An economic analysis

April 2008

Screening for postnatal depression within the Well Child Tamariki Ora Framework

An economic analysis of implementation of a screening programme

Arsupol Suebwongpat
Lachlan Standfield
Suzanne Campbell
Sarah Norris
This report should be referenced as follows:

Campbell, S, Norris, S, Standfield, L, and Suebwongpat, A. Screening for postnatal depression within the Well Child Tamariki Ora Framework. 
*HSAC Report* 2008; 1(2).

Health Services Assessment Collaboration (HSAC), University of Canterbury
ISBN 978-0-9582910-1-9 (Online)
ISSN 1178-5748 (Online)
**Review Team**

This economic analysis was undertaken by the Health Services Assessment Collaboration (HSAC). HSAC is a collaboration of the Health Science Centre of the University of Canterbury, New Zealand, and Health Technology Analysts, Sydney, Australia. This report was authored by Arsupol Suebwongpat, Lachlan Standfield, Suzanne Campbell, and Sarah Norris. The level 3 economic analyses were undertaken by Arsupol Suebwongpat, Health Economist, overseen by Lachlan Standfield, Senior Health Economist.

**Acknowledgements**

Dr Ray Kirk (HSAC Co-Director) peer reviewed the final draft. Cecilia Tolan (Administrator) provided document formatting.

Dr James Harris (Principal, LECG) provided assistance with unit cost collection.

The current review was conducted under the auspices of a contract funded by the New Zealand Ministry of Health.

This report was requested by Pat Tuohy, Chief Advisor, Child and Youth Health, of New Zealand’s Ministry of Health.

**Copyright Statement & Disclaimer**

HSAC is a collaboration between the University of Canterbury and Health Technology Analysts and is funded under contract by the New Zealand Ministry of Health.

This report is copyright. Apart from any use as permitted under the Copyright Act 1994, no part may be reproduced by any process without written permission from HSAC. Requests and inquiries concerning reproduction and rights should be directed to the Director, Health Services Assessment Collaboration, Health Sciences Centre, University of Canterbury, Private Bag 4800, Christchurch, New Zealand

HSAC take great care to ensure the accuracy of the information in this report, but neither HSAC, the University of Canterbury, Health Technology Analysts Pty Ltd nor the Ministry of Health make any representations or warranties in respect of the accuracy or quality of the information, or accept responsibility for the accuracy, correctness, completeness or use of this report.

The reader should always consult the original database from which each abstract is derived along with the original articles before making decisions based on a document or abstract. All responsibility for action based on any information in this report rests with the reader.

This report is not intended to be used as personal health advice. People seeking individual medical advice should contact their physician or health professional.
The views expressed in this report are those of HSAC and do not necessarily represent those of the University of Canterbury New Zealand, Health Technology Analysts Pty Ltd, Australia or the Ministry of Health.

Contact Details
Health Services Assessment Collaboration (HSAC)
Health Sciences Centre
University of Canterbury
Private Bag 4800
Christchurch 8140
New Zealand
Tel: +64 3 345 8147  Fax: +64 3 345 8191

Email: hsac@canterbury.ac.nz
Web Site: www.healthsac.net
Executive Summary

Objective
The purpose of this economic analysis is to evaluate the potential value for money of implementing a screening programme for postnatal depression within the Well Child Tamariki Ora Framework.

Background
Postnatal or postpartum depression (PND) is the most prevalent mood disorder associated with childbirth. It is characterised by a range of somatic and psychological symptoms, such as sleep and eating disturbance, emotional lability, guilt, shame and mental confusion, and, in severe cases, feeling suicidal. Most cases of PND develop within the first 3 months, with a peak incidence at 4 to 6 weeks. However, PND is usually not recognised in its early stages. Unlike most other medical conditions, a firm diagnosis cannot usually be made with a single point of observation unless it is already quite severe. If untreated, PND may continue for several weeks to months, and severe episodes may persist for years.

Epidemiology
The established range for the prevalence of PND is 10-20%. Epidemiological studies from New Zealand have found the prevalence of major depression in the general population to be significantly higher than overseas. Although some studies have reported high rates of PND in New Zealand, published estimates vary considerably from 7.8% to 16%, depending on ethnic differences in the populations assessed, the timing of assessment, and the screening tool used.

Impact of PND
The presence of maternal depressive symptoms at a critical time for infant and family has widespread and, in some cases, long-standing adverse effects such as marital distress, family function issues, problems with mother-infant interaction and attachment, and adverse behavioural and cognitive effects in the child. There is evidence to suggest that over time, children raised in a home with a depressed parent are more likely to develop behavioural problems and depression. Evidence also exists for a link between maternal PND and later violent behaviour in the children of depressed mothers.

However, despite the growing body of evidence showing the adverse effects that maternal PND can have on the child, there is a lack of reliable and quantifiable data linking the resolution of maternal PND with improved outcomes in the child. Although not in PND, several studies of children of depressed mothers have reported a significant association between remission of maternal depression after treatment and a reduction in infant symptoms and diagnoses of psychiatric disorders including anxiety, depression and disruptive behaviour disorders.
In addition to the cognitive and developmental effects on the child, mothers with depressive symptoms report poorer prevention practices and reduced attendance at Well Child visits and scheduled vaccinations. Depressed mothers are more likely to utilise emergency health services and require urgent care for their young child.

Thus, recognising and treating PND provides opportunities to decrease rates of childhood psychiatric disorders, improve rates of normal child development, lower suicide and infanticide rates, decrease divorce rates, and reduce the burden on the healthcare system.

**Treatment of PND**

Because of the negative impact of depression on early mother-infant interactions and research evidence that negative mental health outcomes in offspring may be more severe when maternal depression is prolonged, treatment should not be delayed. With treatment, an episode of PND often resolves in about six weeks. However, antidepressant treatment is often continued for 12 months after resolution of symptoms.

PND is a heterogenous condition and different treatments may be needed for different women. Although there is limited high quality evidence for the effectiveness of treatment for PND, there are a number of published trials in depression, which can potentially be generalised to women with PND. Non-pharmacological treatments include cognitive behavioural therapy, debriefing, non-directive counselling (listening visits), interpersonal psychotherapy, psychodynamic psychotherapy, support and education, psychoeducation, and broader psychosocial interventions (e.g., continuity of midwife care, timing of appointments and hospital discharge following delivery, and source of care – community based or primary care based). In more severe cases of PND, pharmacological treatments may be prescribed, including antidepressants, anticonvulsants, lithium, antipsychotics, and benzodiazepines.

A legitimate concern with screening is whether it would dramatically increase the requirement for treatment. However, rather than increasing the burden of care, screening could actually bring about a change in focus, with early detection of women who otherwise might not have been treated until later in their illness when they are more severe.

**Screening instruments**

Although the most widely accepted screening scale used internationally in the perinatal period is the Edinburgh Postnatal Depression Scale (EPDS), brief two-and three-question depression risk screeners are gaining popularity. The Well Child Tamariki Ora Framework Options paper (July 2007) recommends the use of the two-question Patient Health Questionnaire (PHQ-2), which has been validated in both primary care and obstetric populations and has been shown to perform as well as longer screening measures. The PHQ-2 has been recommended by the National Institute for Clinical Excellence (NICE) and the US Preventative Services Task Force for screening adults for depression in primary care settings. NICE have also recommended the screener for detection of PND, but suggest that a third question which asks “is this something with which you would like help?” be incorporated into
the screener for enhanced specificity. The three-question screener has been validated in general practice in New Zealand and is recommended by the New Zealand Guidelines Group for use by primary health practitioners to detect depression. Although a more comprehensive instrument would be preferred when the intent is either to definitively diagnose depressive disorders or to assess depression outcomes in response to treatment, the PHQ-2 or -3 is a more realistic option for incorporation into a Well Child visit because it takes less time to administer and score. Furthermore, the ability to ask the relevant questions and discuss the options available is part of existing community child health nurse and GP competencies and so extensive training to administer the PHQ-3 will not be required.

The timing of screening is important. Within the first few weeks postpartum assessment of symptoms for PND is likely to be contaminated with transient factors related to normal postpartum adjustment. With later assessments questions arise as to whether the depression is truly linked to childbirth, and whether early onset cases may have already resolved. Thus, the most appropriate time-point for screening for PND is later than five weeks postpartum and earlier than six months postpartum. However, it is important to recognise that screening is only a first step. Patients who screen positive should be further evaluated with other diagnostic instruments, or direct interview to determine whether they meet criteria for a depressive disorder.

