewhat discrepant from the measured value (Kaplan & Saccuzzo, 1997). For instance, with a total possible score of 36 and a mother's score of 10, there is a 95% chance that a mother's true score lies between 7 and 13 for the antenatal GHQ-12. Therefore, the ability to make precise statements about good or poor general wellbeing is diminished. The cut-off of ≥ 8 corresponds to the 25th percentile of the GHQ-12 values distribution; the findings suggest the necessity of revisiting cut-scores in future research.

Accounting for 19% of the variance in PND scores, given the GHQ-12 was not designed to predict PND, is noteworthy. Why the GHQ-12 had more predictive ability than Cooper et al.'s (1996) index is unclear. The results may be explained by the fact the GHQ-12 is a broader measure encompassing depressive states in general. General measures, while useful indicators lack precision in identifying the problems associated with PND. Specific measures on the other hand, allow targeting of interventions at areas that may be more of concern for mothers in certain groups. Thus the GHQ-12 may have value in being incorporated into a more specific measure leading to the development of a better predictive index of PND.

Previous principal components analyses of the GHQ-12 have found two significant components accounting for 44% of the variance (Goldberg & Williams, 1988). This was supported in the present study with 45% of the variance being accounted for by two components, with few cross-loadings. Previous studies conducting principal components analyses of the GHQ-12, have isolated a factor as 'coping' (Martin, 1999). A coping factor is also noted in the present research. The one large factor in the present study, although it has several items, seems to classify 'anxiety/dysphoria'. Again, this supported previous research findings (Goldberg & Williams, 1988).

Although PCA and factor analysis of the antenatal GHQ-12 yielded similar findings in component and factor structures, slight differences were noted among the antenatal and postnatal GHQ-12 factor analyses. In particular, items on the second factor, although equalling three items for both analyses, loaded on different items. The antenatal questionnaire identified a coping factor and the postnatal questionnaire identified a self-esteem factor. Variations may be reflective of changes brought about with a new baby. Both factors find support in research on longer versions of the GHQ (Goldberg & Williams, 1988); this suggests items define the constructs they are supposed to. Overall, the content and that of the factors generally provides a sensible partitioning of the constructs. Support for the GHQ-12 as a measure of general psychological wellbeing is evident.

Internal consistency reliability estimates were high with coefficient $\alpha = .79$ for the antenatal GHQ-12 and .87 for the postnatal GHQ-12. These reliabilities are comparable to internal consistency reliabilities from previous research (Hardy, Shapiro, & Haynes, 1999). This shows a high correspondence between the items. The GHQ-12 also showed consistency in scores over time. Although the interval between tests varied between mothers and a major event in the form of birth had occurred between the two administrations of the GHQ-12, this did not appear to cause variations in the results obtained. This was an interesting finding suggesting that either psychological wellbeing is not affected by the birth of a baby or wellbeing is affected during pregnancy and remains constant postnatally. An additional explanation is that the GHQ-12 is not sensitive enough to pick up the variation. Further research is warranted to clarify this anomaly.

Overall, the GHQ-12 had the greatest predictive ability of the antenatal measures. The effect size was large, the results were significant and a high level of power was obtained.

4.5.2 Cooper et al.'s antenatal predictive index (antenatal risk factors)

The demographic similarities between Cooper et al.'s (1996) study and the current study were surprising. Mothers giving birth in the Rosie Maternity Hospital in Cambridge, where Cooper et al.'s study was based, do not differ greatly from the Auckland sample.

Attempting to isolate which particular variables in Cooper et al.'s (1996) study were most predictive of PND was not an easy task. Cooper et al.'s intricate scoring method, involving complex weighting of items to obtain a total score, meant establishing the relative importance of predictive variables was not possible. Some of Cooper et al.'s items obtained individual scores of zero and by combining these items with others, Cooper et al. obtained a total score. Cooper et al. went to great lengths to weight the items appropriately. The

variables contributed multiplicatively to the risk (or odds) of depression. It was however, a limitation that details of the weighting by log odds were not available from the authors (Professor P.J. Cooper, personal communication, December 17, 1999). As the purpose of the study was to assess the predictive validity of Cooper et al.'s index within New Zealand, scoring was kept in accordance with the original study.

Cooper et al. (1996) suggested it might be worthwhile to look more closely at the mother's actual birth experiences, as well as factors existing in the immediate postnatal environment. As Cooper et al. predicted, there was an increase in the relationship between EPDS scores when the antenatal index and postnatal difficulties were combined in the present study. Further investigation was not attempted due to the desire to keep as close as possible to the research aim of antenatal prediction. Nevertheless, two variables were highlighted as worthy of additional study, namely, postpartum blues and an irritable baby.

In terms of sensitivity, specificity and positive predictive value, the findings from the present study were similar to that of Cooper et al.'s. Cooper et al. concluded that their index was a sufficient improvement over a base rate of 1:9 (11%) for PND to be of use in identifying women at increased risk of developing PND. In the present study, at a score of 23 on the index, the risk of depression was 26% and half of those who were to become depressed scored in this range. This is also an improvement over the base rate of 11%. Overall, findings generally show the index performs comparably in a New Zealand sample. However, to find only 6% of the variance in PND scores attributed to Cooper's index suggests the measure has limited utility in a New Zealand setting of Pakeha Auckland mothers.

4.5.3 Antenatal predictive measures combined (the GHQ-12 and Cooper et al.'s antenatal predictive index)

When Cooper et al.'s index was combined with the GHQ-12, an improvement in findings was obtained. In total, 25% of the variability in PND scores was explained by the two antenatal measures. This was a greatly improved finding

over the 6% found with Cooper et al.'s index alone. However, when the goal is prediction rather than description, R^2 ideally should be around .7 (Hammersley, 1998). A goal of .7 may be unrealistic in research of the present nature. To predict a quarter of mothers likely to experience PND by using an antenatal measure, when taking into account the heterogeneity of antenatal experiences, is of value. In particular, an increase of 2% in sensitivity, 15% in specificity and 6% in positive predictive value was found when including the GHQ-12 with Cooper et al.'s index.

The results of the discriminant analysis also confirmed that the GHQ-12 and Cooper et al.'s index in combination were better predictors of depressed and non-depressed mothers than Cooper et al.'s index alone. The discriminant analysis showed that the overall percentage of cases classified correctly into depressed and non-depressed groups was 66% as opposed to 62% with Cooper et al.'s index alone.