**Current practice for detecting PND**

Well Child visits provide a convenient longitudinal opportunity to screen for postpartum depression, as they occur at regular intervals throughout the first postpartum year. However, this opportunity is currently underutilised because the visits primarily focus on the child’s health and consequently providers do not routinely enquire about the mother’s mental health status. It is clear that new mothers in New Zealand are currently not formally screened for PND and that practice varies depending on the provider and district. Although the Well Child Schedule currently recommends use of the EPDS at core Well Child contacts at six weeks, three months, five months, and at other opportunistic contacts, these assessments are not always carried out according to the Schedule. Thus, there is a strong possibility that some cases of PND are currently not being detected and that in the cases that are identified, detection may be delayed.

**Challenges with implementation of screening**

Regardless of the screening instrument used, treatment for a mother with PND can be effective only if she accepts help and complies with treatment. The perceived barriers to treatment included unavailability of resources, reluctance of mothers to seek help, reluctance of family, time pressure, and economic issues.

The value of any screening programme will depend on the resources available locally and the ability of the woman and her primary care team to access these resources. At present, the availability of specialist secondary care resources, certified psychiatric nurses, psychologists, and psychiatrists, vary enormously throughout New Zealand. Screening creates an expectation of care and thus it could be considered unethical to identify cases of depression if support services are under-resourced and not readily available.
Economic analysis

An economic analysis has been conducted of the potential value for money of implementing screening for maternal PND within the Well Child Tamariki Ora Framework. The analysis is of a comparative nature whereby the proposed programme is compared against current practice. The economic analysis is not intended to be an exhaustive economic evaluation but rather an exploratory analysis, intended for use by the Ministry of Health to inform policy decision-making in conjunction with other information.

According to the Well Child Tamariki Ora Framework Options paper (July 2007), the Ministry is proposing that WCPs routinely screen for PND using the PHQ-2 at six weeks and four months postpartum. It is assumed in the analysis presented herein that the three-question PHQ is used as a screener for PND, and that screening at six weeks would be performed by a GP or practice nurse, and screening at four months would be performed by a WCP (most likely a Plunket nurse).

There are a number of methodological challenges associated with undertaking the analysis. These challenges arise mainly from difficulties in obtaining robust data, defining current screening and treatment practices in New Zealand, and the differential unit costs of providing the new screening programme. The economic model presented herein is based mainly on the findings of two health technology assessment reports commissioned by NICE for the management of antenatal and postnatal mental health and the management of depression in primary and secondary care.

The economic model is based on a cross-sectional population of mothers of newborns regardless of the number of previous births. The model estimates the annual cost of implementing a routine screening programme for PND to these mothers. The model was developed in the form of a decision tree using Microsoft Excel. Discounting of costs and benefits is not required as the time horizon of the model is 12 months.

The economic analysis is undertaken from the perspective of the Ministry of Health as a third party payer. This means that out-of-pocket costs to patients are not included. Likely costs or savings, and benefits to other government bodies, such as the Ministry of Social Development and the Ministry of Justice, and to society in general are not included in the analysis. The model captures direct medical costs associated with both screening and treatment. Screening costs cover the time spent completing the questionnaire and discussing results with mothers. Treatment costs are broken down into three types of treatment: (i) social support, (ii) psychological therapy, and (iii) a combination of antidepressants and psychological therapy.

The benefits of PND screening are captured in the model in terms of maternal health as well as health-related quality of life. The key health outcomes are: (1) the number of mothers with resolved PND (who are not depressed at endpoint), (2) the number of PND cases detected, and (3) maternal Quality Adjusted Life Years (QALY). The base case results are presented in Table A.
### Table A  Base case results from the economic analysis

<table>
<thead>
<tr>
<th>Title</th>
<th>Proposed programme</th>
<th>Current practice</th>
<th>Incremental difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total programme cost</td>
<td>$3,854,716</td>
<td>$1,722,479</td>
<td>$2,132,238</td>
</tr>
<tr>
<td>Screening cost</td>
<td>$783,519</td>
<td>$304,831</td>
<td>$478,688</td>
</tr>
<tr>
<td>Treatment cost</td>
<td>$3,071,197</td>
<td>$1,417,648</td>
<td>$1,653,549</td>
</tr>
<tr>
<td>PND cases detected</td>
<td>13,781</td>
<td>6,361</td>
<td>7,420</td>
</tr>
<tr>
<td>PND cases resolved</td>
<td>9,900</td>
<td>4,570</td>
<td>5,330</td>
</tr>
<tr>
<td>Total QALYs gained</td>
<td>46,875</td>
<td>46,259</td>
<td>616</td>
</tr>
<tr>
<td>Cost per additional case of PND detected</td>
<td>$287</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per additional case of PND resolved</td>
<td>$400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per additional QALY gained</td>
<td>$3,461</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The total annual cost of implementing routine screening for PND is estimated to be approximately $3,854,716 compared with current practice which is estimated to cost $1,722,479. This yields an incremental total annual cost of $2,132,238. On a yearly basis, the cost per year of routine screening is clearly more expensive but it is associated with considerable maternal health benefits. The number of mothers who have depressive symptoms resolved at endpoint in the proposed programme is estimated to be 9,900 compared with 4,570 estimated under current practice.

The total cost of the programme ($3,854,716) incorporates costs associated with (i) screening ($783,519), and (ii) treatment ($3,071,197). Thus, the treatment component represents the greater part (80%) of the total cost of the programme, and will be shared between the Ministry, PHARMAC, and the District Health Boards.

The additional cost of moving from the current practice to implementing a routine screening programme is $2,132,238 per year. The routine screening programme is expected to detect 7,420 extra cases and deliver 5,330 extra PND cases resolved. The incremental cost per additional case detected is $287 and the incremental cost per additional case resolved is $400.

In the base case, the cost per additional QALY gained with the introduction of a routine screening programme for PND is $3,461.

In any economic evaluation, it is important to examine the robustness of the results to the assumptions made to account for parameter uncertainty. In sensitivity analyses, the ICER remains cost-effective, ranging from $2,959 to $9,607. The economic model was found to be most sensitive to the proportion of mothers that were diagnosed with PND that accessed and initiated appropriate treatment.

### Conclusion

In comparison with other New Zealand screening programmes and the levels at which PHARMAC might consider funding for a pharmaceutical, the proposed routine screening programme for PND within the Well Child framework appears to be highly
cost-effective from a government perspective, when compared with current practice. However, one must keep in mind that the economic study conducted herein is only intended to be an exploratory analysis and is based on a number of necessary assumptions, which represent ‘best estimates’ of current practice and the likely costs and benefits associated with the introduction of formalised screening.

The economic analysis focuses on maternal outcomes and maternal health-related quality of life improvements. The model does not capture the impact of the successful treatment of PND to children and society in general. Importantly, the model does not capture likely future savings to other government jurisdictions such as education, social development and justice. Therefore, the ICER results from the exploratory model can be considered conservative.

It is important to recognise that the value of any screening programme for PND will be dependent on the resources available locally and the ability of the woman and her primary care team to access these resources. Thus, screening for PND will only be effective if coupled with systems changes so that women can be appropriately diagnosed and treated. Many of the changes to practice needed to achieve better PND-related outcomes are currently not publicly funded to sufficient levels (e.g., support groups and psychologist sessions). Consequently, consideration may need to be given as to whether such costs should be funded by government if the proposed PND screening programme is to be effective at a national level.
# Table of Contents

Review Team .................................................................................................................................................. i
Acknowledgements ......................................................................................................................................... i
Copyright Statement & Disclaimer ........................................................................................................ i
Contact Details ........................................................................................................................................... ii

Executive Summary ................................................................................................................................. iii
  Objective .................................................................................................................................................... iii
  Background ............................................................................................................................................... iii
  Epidemiology ............................................................................................................................................ iii
  Impact of PND ........................................................................................................................................ iii
  Treatment of PND ................................................................................................................................... iv
  Screening instruments ........................................................................................................................... iv
  Current practice for detecting PND ....................................................................................................... v
  Challenges with implementation of screening ....................................................................................... v
  Economic analysis ............................................................................................................................... vi
  Conclusion............................................................................................................................................... vii

Table of Contents ..................................................................................................................................... ix
List of Tables ............................................................................................................................................... xi
List of Figures ............................................................................................................................................ xii
List of Abbreviations and Acronyms ....................................................................................................... xiii

Introduction.................................................................................................................................................. 1
  Objective .................................................................................................................................................... 1
  Background ............................................................................................................................................... 1
  Epidemiology ........................................................................................................................................... 2
  Impact of postnatal depression ............................................................................................................ 3
  Treatment of postnatal depression ....................................................................................................... 5
  Instruments for detection of PND ......................................................................................................... 6
  Timing of screening ............................................................................................................................... 9
  Current practice for detecting PND ................................................................................................... 10
  Challenges with implementation of screening .................................................................................. 11
  New Zealand initiatives for PND ......................................................................................................... 12
  Australian initiatives for PND ............................................................................................................. 13

Economic analysis ................................................................................................................................... 17
  Background to economic analysis ....................................................................................................... 17
  Model structure .................................................................................................................................... 18
  Screening ............................................................................................................................................... 18
  Treatment .............................................................................................................................................. 19
Screening for postnatal depression within the Well Child Tamariki Ora Framework.

Population of interest ................................................................. 21
Costs and health outcomes ........................................................................................................... 21
Costs ................................................................. 21
Health Outcomes ................................................................. 22
Cost data and resource use ........................................................................................................... 23
Model parameters .......................................................................................................................... 24
Assumptions ................................................................................................................................. 28
Results ......................................................................................................................................... 29
Sensitivity analyses .......................................................................................................................... 30
Comparison of cost-utility ratios in New Zealand ........................................................................ 32
Discussion .................................................................................................................................. 34
Conclusion ................................................................................................................................... 36
References ..................................................................................................................................... 37
Appendix 1 .................................................................................................................................. 44
Appendix 2 .................................................................................................................................. 45
## List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table A</td>
<td>Base case results from the economic analysis</td>
<td>vii</td>
</tr>
<tr>
<td>Table 1</td>
<td>Number of mothers with children enrolled in WCPs</td>
<td>21</td>
</tr>
<tr>
<td>Table 2</td>
<td>Unit costs applied in the economic model</td>
<td>24</td>
</tr>
<tr>
<td>Table 3</td>
<td>Resource use data</td>
<td>24</td>
</tr>
<tr>
<td>Table 4</td>
<td>Model parameters - screening</td>
<td>26</td>
</tr>
<tr>
<td>Table 5</td>
<td>Model parameters - treatment</td>
<td>27</td>
</tr>
<tr>
<td>Table 6</td>
<td>Health state utility values</td>
<td>27</td>
</tr>
<tr>
<td>Table 7</td>
<td>Base case results from the economic analysis</td>
<td>29</td>
</tr>
<tr>
<td>Table 8</td>
<td>Univariate sensitivity analyses</td>
<td>31</td>
</tr>
<tr>
<td>Table 9</td>
<td>Multivariate sensitivity analyses</td>
<td>32</td>
</tr>
<tr>
<td>Table 10</td>
<td>Comparison of cost-utility ratios in New Zealand</td>
<td>33</td>
</tr>
</tbody>
</table>
**List of Figures**

| Figure 1 | Generalised structure of the economic model | 20 |
| Figure 2 | Health States in economic model | 23 |
| Figure 3 | Utility weight over time for a patient diagnosed and treated for severe depression | 28 |
| Figure 4 | Utility weights over time in the mild/moderate health state | 45 |
| Figure 5 | Utility weights over time in the severe health state | 46 |
# List of Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBT</td>
<td>Cognitive behavioural therapy</td>
</tr>
<tr>
<td>DSM</td>
<td>Diagnostic and Statistical Manual for Mental Disorders</td>
</tr>
<tr>
<td>EPDS</td>
<td>Edinburgh Postnatal Depression Scale</td>
</tr>
<tr>
<td>FOBT</td>
<td>Foetal occult blood testing</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross domestic product</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
</tr>
<tr>
<td>ICD</td>
<td>International Classification of Diseases</td>
</tr>
<tr>
<td>ICER</td>
<td>Incremental cost-effectiveness ratio</td>
</tr>
<tr>
<td>IPT</td>
<td>Interpersonal therapy</td>
</tr>
<tr>
<td>LY</td>
<td>Life-year</td>
</tr>
<tr>
<td>NHMRC</td>
<td>National Health and Medical Research Council (Australia)</td>
</tr>
<tr>
<td>NICE</td>
<td>National Institute for Health and Clinical Excellence</td>
</tr>
<tr>
<td>NSC</td>
<td>National Screening Committee</td>
</tr>
<tr>
<td>PHQ</td>
<td>Patient Health Questionnaire</td>
</tr>
<tr>
<td>PND</td>
<td>Postnatal/postpartum depression</td>
</tr>
<tr>
<td>PNDS</td>
<td>Postnatal/postpartum depression symptoms</td>
</tr>
<tr>
<td>QALY</td>
<td>Quality-adjusted life year</td>
</tr>
<tr>
<td>RDC</td>
<td>Research Diagnostic Criteria</td>
</tr>
<tr>
<td>SG</td>
<td>Flexible sigmoidoscopy</td>
</tr>
<tr>
<td>WCP</td>
<td>Well Child Provider</td>
</tr>
</tbody>
</table>
Introduction

Objective

The purpose of this economic analysis is to evaluate the potential value for money of implementing a screening programme for postnatal depression within the Well Child Tamariki Ora Framework.

Background

Postnatal or postpartum depression (PND) is the most prevalent mood disorder associated with childbirth (NHMRC, 1999). Diagnosis is made using the American Psychiatric Association’s Diagnostic and Statistical Manual for Mental Disorders criteria (DSM-IV), the World Health Organization’s International Classification of Diseases (ICD-10), or Research Diagnostic Criteria (RDC) for major or minor unipolar depression arising during the first postnatal year. Whilst the DSM-IV criteria allows for a specifier of postpartum onset when the disorder commences within four weeks of giving birth, the ICD-10 enables a classification of depressive disorder with puerperal onset when the depressive disorder cannot be classified elsewhere and onset was within six weeks of childbirth. Nevertheless, the first 12 months postpartum are considered in clinical practice to be the period in which postnatal unipolar depression is most likely to arise.

The distinction between PND and sub-syndromal depressive symptoms may be academic in clinical practice, where women present with a spectrum of distressing symptoms needing support and help (Shakespeare, 2001). In the postnatal period there are three broad subgroups of women with depressive symptomatology whose management may differ: (i) those that developed depression only after childbirth, (ii) those whose depression developed during pregnancy, and (iii) women with pre-existing chronic depression. In order to meet DSM IV diagnostic criteria, there is a requirement for at least two weeks of unremitting symptoms.

PND is characterised by a range of somatic and psychological symptoms, such as sleep and eating disturbance, emotional lability, guilt, shame and mental confusion, and, in severe cases, feeling suicidal. Women with PND have an elevated risk of recurrent depression during subsequent pregnancies and at other times (Cooper & Murray, 1995). The strongest risk factors for the development of PND, measured during pregnancy, are past history of psychopathology and psychological disturbance during pregnancy, poor marital/partner relationship, low social support, and stressful life events, such as bereavement, housing problems, unemployment, or illness (NHMRC, 2000). Low social status has been shown to be a small but significant risk for PND (O’Hara & Swain, 1996). Negative intra-partum experiences of childbirth can also affect postnatal mood (Green, 1990), as can postnatal factors such as severe maternity blues (Hapgood et al, 1988; Playfair et al, 1981; Fossey et al, 1997), and observed irritability or poor motor control in the baby (Murray et al, 1996).

PND is usually not recognised in its early stages. Unlike most other medical conditions, a firm diagnosis cannot usually be made with a single point of observation unless it is already quite severe. In its mild to moderate manifestation, symptomology
will begin before the time of the six-week check and continue to unfold through three and five months postpartum. The duration of PND has been found to vary markedly in different studies and is clearly influenced by the length of follow-up assessment (NHMRC, 1999). If untreated, PND may continue for several weeks to months, and severe episodes may persist for years (Cox et al, 1987). It has been claimed that most episodes typically remit within two to six months, although in untreated cases a significant proportion of women will remain depressed throughout the first postpartum year (Cooper et al, 1988).

Epidemiology

The established range for the prevalence of PND is 10-20%. A meta-analysis of 59 international studies concluded that the overall prevalence of PND worldwide was 13% (O’Hara & Swain, 1996). This meta-analysis included studies in which the diagnosis was made using validated psychiatric interviews and self-report questionnaires, such as the Edinburgh Postnatal Depression Scale (EPDS). The prevalence is variable, depending on the method of assessment used (with larger estimates in studies using self-report measures), different inclusion criteria, and the length of postpartum follow-up (longer periods predict higher prevalences). Furthermore, the prevalence of PND varies considerably in different ethnic groups (Kumar et al, 1994). The reported rate of recurrence of PND after a subsequent birth is 30%, and the rate is higher for women in whom the first episode of PND is the first-ever depressive episode, compared with the rate in women who have had previous non-puerperal depression (Cooper et al, 1995).

A large number of PND and postnatal depressive symptoms (PNDS) prevalence studies have been conducted, primarily in North America and the United Kingdom, but there is a lack of information for New Zealand (Thio et al, 2006). Epidemiological studies from New Zealand have found the prevalence of major depression in the general population to be significantly higher than overseas (Wells et al, 1989; Oakley et al, 1989). Although some studies have reported high rates of PND in New Zealand, published estimates vary considerably, despite the use of the same population-specific instrument - the EPDS. Reported rates in New Zealand range from 7.8% (Webster et al, 1994) to 13% (McGill et al, 1995) and 16% (Thio et al, 2006; Abbott & Williams, 2006). It is likely that the difference in prevalence estimates has arisen due to differences in the populations assessed, EPDS cut-offs for depression, and the timing of assessment. Whereas the study by Webster et al (1994) assessed women within the first four weeks postpartum, the study by Abbott & Williams (2006) assessed women at six weeks, the study by Thio et al (2006) assessed women at four months, and the study by McGill et al (1995) assessed women at eight to nine months postpartum.