4.5.4 Edinburgh Postnatal Depression Scale

The incidence rate of 21% of mothers with possible PND found by using the EPDS with a cut-off score of ≥ 9 is comparable to previous findings (McGill et al., 1995). The GHQ-12 postnatal measure had the highest correlation with the EPDS ($r = .77$, $p < .05$). The high correlation suggests general wellbeing and postnatal depression are related, in which case the GHQ-12 might serve as a useful postnatal measure for identifying PND. However, as the EPDS has established reliability and validity, whether another measure would add sufficient information to be of value is uncertain. The problem is not identifying mothers accurately postnatally, rather identifying them accurately antenatally. Overall, there is some tendency for mothers with high scores on the antenatal predictive measures to have corresponding high scores on the PND scale (the EPDS).

Although Cox et al. (1987) did not conduct a factor analysis when developing the EPDS, factor analysis in the present study enhanced understanding of the

structure of the measure. Good definition of factors was achieved with two factors representing low mood and anxiety and a high level of internal consistency reliability (.85) is shown.

4.5.5 Satisfaction with maternity care

Items for the satisfaction with maternity care measure were chosen to reflect changes to the Maternity Services Scheme in place since 1996, that resulted in mothers having to choose a sole lead maternity caregiver (Adair et al., 1999). Findings did not support those of Adair et al.'s national study, which suggested unhappiness with the lack of choice in maternity care. Thirteen mothers in the present study were not satisfied with the choices available. This may be reflective of the intervening years since the maternity services amendment was made. It is possible that first-time mothers are less aware of the choices that were available before the 1996 changes to the Maternity Services Scheme and are therefore accepting of the choices available to them in 2000. It is possible that mothers who are more affluent are happy, as financial constraints would not exclude the option of paying for the care of their choice. Only two mothers were either mostly unhappy or very unhappy with their maternity caregiver. While encouraging from the mothers' perspective, this result did not allow comparisons between dissatisfaction with maternity caregiver and subsequent likelihood of PND. It was interesting that the two unhappy responses were from mothers with specialist obstetrician care. Considering only eight of the mothers had specialists, this finding warrants additional research and comparison of the approach to care by the different maternity caregivers. It is often the case that mothers requiring specialist care have difficulties with their pregnancy; therefore, other factors such as concern for their baby and the necessity for medical intervention may influence dissatisfaction.

With so few mothers in the dissatisfied group in terms of maternity care satisfaction, it was not possible to determine any relationship. It is difficult to determine if mothers were genuinely dissatisfied and were uncomfortable with reporting this, or were honestly happy. A possible confound arose as the

mothers' maternity caregiver handed out the questionnaire. Although mothers were informed that their responses were anonymous, they may have been less likely to state they were unhappy if they felt there might be some way of their midwife finding this out. Therefore, dissatisfaction may or may not be a useful predictor. Previous research has found that dissatisfaction with choices for maternity care is a concern for New Zealand mothers (Adair et al., 1999) and dissatisfaction with antenatal care was found to increase the odds of depression in Australia (Astbury et al., 1994). It seems prudent to investigate satisfaction further by targeting mothers who are dissatisfied.

Overall, satisfaction with maternity care did not make a significant contribution to the present study in terms of predictive value. Including this measure would most likely not enhance future New Zealand research using a demographically comparable group of mothers and a similar distribution method for the questionnaires.

4.5.6 Postnatal experiences

The measure of postnatal experiences also performed poorly. It had little correlation with the EPDS and limited reliability. However, when including postnatal experiences with Cooper et al.'s index, the Pearson Product Moment Correlations showed a slight improvement. These findings supported Cooper et al.'s suggestion for improving their index. While promising for future research, the purpose of the current study was antenatal prediction rather than after the birth.

Surprisingly, no relationship was found between early hospital discharge and PND. Perhaps the level of social support reported meant that mothers were happy leaving hospital knowing they would get help at home. The sole mother in the present study reporting she had to leave hospital before feeling ready had only spent 24 hours in hospital. More information about this particular mother's experiences would be beneficial to have. It is possible that pressure from home, rather than the hospital may have resulted in early discharge.

Findings in the current study did not support those of Adair et al. (1999) showing mothers felt pressured to leave hospital.

The nature of the present study was not to assess postnatal experiences and their relation to PND, rather to address antenatal prediction. For this reason, little attention has been given to postnatal experiences generally. Future studies could however, devote time to looking at types of postnatal experiences common to mothers with PND. This would increase understanding of factors existing in the early postpartum days that may have a bearing on PND. As shown in the present study, over half the mothers showed signs of postpartum blues and one-third found their baby irritable. These two variables in particular would be worthwhile following up in future studies.

4.6 Sensitivity, specificity and positive predictive value

Sensitivity, specificity and positive predictive value provide information about the ability of any test to make correct and incorrect classifications. When prevalence is low, even tests with relatively high specificity will produce a substantial number of false positives (Gehlbach, 1988). The 30% false positive rate (70% specificity) in the present study is acceptable if considering that wrongly identifying mothers as having PND has fewer ramifications than wrongly identifying mothers as not having PND. The false negative rate of 48% (52% sensitivity) obtained is problematic, however. There is a trade-off between sensitivity and specificity. In the present case, it would be of greater benefit to increase sensitivity at the expense of specificity. Changing the cut-off point that divides a positive and negative test will increase sensitivity (Gehlbach, 1988). The results of the discriminant analysis highlighted the need for addressing the cut-off for depressed and non-depressed mothers.

As sensitivity is paramount when the consequences of missing a disease are crucial, supplementary analyses were performed with altered cut-off scores on the EPDS. Decreasing the cut-off score to ≥ 8 on the EPDS improves the sensitivity, specificity and positive predictive value of the antenatal measures.

At this lower cut-off point, rates of depression are higher at 33%. Rates of 33% though, are not greatly outside the range of between 20% and 30% commonly reported for PND using standardised self-report measures (Gotlib, Whiffen, Mount, Milne, & Cordy, 1989 cited in Terry et al., 1996). On the other hand, increasing the EPDS score to ≥ 12 in the present study finds only 9% of mothers with likely PND. This is lower than the incidence rates in most studies (Appleby et al., 1994; Braverman & Roux, 1978; Nhiwatiwa et al., 1998; Posner et al., 1997; Stamp et al., 1996). Therefore, the risk of missing depressed mothers may increase. Confirming this, increasing the cut-off on the EPDS decreased the sensitivity of the test in the current research. As the primary concern is identifying mothers with depression and being prepared to run the risk of making Type I rather than Type II errors, increasing sensitivity is an option needing addressing in similar studies.

4.7 Limitations

The convenience sample, comprised of Pakeha, mainly middle-class women lead to lack of generalisability to the population of new mothers in Auckland. Mothers on the North Shore of Auckland are predominantly Pakeha, while Central Auckland, where the next largest group of women in the sample lived, shares similarities with the North Shore in terms of affluence and ethnicity (Kearns et al., 1997). Data obtained from affluent Pakeha mothers, while likely representative of the North Shore and Central Auckland, cannot be extrapolated to the wider population of Auckland mothers.

One of the drawbacks in the present research was handing the task of questionnaire distribution to midwives. Although midwives were approached personally and their permission obtained, as only 22% of the total number of questionnaires were received back, midwives seemed less than successful in handing them out. This may have been due to their workload making it difficult to attend to additional tasks. They may also have been reluctant to ask mothers under their care to take part in research. As discussed, being handed the questionnaire by their midwife may have influenced the mothers desire to

accurately record some of their experiences. It is also possible that midwives might have biased the sample by handing questionnaires to mothers they felt were more at risk for PND.

The use of self-report questionnaires can have limitations (Dunham, 1988). Studies that screen participants with a self-report measure and assess only those who scored above a specified cut-off point may not provide an accurate estimate of the prevalence in the population as a whole (Zelkowitz & Milet, 1995). It is possible that relationships may exist between some of the antenatal predictor variables and subsequent PND but the questions may not be detailed enough to accurately assess this. For example, one question about perceptions of infant temperament does not compare to an inventory of items developed to look specifically at babies' dispositions.

One self-imposed constraint of the present study was grouping mothers' ages into bands rather than directly asking mothers their age. This was because it was felt more polite to ask mothers to tick a box showing an age range such as "30-34", "35-40" and "over 40". It was also felt mothers may be more likely to respond to an age range rather than a direct question. All mothers did respond by ticking a box but this method resulted in a loss of relevant information and mean ages for mothers were unable to be reported. It would therefore not be wise to group ages in this way in similar studies in the future.

Some problems in wording of questions became apparent. For instance, the question "were you asked to leave the hospital before you felt ready?" would provide more information if split into two questions such as "did the hospital staff ask you to leave hospital before you were ready?" and "did you feel pressured to leave hospital by someone other than hospital staff?" Likewise, along with the question "how would you describe the area you live in?" it would have been useful to know about the mothers' housing conditions. For example, mothers may live in a run-down substandard house but be in an affluent area. In this case, they may have answered positively to the area but no options were available to describe their actual home environment. More

detailed measures of living conditions might better serve the outcome variable of PND (Webster et al., 1994). More sophisticated measures however, need to be weighed against measures that are simple, easy to understand and quick to fill in (Webster et al., 1994).

Finally, all models of PND could not be looked at within the context of the present study due to the focus on certain psychosocial predictors rather than neurochemistry, personality characteristics or attributional styles. In addition, time allowances and the desire to keep the questionnaire at a manageable length constrained the nature of the study.

4.8 Recommendations for future studies

Broader sampling strategies are required to encompass the range of ethnic groups in Auckland. In particular, Maori and Pacific Island researchers could be enlisted to extend this study with a view to utilising age, gender and culturally matched research assistants (Berg, 1999). Maori and Pacific Island births in Auckland in 1999 made up 41% of the total births (Statistics New Zealand, Te Tari Tatau, 2000). In the present study, the proportion represents 10% of the mothers sampled. It is essential to assess the experiences of minority group mothers in relation to PND. The ability to obtain a representative sample may be enhanced by teams of researchers studying PND. Due to the problems outlined, it would be prudent to distribute questionnaires through a means other than midwives only. The nature of the relationship between midwives and mothers in their care may create a biased sample. Personal contact with mothers was of benefit in recruiting participants in this study. Having telephone contact with mothers responding to the newspaper advertisement resulted in 90% returning questionnaires. Another means of advertising for participants would be women's magazines and flyers in doctor's surgeries. For example, advertising in Little Treasures, a magazine widely read by mothers would be an easy means of covering the whole of New Zealand. As time constraints limited the participation rate and effectiveness of the present study, it is recommended

that future researchers set aside a period of one year for organising sponsorship and establishing contacts.

To address the problem of diagnosing PND by a means other than a self-report scale, future research should incorporate a thorough assessment of psychological morbidity in addition to the EPDS. This has previously been achieved by using a sub-section of the Structured Clinical Interview for DSM-III-R (Williams et al., 1992) and a semi-structured interview adapted from the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott & Spitzer, 1978, cited in O'Hara, 1991a). While the EPDS is a useful, effective screening tool highlighting likely PND, as it is a screening instrument, high scores cannot confirm depressive illness (Warner et al., 1996). An additional interview for those scoring highly, with an appropriately qualified practitioner, would be of value (Sugawara & Kitamura, 1999).

Further research using a longer version of the General Health Questionnaire may be useful in identifying factors that are more specific. For example, the GHQ-60 was designed to be of use in consulting settings. It is concerned with a person's inability to continue to carry out their normal 'healthy' functions and includes the appearance of new phenomena of a distressing nature; both of these concerns could have relevance to new mothers. The GHQ-28, having four subscales may also provide a more sensitive measure of wellbeing in comparison to the GHQ-12 (Goldberg & Williams, 1988). Further investigation also needs to determine if pregnancy affects mothers' reported wellbeing in comparison with matched sample of non-pregnant women. It is possible that pregnancy is confounded with other predictive variables and by itself, accounts for very little variation in depression. A control group of non-childbearing women would also be useful in identifying the most appropriate cut-score. Additionally, a control group could help clarify the findings in the present study that showed mothers antenatal wellbeing did not differ greatly from their postnatal wellbeing.

There does not appear to have been any other study undertaken to look specifically at the GHQ-12's predictive ability for PND. For this reason, the significant findings in the present study invite further investigation.

Cooper et al.'s (1996) antenatal predictive index for PND (antenatal risk factors) did not perform as well as the measure used to identify general wellbeing which was unexpected. Future research could look at using multiple regression with a larger sample and a simpler scoring method to classify Cooper et al.'s variables in terms of their predictive ability. In addition, the constructs outlined by Cooper et al., (emotional and physical experience of pregnancy, previous experience of mood disorder and quality of close relationships) may be too specific to predict a heterogeneous disorder within a heterogeneous population. Providing information on underlying structures and establishing the usefulness of defining sub-constructs would be valuable in future studies of Cooper et al.'s antenatal predictive index.