The study reported by Webster et al (1994) found the prevalence of major depressive disorder at four weeks postpartum was 7.8%, with a further 13.6% of women experiencing more minor depressive symptoms. Whilst Pacific Island and Asian women were excluded from assessment because of concerns about the validity of the questionnaire in subjects where English was the second language, Maori mothers were assessed and found to be at a greater risk of depressive symptoms than European mothers. Using the EPDS, depressive symptoms (i.e., an EPDS score of > 9) were seen in 16.6% of European women and 40.5% of Maori women. Major depression
Screening for postnatal depression within the Well Child Tamariki Ora Framework.

(i.e., an EPDS score of >12) was seen in 6.1% of European women and 14.3% of Maori women.

The McGill et al (1995) study showed that at 6-9 months postpartum, 20% of New Zealand mothers showed some degree of depression. Whilst 13% of women had scores of 14 or higher and were considered to be more severely depressed, 7% had threshold levels of depression (defined as EPDS score of 12 or 13). Data were not shown in the publication by ethnicity.

Due to low survey response rates in non-European/Caucasian women, the study by Thio and colleagues (2006) analysed only those responses received from Caucasian women. Thus, the results may not be representative of Maori, Pacific Island, and Asian women. At four months postpartum, 30% of women were suffering from depressive symptomatology. Approximately 16% scored above the threshold for depressive symptomatology (i.e., EPDS ≥13), and 25% of those women reported that they were receiving treatment (defined as any medical or psychological care or treatment for nerves, or depression, or any type of emotional or mental problem). Approximately 14% of women scored just below the threshold (EPDS 10-12), none of whom were receiving treatment. Follow-up of this sub-threshold group is also important considering that minor depressive symptomology is associated with comorbid anxiety and other disorders, and over time a substantial number will convert to major depression (Thio et al, 2006).

The Abbott & Williams (2006) study assessed the prevalence of PND symptoms at six weeks postpartum in a cohort of mothers of Pacific Island infants in Auckland. Overall, 16.4% of mothers were assessed as probably experiencing depression (defined as EPDS score > 12). However, estimates varied considerably between Pacific Island ethnic groups, ranging from 7.6% for Samoans to 30.9% for Tongans.

**Impact of postnatal depression**

The clinical presentation of postpartum depression is like that of other major depressive disorders, with symptoms of depressed mood, diminished pleasure, marked change in appetite and sleep, psychomotor agitation or retardation, fatigue, feelings of worthlessness or inappropriate guilt, decreased concentration, and recurrent thoughts of death or suicide (Gjerdingen & Yawn, 2007). The presence of maternal depressive symptoms at a critical time for infant and family has additional adverse effects, such as marital distress, family function issues, problems with mother-infant interaction and attachment, and adverse behavioural and cognitive effects in the child (Beck, 2001; Grace et al, 2003). Thus, recognising and treating PND provides opportunities to decrease divorce rates, improve rates of normal child development, and lower suicide and infanticide rates.

Both clinical depressive disorders and subthreshold depressive symptoms have an impact on how effectively mothers can parent (Naerde et al, 2000). Maternal depressive symptoms are associated with fewer positive parenting behaviours and more negative interactions with young children. Depressed mothers talk less to their infants, express fewer positive facial emotions, and show less positive physical affection (Osofsky & Thompson, 2000). Maternal depression is also associated with emotional unavailability, insensitivity, and less secure attachments which can have a
negative effect on a child’s cognitive and social outcomes (NICHD, 1999). Depressed mothers report poorer prevention practices including decreased use of car seats, electrical plug covers, and smoke detectors, and increased use of corporal punishment (McLennan et al., 2000; Chung et al., 2004). Furthermore, it has been reported that preventative services for children including age-appropriate Well Child visits to 12 months and up-to-date vaccinations at 24 months are accessed less by depressed mothers (Minkovitz et al., 2005).

Mothers with depressive symptoms have been shown to utilise more health services and more frequent requirement for urgent care for their young child. Regarding acute care, Mandl et al. (1999) reported a higher proportion of infants with at least two problem-oriented visits in the first five months of life and higher proportions with emergency department visits in the first month of life among infants of mothers with depressive symptoms compared with those whose mothers did not have symptoms. Likewise, Minkovitz et al. (2005) reported increased use of acute care at 30-33 months including emergency department visits in the past year. Chung et al. (2004) reported increased odds of hospitalisations among children whose mothers had depressive symptoms in a community-based survey of low income women.

Over time, children raised in a home with a depressed parent are more likely to develop behavioural problems and depression (Miller et al., 1999; Beardslee et al., 1998; Lieb et al., 2002). It has been reported that children of depressed mothers have delayed psychological, cognitive, neurological, and motor development, and are at higher risk of avoidance and distressed behaviour (Field, 1995; Abrams et al., 1995). Compared with non-depressed mothers, depressed mothers report a three-fold greater risk of serious emotional problems in their children and a 10-fold greater risk of having poor mother-child relations (Weissman et al., 2004). The negative effects of PND on the infant appear to happen very early in life, probably within the first six months (Field, 1992). Children’s behavioural difficulties associated with maternal depression may continue through at least ages 4 to 8 years (Murray et al., 1996; Beck, 1998; Sinclair & Murray, 1998). Whilst depressed mothers’ sons are more prone to behavioural problems and impaired cognitive function in the long term, their daughters are more likely to experience depression themselves (Hay, 1997; Miller et al., 1999).

There is also some evidence for a link between maternal PND and later violent behaviour in the children of depressed mothers. Hay et al. (2003) conducted a prospective longitudinal study of the contribution of maternal PND on child behaviour at 11 years of age. The analysis included a total of 122 families with a full assessment of the mother’s mental health (at 14 and 36 weeks of pregnancy, and at 3 and 12 months postpartum) and measures of the child’s behaviour at age 11. Families were recruited at routine prenatal check-ups in two general medical practices in South London. The results showed a direct effect of maternal depression at three months postpartum on a child’s proclivity for violence at age 11 that was not accounted for by maternal depression at other points in the child’s life, interactions with the child’s sex, or family characteristics. The risk for violence was greatest in the group of children whose mothers were depressed in the postpartum period and at least once thereafter. In contrast to their peers, children whose mothers had been depressed at three months postpartum showed more diverse and more severe aggressive behaviours than other children. The link between postnatal depression and violence at age 11 was associated
with the children’s problems in regulating attention and emotion. Children of depressed mothers at three months postpartum were also angry and inattentive at age 11.

Despite a growing body of evidence showing that maternal PND can result in adverse behavioural and cognitive effects in the child, there is a lack of reliable and quantifiable data linking the resolution of maternal PND with improved outcomes in the child. Although not specifically in PND, several studies of children of depressed parents have suggested some benefit for children of reducing parental symptoms (Beardslee et al., 2003; Verdeli et al., 2004). A multicenter US study, STAR*D (Sequenced Treatment Alternatives to Relieve Depression) assessed 114 mothers who were being treated for depression and 114 of their children between the ages of seven and 17 years (Weissman et al., 2006). More than one-third of the children had current psychiatric disorders including anxiety, depression and/or other disruptive behaviour disorders, and nearly half had a previous psychiatric disorder. The authors found that remission of maternal depression after three months of antidepressant medication was significantly associated with reductions in the children's diagnoses and symptoms. In contrast, children whose mothers did not have a remission after three months on medication had significantly increased rates of diagnosis of depressive, anxiety disorders, and disruptive behaviour disorders. Of those children who had a DSM-IV diagnosis at baseline, 33% of those whose mothers had remissions had remissions themselves, compared with only 12% of children whose mothers' did not experience remissions. All children of mothers whose depression remitted after treatment and who themselves had no baseline diagnosis for depression remained free of psychiatric diagnoses at three months, whereas 17% of the children whose mothers remained depressed acquired a diagnosis.

**Treatment of postnatal depression**

Because of the negative impact of depression on early mother-infant interactions and research evidence that negative mental health outcomes in offspring may be more severe when maternal depression is prolonged (Stein et al., 1991), treatment should not be delayed. With treatment, an episode of postnatal depression usually resolves in about six weeks (Angst, 1998). However, antidepressant treatment is often continued for 12 months after resolution of symptoms, but this is dependent in practice on the timing of remission of the underlying illness (Ferguson, 2007). In the New Zealand study reported by Thio et al (2006), only 13% of women who scored in the threshold or high range of the EPDS were receiving treatment at four months postpartum.