Although no strong evidence for a purely biological basis to PND has been established (O'Hara, 1994; Treloar et al., 1999; Unterman et al., 1990), the possible coexistence of biological with other psychosocial factors should be taken into account in future studies. In the present case this would help determine whether the outstanding 76% of variance in PND scores could be accounted for and would enable a more comprehensive, interrelated assessment of possible predictors. It seems most likely that PND has a number of antecedents. For example, Unterman et al., (1990), suggest physiologic changes provide a trigger for depression in genetically or physiologically predisposed mothers. Clearly, it is important that an interdisciplinary approach is taken to the issue. According to Thurtle (1995), further work should focus specifically on the meanings given to the experience of childbirth by women themselves using an ethnographic approach.

Studies have found that characteristics most consistently appearing in women with postnatal depressive symptomatology are those of a psychosocial nature (Cooper & Murray, 1997). Psychosocial factors and the psychological variables

looked at in the present study do not explain all or even most of the variance in PND scores. The remaining variance in the mothers studied may be due to numerous untested variables. For instance, personality variables or hormonal factors may play a role. Additional factors such as burden of childbirth, trait anxiety, life satisfaction, professional occupation and newborn's weight have also been suggested as having a relationship with PND (Bergant et al., 1999).

Existing research using qualitative methodologies in the study of PND is certainly not as prevalent as the trend towards empirical research. However, researchers such as Mauthner (1993; Mauthner, 1997) and Nahas, Hillege and Amasheh (1999), to name a few, have used approaches such as materialist-discursive, phenomenological, grounded theory and relational and feminist understanding to enhance understanding of the experiences of women postnatally. The importance of taking women's subjective experiences into account cannot be underestimated. However, in the present study, the ultimate goal was to identify a valid and reliable means of screening to attempt to reduce the numbers of women remaining unidentified with PND. For this reason, it was felt there was value and credibility in the use of a positivist quantitative approach.

Twenty-one mothers in the present study scored in the range suggestive of PND. Further research using qualitative methodologies would enhance understanding of the phenomenon of PND in this group of 21 women. For example, a grounded theory approach would give a more in-depth understanding of the mothers' unique experiences and provide a useful extension of the study. Grounded theory requires that theory emerge from the data collected (Strauss, 1987). In this approach, interviewing mothers about their antenatal experiences may provide insight into their attributions for PND. The mother would be in a position to share her expertise and the emphasis would be on meaning rather than measurement. This approach would also resolve the problems associated with self-report scales.

4.9 Summary

Overall, the research found it was possible to accurately identify mothers who were likely to experience PND. Combining two antenatal measures (general wellbeing and antenatal risk factors) accounted for 25% of the variance in scores on a postnatal depression measure. However general wellbeing was found to have greater predictive ability than antenatal risk factors. As the GHQ-12 (general wellbeing) is a more general measure, this is not surprising. Cooper et al.'s (1996) index (antenatal risk factors) in contrast, is likely a more specific measure that does not encompass the full range of constructs affecting mothers antenatally.

This research provides insight into the potential antenatal predictors of PND. Limitations acknowledged, a valid attempt was made to produce useful information and extend the knowledge base about PND. Pakeha mothers mainly living on the North Shore of Auckland in 2000 have scores on a PND measure that indicate they are likely experiencing PND. Antenatally, their scores can be predicted by their general wellbeing and the antenatal risk factors they are experiencing.

The GHQ-12 (a measure of general wellbeing) is found to be a reliable and valid measure able to account for 19% of the variability in scores on a PND screening instrument (the EPDS). When combining the GHQ-12 with Cooper et al.'s index (a measure of antenatal risk factors), an improvement of 6% of the variability in PND scores was obtained. Satisfactory evidence of reliability and validity were unable to be obtained for Cooper et al.'s index due to the differential weightings attached to each score. Evaluation of the scoring method is recommended to future researchers.

That the GHQ-12 has greater predictive ability than Cooper et al.'s index is not surprising. It is a general measure tapping the constructs of anxiety and dysphoria, along with coping that encompasses mild psychopathology. In contrast, Cooper et al.'s index is a specific measure designed to isolate antenatal

factors experienced by mothers likely to predict PND. As such the measure may not have been specific enough to encompass antental risk factors in the present sample.

The present study has made a contribution to the knowledge base existing in New Zealand on the topic of PND. Postnatal depression is a very real issue affecting the lives of New Zealand mothers and those close to them. In order to attempt to reduce the suffering caused by PND, ongoing research is imperative. It is important for the sake of the mothers that research does continue, at least to provide mothers with an effective means of determining their risk status, at best, to prevent the onset of this debilitating condition.

For up to 20% of mothers in Auckland at the current time (McGill et al., 1995), PND is a real problem, a problem that needs to be acknowledged as existing in our community and a problem that cannot be brushed aside as an expected side-effect of motherhood. To do this would be to deny the severity of its impact on the mothers affected and the impact on those close to them, especially their children.

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APPENDIX A

Massey University
COLLEGE OF HUMANITIES & SOCIAL SCIENCES

School of Psychology
Private Bag 102 904,
North Shore Mail Centre,
Auckland,
New Zealand
Telephone: 64 9 443 9863
Facsimile: 64 9 443 9732

A1. Information sheet

EXPLORING ANTENATAL FACTORS IN POSTNATAL DEPRESSION

INFORMATION SHEET

Principal Researcher:

Carolyn Kelly
Masters student
Massey University Albany Campus
Psychology Department
Private Bag 102904
North Shore Mail Centre
AUCKLAND

Phone no: (09) 4157441
Email: c.kelly@clear.net.nz

Supervisor:

Dr Hillary Bennett
Psychology Department
Massey University Albany Campus
Private Bag 102904
North Shore Mail Centre
AUCKLAND

Phone no: (09) 4439777, ext. 9864

Nature of the research project

You are invited to take part in a study to gather information on women's likelihood of developing postnatal depression after the birth of their baby. The researcher is carrying out this study for a Masterate thesis toward an MA in psychology. This study is completely independent of any health practitioners providing assistance to people with postnatal depression. The study will be completed in one year.

Your participation in this study is entirely voluntary. You have the right not to take part, and if you choose not to take part it will not affect any future care or treatment you may require. You also have the right to withdraw your participation at any time during the study, without having to give a reason and this will in no way affect your future or continuing health care. The two questionnaires (one before the birth of your baby and one after) will take approximately 20 minutes to complete.