A legitimate concern with screening is whether it would dramatically increase the requirement for treatment. However, rather than increasing the burden of care, screening could actually bring about a change in focus, with early detection of women who otherwise might not have been treated until later in their illness (Buist et al., 2002).

PND is a heterogeneous condition and different treatments may be needed for different women. Although there is limited high quality evidence for the effectiveness of treatment for PND, the many published trials in depression can potentially be generalised to postnatal depression, even though presentation may differ subtly (Buist et al., 2002). Whilst standard treatments for depression decrease maternal symptoms,
they appear to have less direct benefit on parenting stress and the mother-infant relationship, and the effect on infant outcome is unclear (McLennan et al, 2002).

With appropriate and timely intervention, more than 85% of mothers will respond to treatment. The NICE Clinical Management and Service Guidance for Antenatal and Postnatal Mental Health discusses the available evidence for non-pharmacological and pharmacological interventions (NICE, 2006). The non-pharmacological treatments reviewed by NICE include psychological therapies such as cognitive behavioural therapy, debriefing, non-directive counselling (listening visits), interpersonal psychotherapy, psychodynamic psychotherapy, support and education, psychoeducation, and broader psychosocial interventions (e.g., continuity of midwife care, timing of appointments and hospital discharge following delivery, and source of care – community based or primary care based). A recent Cochrane review evaluated the use of non-pharmacologic interventions in postpartum women experiencing depressive symptomatology (Dennis & Hodnett, 2007). Ten trials met the inclusion criteria and although the methodological quality of the majority of trials was, in general, not strong, the meta-analysis results suggested that psychosocial and psychological interventions are an effective treatment option for women suffering from postpartum depression. Both psychosocial and psychological interventions were effective in reducing depressive symptomatology and, compared with usual postpartum care, were associated with a reduction in the likelihood of continued depression, measured at the final assessment within the first year postpartum (Dennis & Hodnett, 2007). Trials selecting participants based on a clinical diagnosis of depression were just as effective in decreasing depressive symptomatology as those that enrolled women who met inclusion criteria based on self-reported depressive symptomatology.

Medication is often used to treat the metabolic imbalances that occur in more severe cases of PND. NICE considered evidence for the safety and efficacy of a variety of pharmacological treatments for use during pregnancy and breastfeeding, including antidepressants (selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, monoamine-oxidase inhibitors, and novel antidepressants), anticonvulsants (sodium valproate, lamotrigine, and carbamazepine), lithium, antipsychotics, and benzodiazepines. However, high quality evidence is limited – a Cochrane review of pharmacological treatments for PND found only one trial that met the inclusion/exclusion criteria of the analysis (Hoffbrand et al, 2001). The authors found that the SSRI fluoxetine was, after an initial session of counselling, as effective as a full course of cognitive-behavioural counselling in the treatment of postnatal depression.

Instruments for detection of PND

A working party convened by the United Kingdom National Health Service to examine screening for perinatal depression in the United Kingdom using National Screening Committee (NSC) criteria raised concerns about the screening instruments used to date (Shakespeare, 2001). Problems highlighted included inconsistency in choice of screening methods, whether the scales had satisfactory psychometric properties, the acceptability of such measures to women, and the adverse consequences of false positive or false negative results (particularly the potential for stigmatising or not treating affected women). Moreover, a systematic review of
interventions to reduce depression after birth concluded that none of the 16 instruments available to 2002 to screen women antenatally performed sufficiently well in terms of adequate sensitivity, specificity, positive and negative predictive values or likelihood ratios for their use to be recommended (Austin & Lumley, 2003; Lumley et al, 2004).

That aside, the most widely accepted screening scale used internationally in the perinatal period is the EPDS. It is a simple self-report questionnaire that takes less than five minutes to complete. The instrument was designed to allow screening of PND in the primary care setting and has been validated by comparing the mean EPDS scores with Research Diagnostic Criteria (RDC) diagnosis at three months postpartum (Cox et al, 1987). A score of 13 or more has been found to identify all women with an RDC diagnosis of Definite Major Depressive Disorder. A cutoff of 9/10 included women with Minor Depressive Illness. At least two additional studies have shown that there is little change across these parameters for at least the first seven months (Boyce et al, 1993; Harris et al, 1992). The positive predictive value for the EPDS has ranged across studies from 70% to 91%, likely due to differences in the methods for choosing and recruiting subjects and differences in the delivery of the EPDS (Shakespeare, 2001). Validation studies have demonstrated 68% to 86% sensitivity and 78% to 96% specificity. While the EPDS has been translated into and validated in several languages, there is some concern that cultural differences may make it inappropriate for use in some ethnic minority women.

Although the EPDS appears simple to use, training in administering and scoring the scale and providing appropriate feedback to women is important, particularly as the level of the score does not reflect the severity of depression. After a review of the available evidence from the National Institute for Clinical Excellence (NICE), the NSC in the United Kingdom recommended against the use of the EPDS as a screening tool for PND because of concerns relating to its performance in routine care (Screening Specialist Library, 2006). The Committee suggested that the EPDS may serve as a check list as part of a mood assessment for postnatal mothers, used alongside professional judgement and a clinical interview, but that it should not be used as a pass/fail screening tool.

The Well Child Tamariki Ora Framework Options paper (July 2007) recommends the use of the PHQ-2, which is a brief depression risk screener derived from the longer, 9-item, self-administered, PHQ depression diagnostic tool. The PHQ-2 asks two questions about the key Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition determinants of depression, namely altered mood and anhedonia (the inability to experience pleasure or interest in activities usually enjoyed), occurring in the previous two weeks [in some studies extended to the previous month]. The two-question screener has been validated in both primary care and obstetric populations and has been shown to perform as well as longer screening measures, in comparison with a research psychiatric interview (Whooley et al, 1997; Kroenke et al, 2002; Kroenke et al, 2003). The stem question is, “Over the last 2 weeks [or past month], how often have you felt bothered by any of the following problems?” The two items are “little interest or pleasure in doing things” and “feeling down, depressed, or hopeless”. For each item, the response options are “not at all”, “several days”, “more than half the days”, and “nearly everyday”, scored as 0, 1, 2, and 3, respectively. Thus the PHQ-2 can range in score from 0 to 6. At a cut-point of 3, the PHQ-2 has been
shown to have a sensitivity of 83%, a specificity of 90%, and a positive likelihood ratio of 2.9 (Kroenke et al., 2003), which compares favourably with other instruments for depression in primary care (Mulrow et al., 1995). However, sensitivity is enhanced using a cut-point of 2 and specificity is enhanced with a cut-point of 4. This is an important consideration in routine screening because by increasing sensitivity, the number of false-positive cases will rise with a resultant increased burden on referral pathways.

The PHQ-2 has been recommended by NICE and the US Preventative Services Task Force for screening adults for depression in primary care settings. NICE have also recommended the screener for detection of PND, but suggested that a third question be incorporated into the screener for enhanced specificity. The third question asks “is this something with which you would like help?” with three possible responses: “no”, “yes, but not today”, or “yes”. The use of the three-question screener is also recommended by the New Zealand Guidelines Group for use by primary health practitioners to detect depression. The three-question screener has been validated against the composite international diagnostic interview (mood module only) in a cross-sectional study set in general practice in New Zealand (Arroll et al., 2005). The study found that a yes/no answer to the two screening questions alone had a sensitivity of 96% and a specificity of 78%. The addition of the help question had no effect on the sensitivity but increased the specificity to 89% and the positive likelihood ratio from 4.4 to 9.1.

Although a more comprehensive instrument would be preferred when the intent is either to definitively diagnose depressive disorders or to assess depression outcomes in response to treatment, the PHQ-2 is a more realistic option for incorporation into a Well Child visit because it takes less time to administer and score (Olson et al., 2006). Even a 10-item measure such as the EPDS can be challenging to complete. In a study to assess the feasibility of universal PND screening at Well Child visits using the EPDS, Chaudron et al. (2004) reported that screening occurred in 46% of visits and 31% of screening forms either were not scored by providers or were scored inaccurately.

Studies have indicated that paediatricians have been able to incorporate the PHQ-2 into Well Child visits and the brief screener is well accepted by mothers (Olson et al., 2005; Olsen et al., 2006). A US study by Olson et al. (2006) assessed the feasibility and sustainability of maternal depression screening during all Well Child visits. Nurses provided the PHQ-2 screener in paper format to parents as they prepared the child for the visit in the examination room. The screener required less than one minute for administration and parental completion. Clinicians then discussed the screener findings during the visit. In over 85% of cases, discussion required no additional time or less than three minutes. Less than 2% of women required discussion following screening for more than 10 minutes. The trial found that screening rates were reasonably high: 74% during the initial 1-month trial of screening and 67% during 6 months of ongoing screening. Of those women who screened positive (PHQ-2 score of ≥ 3), 42% were referred to primary care physicians, mental health professionals, or community support and another 20% received further support in the form of a

---

1 Available at http://www.nzgg.org.nz/guidelines/0137/Depression___Information_for_primary_health_practitioners.pdf (last accessed 13 November 2007)
Screening for postnatal depression within the Well Child Tamariki Ora Framework.

discussion of the impact of depression on the child, or follow-up monitoring via telephone or a later visit.