Aims of the research project

The aim of the study is to gather information about factors that are believed to indicate a likelihood of a mother developing postnatal depression. Postnatal depression is thought to affect around 15% of mothers and can have a debilitating affect on not only the mother but her baby and those close to her. The information you provide will help to determine whether factors found to predict postnatal depression in a large study of British mothers will also apply to mothers in New Zealand. It is hoped that the results from this study will bring greater awareness and attention to the problem of postnatal depression. If the questionnaire is found to accurately predict mothers who are later at risk of postnatal depression, this may assist in early diagnosis and treatment and help to minimise the detrimental affects of postnatal depression.

Who can take part in the research project

If you are currently 20 or more weeks pregnant, your participation in the study is welcomed and would be greatly appreciated. All women who are 20 weeks pregnant and over are eligible to be part of the study.

What participation will involve

The questionnaires for the study may be completed at any place convenient to you. You do not have to answer all or any of the questions. You will be provided with an addressed, stamped envelope in which to return your completed questionnaires. You may contact the researcher or her supervisor to ask questions about the questionnaire and the study by phoning or writing (the contact numbers and address are at the top of page 1). The first questionnaire has been designed to be answered when you are approximately 20 weeks pregnant and it is requested that the second questionnaire be completed when your baby is approximately 6 weeks old. If you agree to participate in the study, the questionnaires will be mailed out to you. You will be sent a reminder note shortly before the second questionnaire is due to be sent.

Your participation in this study is confidential. No material that could personally identify you will be used in any reports on this study. The forms and questionnaires you complete will be stored in a secure, lockable filing cabinet in the researcher's home. All the information gathered will be kept until the study is completed and then destroyed.

Results of the project will be available

If you wish to obtain a copy of the results of the study once it is completed, please feel free to contact the researcher by phoning the contact number provided. There will be a delay of approximately 3 months between the study's completion and publication of the results.

This study has received ethical approval from the HFA Auckland Ethics Committee and the Massey University Human Ethics Committee.

If you have any queries or concerns regarding your rights as a participant in this research you may contact the Health Advocates Trust, phone 0800 205 555 Northland to Franklin.

Massey University
COLLEGE OF HUMANITIES & SOCIAL SCIENCES

A2. Consent form

School of Psychology
Private Bag 102 904,
North Shore Mail Centre,
Auckland,
New Zealand
Telephone: 64 9 443 9863
Facsimile: 64 9 443 9732

Questionnaire No .....

EXPLORING ANTENATAL FACTORS IN POSTNATAL DEPRESSION

CONSENT FORM

I have read and understand the information sheet dated_____for volunteers taking part in the study designed to gather information about antenatal factors which might lead to developing postnatal depression. I have had the opportunity to discuss this study and am satisfied with the answers I have been given.

I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time and this will in no way affect my future/continuing health care.

I understand that my participation in this study is confidential and that no material which could identify me will be used in any reports on this study.

I have had time to consider whether to take part.

I know who to contact if I have any questions about the study.

I wish to receive a copy of the results YES / NO

I wish my health caregiver to be given a copy of my results YES/NO. If yes, please give name of health caregiver .....

Date:

Name (or anonymous code name):

Contact Address:

Phone Number:

Signature:

If you have any concerns about the nature of the study, you may contact:

Dr Hillary Bennett
Psychology Department
Massey University Albany Campus
Private Bag 102-904
North Shore Mail Centre
AUCKLAND.

Telephone: 443-9799, Ext. 9864

Any general questions about the study (e.g. procedures, instructions, etc.) should be directed to the researcher or the supervisor.

Full name of Researcher:
Carolyn Kelly, phone: 415-7441
Email: c.kelly@clear.net.nz
Massey University Albany Campus
Private Bag 102-904
North Shore Mail Centre
AUCKLAND.

Research Supervisor:
Dr Hillary Bennett, phone: 443-9799, Ext. 9864

A3. Pregnancy questionnaire

Questionnaire No .....

PREGNANCY QUESTIONNAIRE

Please read the following questions carefully, and tick the box corresponding to the statement which most applies to you.

1. Do you already have children

a) No	
b) Yes	

2. If YES: After any previous delivery were you *particularly* miserable or depressed at any time during the following year?

a) No	
b) Yes	

3. Have you ever sought help conceiving?

a) No	
b) Yes, from own doctor	
c) Yes, from a clinic	

4. Has this pregnancy been a positive experience for you?

a) Yes, definitely	
b) Yes, mostly	
c) Mostly not	
d) Definitely not	

5. Have you felt at all tense or anxious during this pregnancy?

a) No, not at all	
b) Yes, a little	
c) Yes, a lot	

6. Have you felt *particularly* depressed or miserable over the last few weeks?

No	
Yes	

7. Have there been other times in your life (other than in the year following a delivery) when you have been *particularly* miserable or depressed?

No	
Yes	

8. If YES to the above:

8a. Did you seek professional help at this time?

No	
Yes	

8b. Did being miserable seriously interfere with your daily life (eg. work, family, friends)?

No	
Yes	

9. Have you had any complications or health problems during this pregnancy which required medical attention?

a) No	
b) Yes, treated by GP	

10. How long have you been with your current partner?

a) No partner	
b) Less than 1 year	
c) 1-2 years	
d) 2-5 years	
e) More than 5 years	

11. How have you and your partner been getting along in recent months?

a) No partner	
b) Close, warm relationship	
c) A few tensions and disagreements	
d) Moderate friction or coolness	
e) Marked friction or coolness	
f) Constant friction, or relationship is breaking down	

12. Did your mother die before you were aged 11 (This could be a step-mother or adoptive mother)?

a) No	
b) Yes	

13. If you have a mother, how would you describe your relationship with her at the moment?

a) No mother	
b) Close, warm relationship	
c) Fair, reasonably warm, some minor discord	
d) Poor, not particularly warm, some serious bad feelings	
e) Very poor, relationship cold or hostile	

14. Have you anyone apart from your mother or partner in whom you can confide?

No	
Yes	

15. What educational qualifications do you have?

a) No formal qualifications	
b) School Certificate	
c) Further qualifications eg. AIT, Unitech certificate/degree	
d) University degree	
e) Postgraduate degree	

16. How would you describe the area that you live in?

a) Very satisfactory to me	
b) Reasonably satisfactory to me	
c) Rather unsatisfactory to me	
d) Very unsatisfactory to me	

17. If you worked during this pregnancy, how do you feel about giving up work?

a) Not working	
b) Keen to stop	
c) Mixed feelings	
d) Reluctant to stop	
e) Don't intend to stop	