A study from the same authors compared paper-based administration of the PHQ-2 with administration of the PHQ-2 via a structured interview format (Olson et al., 2005). While both approaches to screening were found to be feasible at primary care Well Child visits, the proportion of screen-positive women defined as a positive response to either of the two screening questions, differed substantially with 22.9% of women screening positive with the paper-based screen and 5.7% of women screening positive with the interview-based screener. However, requiring two positive responses reduced the rate of paper-based screen positives to 9.9% but made little difference to the interview screen-positive rate (4.9%). Follow-up action among screen-positive mothers was similar using both screening methods (62-69%), as was referral rates for mental health care (approximately 30%).

Regardless of the screening instrument implemented, it is intended that the introduction of a screening programme would identify women with ‘hidden’ depression in addition to those with obvious symptoms of depression already identified at routine Well Child visits. However, the primary benefit of a screening tool may actually be to facilitate discussion between the mother and health care worker, and act as a gateway to services available. It is important to recognise that screening is only a first step. Patients who screen positive should be further evaluated with other diagnostic instruments, or direct interview to determine whether they meet criteria for a depressive disorder. High scores on the PHQ-2 alone would typically not be a sufficient basis to initiate treatment without diagnostic confirmation (Kroenke et al., 2003).

**Timing of screening**

The timing of screening is important. Most cases of PND develop within the first 3 months (Cooper et al., 1988; Kumar et al., 1984), with a peak incidence at 4 to 6 weeks (Cox et al., 1993). Although one study showed that most cases of PND last around 3 months and resolve spontaneously without treatment (Cooper et al., 1988), another study showed that 50% of cases lasted over 6 months and some persisted at 4 years (Kumar et al., 1984). Within the first few weeks postpartum assessment of symptoms for PND is likely to be contaminated with transient factors related to normal postpartum adjustment. With later assessments (e.g., 8 to 9 months), questions arise as to whether the depression is truly linked to childbirth, and whether early onset cases may have already resolved. Thus, the most appropriate time-point for screening for PND is later than 5 weeks postpartum and earlier than 6 months postpartum.

After delivery, there is frequent contact with the healthcare system, but the infant’s health is often the primary focus of healthcare workers, perhaps limiting attention paid to the mother’s mental health (Thio et al., 2006). Stowe et al (2005) found that 78% of women had early onset of PND symptoms, with 11.5% reporting prenatal onset and 66.5% reporting onset within 6 weeks’ postpartum. Thus, 22% of cases have their inception later than the routine 6-week postpartum check-up (Stowe et al., 2005).
Current practice for detecting PND

Well Child visits provide a convenient longitudinal opportunity to screen for postpartum depression, as they occur at regular intervals throughout the first postpartum year. Several studies have found that screening for maternal depression during Well Child visits improves the rate of depressive symptom detection, from 1.6% to 8.5% in one study (Chaudron et al., 2004), and from 29% to 40% in another (Heneghan et al., 2000). However, this opportunity is currently underutilised because Well Child visits primarily focus on the child’s health and consequently providers do not routinely enquire about the mother’s mental health status.

Several reports indicate that identification of depressed women by primary health care providers in routine clinical practice tends to be poor, with up to 50% of cases not being recognised (Briscoe et al., 1986; Hearn et al., 1998; Bagedahl-Strindlund et al., 1998; Heneghan et al., 2000; Evins et al., 2000). This is hardly surprising considering that the approaches used to detect depression are often inadequate, relying on observation of symptoms rather than specific questioning. According to the literature, paediatricians ask routinely about maternal depressive symptoms in less than 10% of cases (Olson et al., 2002). Although the above reports are not specific to New Zealand, there is no evidence to suggest that the situation in New Zealand is different to elsewhere.

Determination of current practice in New Zealand for detection and management of PND has proven difficult. As part of this report, discussions were held with representatives of the Royal Plunket Society and the Royal New Zealand College of General Practitioners. Based on these discussions it is clear that new mothers are not formally screened for PND and that current practice varies depending on the provider and district. Although the Well Child Schedule currently recommends use of the EPDS at core Well Child contacts at 6 weeks, 3 months, 5 months, and at other opportunistic contacts, these assessments are not always carried out according to the Schedule. Thus, there is a strong possibility that some cases of PND are currently not being detected and that in the cases that are identified, detection may be delayed. Furthermore, despite the recommendation in the Well Child Schedule for the use of the EPDS as a detection instrument, there is debate about the validity of the EPDS in a New Zealand context.

Approximately 95% of infants in New Zealand are enrolled with a Well Child Provider. The largest Provider is the Royal New Zealand Plunket Society, which enrolled 90.3% of infants born in New Zealand in 2006, of which 21.7% infants were Maori and 10.3% were Pacific Island (Craig et al., 2007). Maori-Pacific WCPs and other primary health organisations oversee the remaining infants (9.7%) enrolled with a WCP. As the primary WCP, it is possible that Plunket nurses could play a role in any planned PND screening programme. Plunket nurses currently provide new mothers with the booklet Thriving Under Five and alert them to the section dealing with PND, which provides a self-administered questionnaire for recognising symptoms of PND, based on the EPDS. Women are instructed to seek help if they experience symptoms listed in the questionnaire. Thus, although women are not formally screened for PND, the booklet is used to raise self-awareness and stimulate discussion. Women exhibiting signs of depression or requesting help are referred to general practitioners (GPs; who are responsible for management and treatment, as
necessary) or directed to relevant support services (support groups and Family Support Centres).

Although it has not always been so, GPs currently have limited contact with women antenatally and during the early postpartum period. Thus, the first time that a new mother presents to a GP may be for the child’s scheduled 6-week immunisation. Further contact with the GP within the next six months is likely to be limited as the majority of new mothers attend scheduled Well Child visits, primarily undertaken by Plunket nurses. It is clear that GPs are integral to the management of women with PND – from formal diagnosis through to treatment and follow-up. However, under the current system their expertise is underutilised. There is a growing body of evidence which suggests that a GP's prior knowledge of a patient, often accumulated over serial consultations, may have a critical bearing upon awareness of psychological problems and clinical decision making (Marks et al., 1979; Rosenberg et al., 2002). Indeed, a New Zealand study found a clear relationship between frequency of consultation and degree of recognition of psychological problems in general practice (Bushnell et al., 2004). Among patients seen five or more times in the previous year, 80.2% were recognised by the GP as having psychological symptoms, but among patients not seen in the previous 12 months, only 28.8% were recognised. Even allowing for the fact that depressed women might visit a GP more frequently than non-depressed women, it is apparent that a substantial number of cases of PND are likely to remain undiagnosed.

**Challenges with implementation of screening**

Despite initiation of a routine screening protocol, there is no guarantee that mothers will actually be screened at the specified timepoints. In Gippsland, Victoria, Australia, a universal screening programme has been in place for 10 years. However, an audit of the Programme showed that only 15.5% of women were screened according to the protocol at all three time-points (1 month, 4 months, and 8 months postpartum) and almost 22% of women were never screened (Armstrong & Small, 2007). At the 4-week and 4-month timepoints, approximately 50% of all women were recorded as having completed an EPDS, falling to 38% by the 8-month screening point. Note that the screening protocol has since changed from three to two screening timepoints, completed at 2 and 8 months postpartum.

There were multiple reasons provided for screening not to have taken place. Some were logistical: a relieving maternal and child health nurse was in attendance and was not familiar with the screening process at that centre; someone other than the mother brought the child to the centre; or a home-based service was provided to the mother and no screening data were available. However, in 42% of cases (when explanations were available) either the maternal child health nurse or the mother made a decision not to do the screening. The nurses involved in delivering the screening programme indicated that whilst there were some cases where screening was refused by the mother, there were also instances where the nurses felt that there was no need to administer the screening instrument because the mother was coping well.

Although the use of a two- or three-question screener instead of the EPDS will reduce administration time, it is unlikely to significantly change the length of the discussion which follows if the woman screens positive. If the screen is administered by nursing
staff, the findings and the options for follow-up may require some discussion. GPs will be responsible for providing further assessment and clinical diagnosis, discussing treatment options, and providing details for accessing the appropriate support services (local mental health services, counselling services, local support groups). Although some training will be required if routine screening is introduced using the PHQ-2, the ability to ask the relevant questions and discuss the options available is part of existing community child health nurse and GP competencies.

Regardless of the screening instrument used, treatment for a mother with PND can be effective only if she accepts help and complies with treatment (Shakespeare, 2001). Convincing women to follow-up after a positive screening and then to enter into treatment after diagnosis is not always straightforward. There is often reluctance for many women to admit that they are unwell or unable to cope, and to seek help from health care professionals (Small et al, 1994; Whitton et al, 1996). The Australian beyondblue National Postnatal Depression programme found that 30-40% of women ignored the advice given after screening to seek help (Buist & Bilszta, 2006). The perceived barriers to treatment included unavailability of resources, reluctance of mothers to seek help, reluctance of family, time pressure, and economic issues.

In a New Zealand study of antenatal screening using the EPDS with a sample of 400 women (completion rate 92.5%, with 13.2% scoring as probably depressed), “severe losses occurred subsequently” when follow-up support was offered, and eventually only one woman received treatment that she rated as valuable (Carter et al, 2005). The authors concluded that while the vast majority of pregnant women were willing to complete a depression screening questionnaire, most did not agree to additional contact for assessment, and either were not offered treatment or did not accept treatment.

It is important to recognise that the screening instrument is not intended to make a ‘diagnosis’ of depression, but to pick up ‘distress’. The use of the screener needs to be backed up with adequate support from secondary care services. The value of any screening programme will depend on the resources available locally and the ability of the woman and her primary care team to access these resources. At present, the availability of specialist secondary care resources, certified psychiatric nurses, psychologists, and psychiatrists, vary enormously throughout New Zealand. Screening creates an expectation of care and thus it could be considered unethical to identify cases of depression if support services are under-resourced and not readily available. Indeed, there is some evidence among Australian GPs of reluctance to identify depression and other maternal postpartum problems for which no standard care can be offered (Gunn et al, 1998). In recommending routine screening for depression in primary care, the US Preventative Services Task Force concluded that depression screening is only effective if coupled with systems changes to appropriately diagnose and treat depression (Pignone et al, 2002).

New Zealand initiatives for PND

In 2003 ProCare in Auckland self-funded a practice nurse-delivered screening programme using the EPDS at two out of three scheduled visits (six weeks, three months, and five months). The EPDS was completed by the mother during the 20 minutes spent in the waiting room after her child’s immunisation. It has been reported
that the project was well accepted by practices and often continued after funding ended (Ferguson, 2007). Over the three years since implementation over 14,000 women have been screened with a PND detection rate (based on EPDS score ≥ 13) of 17%.

A Guideline for Identification of common mental disorders and management of depression in primary care is currently under development by the New Zealand Guidelines Group (NZGG), and includes draft recommendations for screening and managing depression in antenatal and postnatal women. The assumptions used in the economic analysis presented herein are consistent with these NZGG draft recommendations, in particular; (i) targeted screening for common mental disorders is indicated for pregnant and postnatal women (Grade C), (ii) Targeted screening for depression and anxiety should include the use of verbal 2-3 question tools (Grade B), (iii) At a woman’s first contact with primary care, at her ‘booking’ visit and postnatal visit (usually at 4-6 weeks and 3-4 months) routine assessment should include questions that address depression (Grade C), and (iv) First line interventions in the management of women with antenatal or postnatal depression should be brief psychological therapy (e.g., 6 sessions of targeted psychotherapy) or listening therapy (Grade B).

Australian initiatives for PND

Routine PND screening was trialled in Australia between 2001 and 2005 as part of the beyondblue PND Programme. The Programme aimed to determine the value of antenatal screening, information packages and psychological and social interventions. Although the feasibility and acceptability of routine screening was assessed as part of the initiative, the Programme did not attempt to assess any potential benefits of screening in terms of improved outcomes for women and their children. According to the website[^1], beyondblue is currently developing a national approach to translate the outcomes of this research into evidence-based policy and practice.

Over a four-year period from 2001 to 2005, the beyondblue PND Programme provided information and resources about postnatal depression to over 200,000 women and involved the direct screening of over 40,000 women antenatally and 12,000 women postnatally in 43 different health services/regions (Buist & Bilszta, 2006). Antenatal screening was conducted at 26-32 weeks and postnatal screening at 6-8 weeks postpartum, using the EPDS.

Women screened as part of this programme were approached through the antenatal clinics at major maternity hospitals and all women received an educational booklet, which provided resources and contact numbers should they require further help. All screened women showing signs of being at risk of depression were sent a letter suggesting that if they were concerned about their mood or how they were feeling emotionally, they should approach their GP to discuss their concerns. A note was also made in their hospital records and their GP was informed by letter. In addition, GPs were also forwarded a flyer to aid them in assisting patients who presented with a mood disorder, as well as contact numbers for further information or assistance. All women screened antenatally were asked to complete the EPDS again, six to eight

weeks after they had their baby. GPs were invited to participate and have women complete the EPDS at their six-week check-up. If the postnatal screening was conducted by the maternal child health nurses, the GP was notified of any women screened as being at risk of depression.

A major aim of the PND Programme was to increase awareness of perinatal depression amongst the general community and health professionals. This was achieved by a multifaceted approach targeting perinatal women, their families, and health professionals:

- screening as many women as possible and providing them with information about emotional health in pregnancy and early parenthood
- provision of information postnatally in all child health centres in Australia
- promotional posters in antenatal clinics, GP clinics, and Maternal-Child Health centres
- newspaper/magazine articles; television, radio, and promotional activities
- training of health professionals from a variety of different organisations (including maternity/obstetrics, maternal-child health, psychology, psychiatry, community and primary mental health) in the detection and management of perinatal depression
- wide distribution of depression management guides and guides explaining how to use the EPDS.

Further details of the extent of health professional training and the distribution of promotional materials are provided in the Programme’s Final Report (Buist & Bilszta, 2006).

Although the PND Programme did not provide new mental health services, it was anticipated that through better links and referral paths, more women with depression/stress would access their GP and other support services. At end evaluation it was found that there was actually less reliance by GPs on referral to a mental health professional. The authors suggested that this was due to the additional training and support which was successful in helping GPs manage more women with postnatal depression.

Many of the findings from the beyondblue Research Programme are similar to the current situation in New Zealand and elsewhere. The research found that most mothers were unlikely to identify their own depression and were also unlikely to seek treatment if they did feel depressed. The Final Report suggested a number of ways of overcoming barriers to seeking help:

- a critical step in increasing early identification and intervention was linking women to their GP who had been trained to routinely ask about depression
- information about the treatment of depression was helpful in decreasing reluctance of women to consider using antidepressant medication during the postnatal period
- GP training helped to broaden the GPs range of treatment options.

The final recommendations from the PND Programme were as follows:
• a national advocacy group of key stakeholders be formed with the task of promoting the introduction of routine psychosocial assessment and referral pathways and consider relevant training and education needs
• depression screening be a part of routine antenatal and postnatal care
• the use of the EPDS as the best available and most practical screening tool, and use of additional key psychosocial questions to assess risk and plan perinatal care (in particular, level of support, past history of anxiety and depression and current stressors)
• antenatal screening in the third trimester and postnatal screening 6-8 weeks after childbirth
• all pregnant women are provided with an information and resource booklet on emotional health in the perinatal period
• specific resources to address the needs particular groups, such as Indigenous, culturally and linguistically diverse, multiple birth mothers and male partners, be supported
• screening programmes need to be accompanied by ongoing training and support of all relevant health professionals involved in perinatal care
• each obstetric/area-health service needs to develop a local care pathway including appropriate referral and allied-health service links.

The outcomes of this research are currently being used to develop a national approach to the screening and management of women with depression during pregnancy and the postnatal period. beyondblue has joined with experts and key stakeholders to develop a framework to implement national antenatal and postnatal depression screening and develop pathways to care. The framework was anticipated to be completed in late 2007.

The Australian Commonwealth Government budget for 2005 outlined new funding over 2004-08 to enable beyondblue to continue its National Postnatal Depression Programme. It is not clear whether this financial support was intended to continue the Programme already underway, or provide funding for the role-out of the initiative after the framework has been developed.

On the eve of a Federal election in Australia (in November 2007), the Australian Labor party also outlined a National Plan for PND3. Federal Labor has pledged $85 million over five years to improve prevention and early detection of antenatal and postnatal depression, and provide better support and treatment for women with PND. Under the Plan, all mothers will be screened twice, as per the beyondblue PND Programme – once during pregnancy and a follow-up check when the baby is immunised at around two months. Routine screening will be provided by midwives, child and maternal health nurses, and general practitioners. Training will be provided for health professionals to help them screen all mothers and make appropriate referrals so that women who need it can get early access to treatment and support. Additional funding will be provided for psychologists and other allied health professionals through participating general practice and primary care networks. These treatment and support services will include medical treatment, counselling services, and fostering better networks of support groups for new mothers.