18. Are you satisfied with the choices currently available for maternity care?

a) No	
b)Yes	
c)Undecided	

19. Were you able to obtain the lead maternity carer of your choice?

a) No	
b)Yes	

20. Who is your lead maternity caregiver?

a) Midwife	
b) GP	
c) Specialist	
d) Hospital	

21. How happy are you with the maternity care you have at the moment?

a) Very happy	
b) Mostly happy	
c) Mostly unhappy	
d) Very unhappy	
e) Undecided	

22. If you already have a child, did you have different type of maternity care throughout your previous pregnancy(s)?

a) No	
b)Yes	

23. If YES, which type of maternity care do you prefer?

a) The maternity care I currently have	
b) The maternity care I had previously, please circle: M/Wife or GP or Specialist or Hospital or Shared care	
c) Undecided	

HAVE YOU RECENTLY:

24. been able to concentrate on whatever you're doing?

a) Better than usual	
b) Same as usual	
c) Less than usual	
d) Much less than usual	

25. lost much sleep over worry?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

26. felt that you are playing a useful part in things?

a) More so than usual	
b) Same as usual	
c) Less useful than usual	
d) Much less useful	

27. felt capable of making decisions about things?

a) More so than usual	
b) Same as usual	
c) Less so than usual	
d) Much less capable	

28. felt constantly under strain?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

29. felt you couldn't overcome your difficulties?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

30. been able to enjoy your normal day-to-day activities?

a) More so than usual	
b) Same as usual	
c) Less so than usual	
d) Much less than usual	

31. been able to face up to your problems?

a) More so than usual	
b) Same as usual	
c) Less able than usual	
d) Much less able	

32. been feeling unhappy and depressed?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

33. been losing confidence in yourself

a) Not at all	
b) No different to the way I usually feel	
c) Rather more than usual	
d) Much more than usual	

34. been thinking of yourself as a worthless person?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

35. been feeling reasonably happy, all things considered?

a) More so than usual	
b) About same as usual	
c) Less so than usual	
d) Much less than usual	

36. What is your age group?

a) 20 or under	
b) 21-25	
c) 26-30	
d) 31-35	
e) 36-40	
f) Over 40	

37. What ethnic group do you belong to?

a) Maori	
b) NZ European/Pakeha	
c) Samoan	
d) Tongan	
e) Niuean	
f) Rarotongan	
g) Fijian	
h) Chinese	
i) Korean	
j) Indian	
k) Other (please specify)	

38. How many weeks pregnant are you? _____

39. What is your expected delivery date? _____

40. Please feel free to add any additional information:

_____

_____

_____

Thankyou for your help with this study. The second questionnaire will be posted to you approximately five weeks after your delivery date.

A4. Letter sent with postnatal questionnaire.

Dear

Thank you for your participation in the postnatal depression study and filling in the antenatal questionnaire. I hope that everything is going well with both you and the baby.

I have enclosed the second part of the study that involves filling in the postnatal questionnaire when your baby is around six weeks old. As stated in the first questionnaire, your participation is entirely voluntary and you do not have to answer all or any of the questions.

Thank you once again for your help.

Carolyn Kelly
Masters student
Massey University Albany

A5. Postnatal questionnaire

Questionnaire No .....

POSTNATAL QUESTIONNAIRE

The following 10 questions are from The Edinburgh Postnatal Depression Scale. Cox, Holden, & Sagovsky (1987). Copyright: British Journal of Psychiatry.

IN THE PAST SEVEN DAYS:

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

a) As much as I always could	
b) Not quite so much now	
c) Definitely not so much now	
d) Not at all	

2. I have looked forward with enjoyment to things:

a) As much as I ever did	
b) Rather less than I used to	
c) Definitely less than I used to	
d) Hardly at all	

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

a) Yes, most of the time	
b) Yes, some of the time	
c) Not very often	
d) No, never	

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

a) No, not at all	
b) Hardly ever	
c) Yes, sometimes	
d) Yes, very often	

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

a)Yes, quite a lot	
b) Yes, sometimes	
c) No, not much	
d) No, not at all	

6. Things have been getting on top of me:

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

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

a) Yes, most of the time	
b) Yes, sometimes	
c) Not very often	
d) No, not at all	

8. I have felt sad or miserable:

a) Yes, most of the time	
b) Yes, quite often	
c) Not very often	
d) No, not at all	

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

a) Yes, most of the time	
b) Yes, quite often	
c) Only occasionally	
d) No, never	

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

a) Yes, quite often	
b) Sometimes	
c) Hardly ever	
d) Never	

HAVE YOU RECENTLY:

11. been able to concentrate on whatever you're doing?

a) Better than usual	
b) Same as usual	
c) Less than usual	
d) Much less than usual	

12. lost much sleep over worry?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

13. felt that you are playing a useful part in things?

a) More so than usual	
b) Same as usual	
c) Less useful than usual	
d) Much less useful	

14. felt capable of making decisions about things?

a) More so than usual	
b) Same as usual	
c) Less so than usual	
d) Much less capable	

15. felt constantly under strain?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

16. felt you couldn't overcome your difficulties?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

17. been able to enjoy your normal day-to-day activities?

a) More so than usual	
b) Same as usual	
c) Less so than usual	
d) Much less than usual	

18. been able to face up to your problems?

a) More so than usual	
b) Same as usual	
c) Less able than usual	
d) Much less able	

19. been feeling unhappy and depressed?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

20. been losing confidence in yourself

a) Not at all	
b) No different to the way I usually feel	
c) Rather more than usual	
d) Much more than usual	

21. been thinking of yourself as a worthless person?

a) Not at all	
b) No more than usual	
c) Rather more than usual	
d) Much more than usual	

22. been feeling reasonably happy, all things considered?

a) More so than usual	
b) About same as usual	
c) Less so than usual	
d) Much less than usual	

Please read the following questions carefully, and tick the box corresponding to the statement which most applies to you.

23. How long did you stay in hospital following the birth?

a) Less than 24 hours	
b) 24 hours	
c) Between 24 and 48 hours	
d) Longer than 48 hours	

24. Did you have a normal delivery? (eg. no forceps, Ventouse extraction, emergency caesarean)

Yes	
No	

25. Did your baby experience any difficulties? (eg., jaundice, time in the special care baby unit, or intensive care)

Yes	
No	

26. Were you asked to leave the hospital before you felt ready?

Yes	
No	

27. If you chose to breastfeed, did you have problems feeding your baby?

Yes	
No	

28. Are you having problems with your baby sleeping?

Yes	
No	

29. Is your baby experiencing any health problems?

Yes	
No	

30. Did you experience periods of crying, depression and irritability during the first week after delivery?

Yes	
No	

31. Would you consider your baby irritable, fussy and difficult to console?

a) Yes, some of the time	
b) Yes, most of the time	
c) Yes, all of the time	
d) No	

32. Please feel free to make any additional comments.

_____
_____
_____
_____
_____

33. How many weeks old is your baby? _____ wks

Thank you very much for participating in this study.

In the event that you score highly on this questionnaire, you will be informed in person and directed to your primary caregiver for any assistance that may be required.

A6. Letter sent informing mothers of high scores on the EPDS.

Dear

Thank you for your assistance in gathering information on factors thought to be associated with postnatal depression.

As follow-up I would like to inform you of your score on the Edinburgh Postnatal Depression Scale. Possible scores range from 0 - 30 and your individual score was _____.

Your score falls within the range that sometimes indicates an episode of postnatal depression (12 or above), but this would need to be confirmed by visiting your GP. It may be helpful to mention this letter, or show it to your GP when you have an appointment as s/he will have ideas about options available to you to should the need arise.

So far, everything is going well with the study and I hope to be able to send out a copy of the overall results by the end of the year. Thank you once again for your help and all the best for the future.

Carolyn Kelly
Masters student
Massey University at Albany.

A7. Newspaper Advertisement

STUDY FOR PREGNANT WOMEN

If you are currently 28 or more weeks pregnant and would like a chance to win 150 **Huggies**® newborn nappies, you are invited to take part in a research project.

This study involves investigating antenatal factors thought to be related to postnatal depression as part of a Masters degree. You will be asked to fill in two short questionnaires that will be posted to you, one before your baby is born and one after.

The aim is to try to help mothers by identifying who may be at risk of developing postnatal depression. The study will look at experiences during the later stages of pregnancy. A copy of the results will be available at the completion of the study. All participants will go in a draw to win 150 **Huggies**® newborn nappies and the first 25 replies will receive a sample pack. Please phone Carolyn on 415-7441 to receive a questionnaire and a sample of nappies. Your help would be greatly appreciated.

APPENDIX B

Table B1

Counts of observed and expected frequencies for chi-square tests

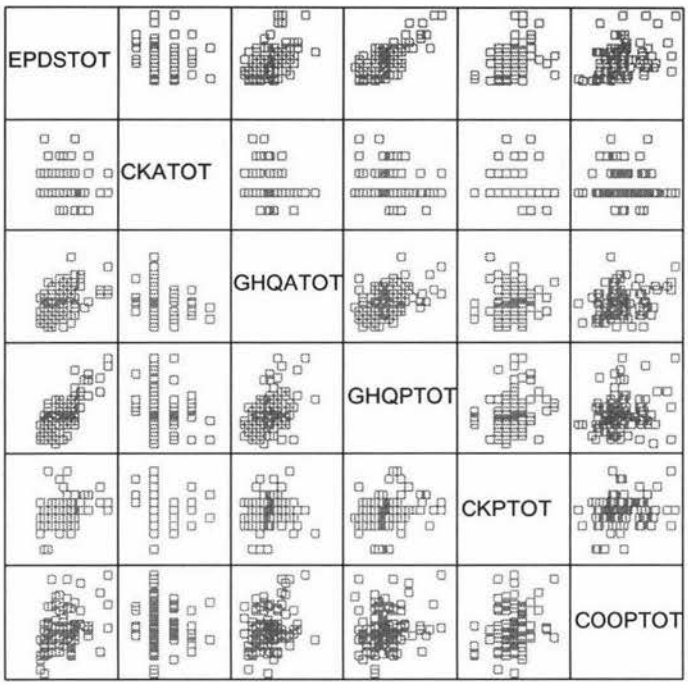
Parity	**No children**		**Children**		**Total**
	Observed	Expected	Observed	Expected	
EPDS ≤ 8	50	48.7	27	28.3	77
EPDS ≥ 9	12	13.3	9	7.7	21
History of depression	**No**		**Yes**		
	Observed	Expected	Observed	Expected	
EPDS ≤ 8	41	40.9	36	36.1	77
EPDS ≥ 9	11	11.1	10	9.9	21
Antenatal depression	**No**		**Yes**		
	Observed	Expected	Observed	Expected	
EPDS ≤ 8	71	69.1	6	7.9	77
EPDS ≥ 9	17	18.9	4	2.1	21

Table B2

Count of weeks pregnant when filling in the antenatal questionnaire and age of baby when filling in the postnatal questionnaire

	Baby's age in weeks												
Weeks preg.	3 weeks	4 weeks	5 weeks	5.5 weeks	6 weeks	6.5 weeks	7 weeks	7.5 weeks	8 weeks	10 weeks	11 weeks	12 weeks	14 weeks
28.00					1								
29.00							2						
30.00								1					1
31.00					1		1						
31.50											1		
32.00							3						
33.00					2		1		1	1			
34.00	1				3	1	1		1				
35.00				1	2								
36.00		1	1		3	1	1						
37.00					3	2	1		1				
37.50						1							
38.00		1			6				1			1	
38.50					2								
39.00					2	2	1						
40.00					1								

Table B2 outlines the time lapse between filling in the antenatal and postnatal questionnaires.



Legend:

EPDSTOT	→	EPDS
CKATOT	→	Maternity satisfaction
GHQATOT	→	Antenatal wellbeing
GHQPTOT	→	Postnatal wellbeing
CKPTOT	→	Postnatal experiences
COOPTOT	→	Antenatal risk factors

Figure B1: Scatterplot of correlations between the measures

Table B3

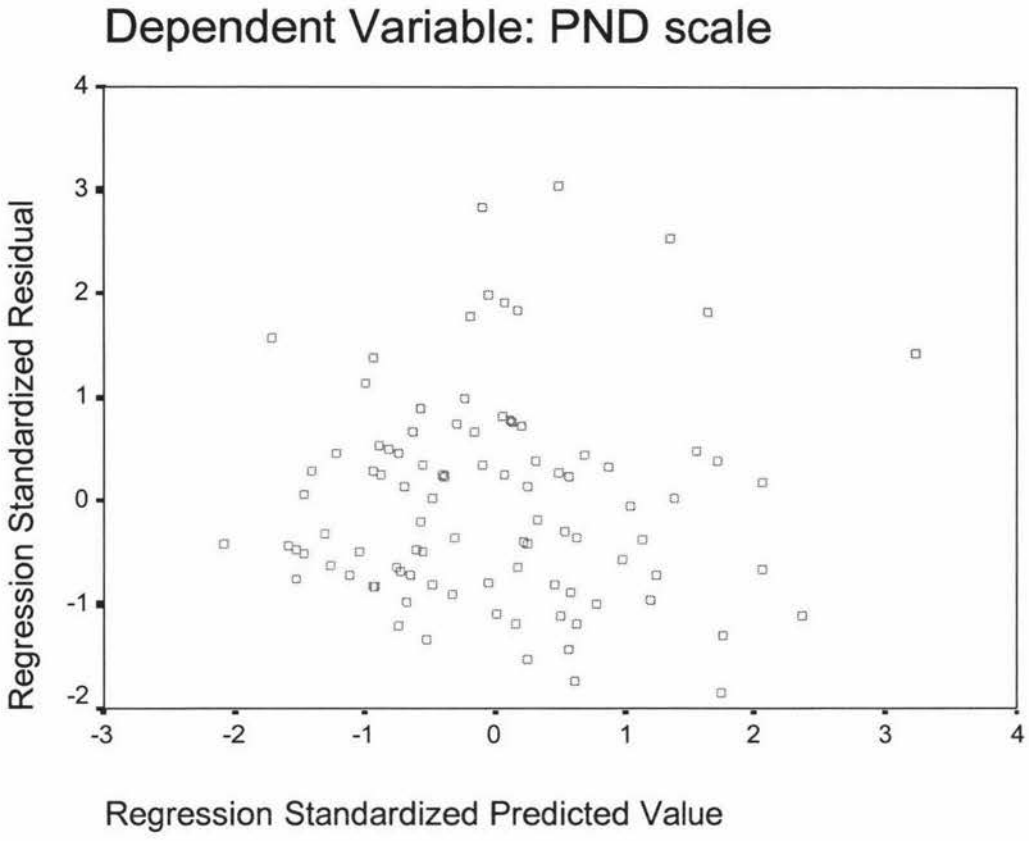
Analysis of variance for education, range of ages and hospital stay

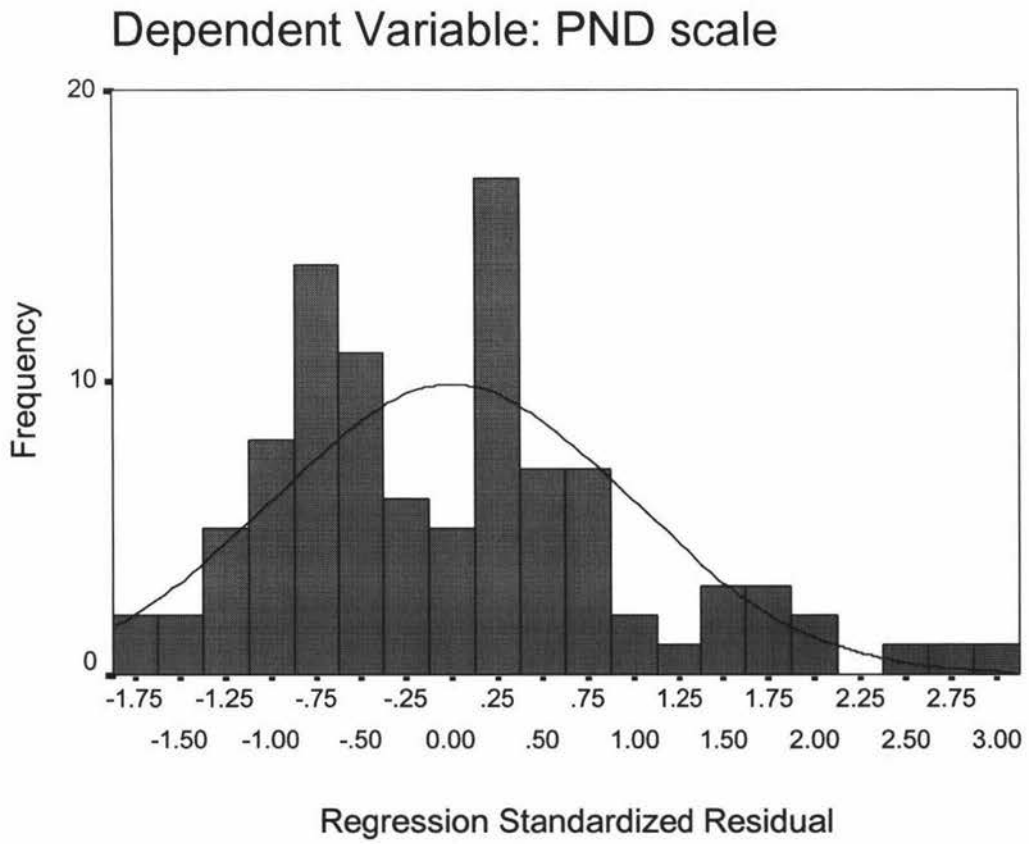
Source	df	F
Education	4	1.18
Within-group error	93	(17.16)
Employment	4	.44
Within-group error	93	(17.69)
Age range	3	1.87
Within-group error	91	(15.63)
Hospital stay	4	1.68
Within-group error	93	(16.82)

Note. Values enclosed in parentheses represent mean square errors.

$p < .05$ for all analyses.

Table B3 outlines the non-significant findings obtained from three analysis of variance tests.





Figures B2 and B3: Standardised residuals for EPDS scores

Table B4

Live births by urban area (Auckland) by ethnicity of mother for year ending 1999

	North Auckland	South Auckland	West Auckland	Central Auckland	TOTAL
European	2,027	1,822	1,636	2,570	8,055
Maori	263	1,571	525	704	3,063
Asian	270	702	309	1,093	2,374
Pacific Island	158	2,222	624	1,341	4,345
Other	45	52	38	91	226
TOTAL	2,763	6,369	3,132	5,799	18,063

The total New Zealand births numbered 57,053 for the year ending 1999 and Auckland makes up 32% of this total. Table B5 provides information pertaining to the present sample of 98 mothers. To maintain consistency with Statistics New Zealand figures in Table B4, East Auckland has been combined with Central Auckland for the following table.

Table B5

Live births by urban area (Auckland) by ethnicity of mother for February-August 2000 in the present study

	North Auckland	South Auckland	West Auckland	Central Auckland	Total
European	49	4	10	24	87
Maori	3	2	1	3	9
Asian				1	1
Pacific Island		1			1
TOTAL	52	6	11	28	98