Screening for postnatal depression within the Well Child Tamariki Ora Framework.
Screening for postnatal depression within the Well Child Tamariki Ora Framework.
Economic analysis

This section evaluates the potential value for money of implementing screening for maternal PND within the Well Child Tamariki Ora Framework. The analysis is of a comparative nature whereby the proposed programme is compared against current practice. The economic analysis is not intended to be an exhaustive economic evaluation but rather an exploratory analysis, based on a number of necessary assumptions, which represent ‘best estimates’ of the likely costs and benefits associated with the PND screening programme. The analysis is intended for use by the Ministry of Health to inform policy decision-making in conjunction with other information. The content of the economic analysis alone does not constitute clinical advice or policy recommendations.

According to the Well Child Tamariki Ora Framework Options paper (July 2007), the Ministry is proposing that WCPs routinely screen for PND using the two Patient Health Questionnaire (PHQ-2). Specifically, it is proposed that screening be performed at six weeks and four months postpartum. It is anticipated that the screening at six weeks would be performed by a GP or practice nurse, and screening at four months would be performed by a WCP, most likely a Plunket nurse.

Currently, there is no routine screening for PND under the existing Well Child Schedule. However, there are recommended procedures, which are outlined under the Maternal Mental Health section in the Well Child Tamariki Ora Framework. These procedures are aimed at recognising PND early and referring mothers who are affected by PND and other mental health conditions to the appropriate healthcare practitioner. However, current practices by WCPs are understood to vary from region to region depending on resource availability. Consequently, it is difficult to model current practice accurately.

The economic analysis is undertaken from the perspective of the Ministry of Health as a third party payer. The focus is on the immediate costs of implementation to the Ministry and benefits to mothers. This means that out-of-pocket costs to patients are not included in the analysis. Likely costs or savings, and benefits to other government bodies, such as the Ministry of Social Development and the Ministry of Justice, and to society in general are not included in the analysis.

Background to economic analysis

There are a number of studies, which discuss the cost-effectiveness of prevention and management of PND (e.g., Boath et al, 2003; Barrett et al, 2005; Morrell et al, 2000; Petrou et al, 2006) and the feasibility of PND screening (examples include Chaudron et al, 2004; Olson et al, 2005; Olson et al, 2006; Buist & Bilszta, 2006). However, none of the identified published literature reported a formal economic evaluation of a PND screening programme.

Depression in general is estimated to cost the United States $30 to $50 billion each year, which is approximately 0.3-0.4 percent of 2005 US gross domestic product (GDP)\(^4\), in direct medical costs and lost productivity (Robinson et al 2005). Those

\(^4\) www.oecd.org
who are depressed miss work twice as much as the general population. Sobocki (2006) estimated the economic cost of depression in 28 European countries to correspond to approximately one percent of the total European economies (in terms of GDP). Just how much PND contributed to the economic cost of general depression is unclear. Equivalent data for New Zealand were not found. However, based on Sobocki’s findings, one could anticipate economic costs of depression in New Zealand to reach approximately NZ$1.3 billion per annum.

The economic model presented herein is based mainly on the findings of two health technology assessment reports commissioned by NICE (*Antenatal and postnatal mental health: clinical management and service guidance*, October 2006; *Depression: management of depression in primary and secondary care*, 2004). Where necessary, literature searches were conducted specifically for the current report. There are a number of methodological challenges associated with undertaking this analysis. These challenges arise mainly from difficulties in obtaining robust data, defining current screening and treatment practices in New Zealand, and the differential unit costs of providing the new screening programme.

All costs are measured in 2006/2007 New Zealand dollars. The final results are presented in five ways:

1. total estimated costs of the proposed programme
2. incremental costs of the proposed programme
3. cost per additional case of PND detected
4. cost per case of PND resolved
5. cost per QALY gained by women in the post-natal period.

**Model structure**

The economic model is based on a cross-sectional population of mothers of newborns regardless of the number of previous births. The time horizon of the model is 12 months. The model estimates the annual cost of implementing a routine screening programme for PND to these mothers. No ethnicity-specific data were available to inform a sub-group analysis for cost-effectiveness. PND is not found to be critically age-dependant, and hence an analysis by age group would not add any new information, and has not been undertaken.

The model was developed in the form of a decision tree using Microsoft Excel. A diagrammatic representation of the model structure is presented in Figure 1. The explanation of the model structure is divided in two sections: (1) screening, and (2) treatment. Screening and treatment procedures are identical for both the first and the second screens.

**Screening**

After identifying the population of interest, a proportion of women will be screened using a three-question questionnaire to identify those suffering from depression or being at ‘high risk’ of developing depression. The screening procedure itself does not diagnose the illness; rather it identifies early signs of illness. Those who screen positive then require further evaluation by a GP for formal assessment and diagnosis. A proportion of mothers whose symptoms are below the threshold level of depression.
but who are concerned about depression will be referred to a GP to discuss this. After identifying women with PND, the GP will assess the level of severity and allocate appropriate treatment strategies accordingly.

**Treatment**

Those who continue and complete the entire course of treatment will either respond to the treatment (not depressed) or not respond (depressed). The response rate to therapy is reduced in women who discontinue treatment prematurely.

The treatment pathway used in the model is based on NICE Guidance for antenatal and postnatal mental health (2007). The guidance recommends different types of treatment depending on the type of depression, its severity, and the mothers’ circumstances. The scope of the current analysis does not extend to the detailed complexity of treatment procedures or the specifics of treatment delivery in New Zealand. Instead, the current analysis incorporates rates of treatment observed in other populations, and applies average measures of these treatments (i.e., intensity, duration, frequency). Based on the NICE guidance, the model assumes that all mothers diagnosed with severe depression will receive a combination of antidepressants and psychological therapy. In the model, those with mild or moderate depression will receive psychological therapy. Furthermore, it is assumed that a proportion of mothers not diagnosed with PND but who have concerns about their depressive symptoms and who have certain risk factors will receive social support.

The economic analysis therefore assumes that women receive the most appropriate treatment for their level of PND severity. According to the draft NZGG Guidelines for the *Identification of common mental disorders and management of depression in primary care* there is little evidence of the safety of antidepressants during pregnancy and while breast feeding. Consequently, these authors recommend non-pharmacological first line interventions, and consultation with maternal mental health services prior to initiation of antidepressants in these populations. However, in practice, rates of treatment with antidepressants or psychological therapy may be driven by other factors such as access to treatment and cost. In New Zealand, antidepressant medication is considerably less expensive than in other countries and relatively inexpensive compared with psychologist services and this may influence a woman’s choice of therapy.
**Figure 1**  Generalised structure of the economic model

Mothers of newborn babies

<table>
<thead>
<tr>
<th>Proposed Programme</th>
<th>Current practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screened</td>
<td>Screened</td>
</tr>
<tr>
<td>Not screened</td>
<td>Not screened</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positive results</th>
<th>Positive results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results below threshold</td>
<td>Results below threshold</td>
</tr>
<tr>
<td>No Depression</td>
<td>No Depression</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GP consult</th>
<th>GP consult</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Treatment options</th>
<th>Treatment options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue</td>
<td>Continue</td>
</tr>
<tr>
<td>Discontinue</td>
<td>Discontinue</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respond</th>
<th>Not Respond</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respond</td>
<td>Not respond</td>
</tr>
<tr>
<td>Respond</td>
<td>Not respond</td>
</tr>
<tr>
<td>Respond</td>
<td>Not respond</td>
</tr>
<tr>
<td>Respond</td>
<td>Not respond</td>
</tr>
</tbody>
</table>
Population of interest

The population of interest is new mothers in New Zealand who have given birth in any 12 month period. The number of new mothers in the model is adjusted to account for multiple births. The latest statistic available on live births was estimated as at June 2007\(^5\). The proportion of single births in New Zealand has been fluctuating around 97 percent since 2002\(^6\).

The Well Child Tamariki Ora programme is estimated to cover approximately 95 percent of these mothers\(^7\). The study population consists of all mothers of newborns regardless of the number of previous children they have had. Under the proposed programme, all mothers who are screened at 6 weeks postpartum are screened again at 4 months postpartum. The final population entered into the economic model is therefore 56,635 (see Table 1).

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Number of mothers with children enrolled in WCPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items</td>
<td>Numbers</td>
</tr>
<tr>
<td>No. of live births as at June 2007</td>
<td>61,612</td>
</tr>
<tr>
<td>Proportion of single births to All births</td>
<td>97%</td>
</tr>
<tr>
<td>Estimated no. of mothers</td>
<td>59,616</td>
</tr>
<tr>
<td>Well Child coverage</td>
<td>95%</td>
</tr>
<tr>
<td>Total no. of mothers covered by WCP</td>
<td>56,635</td>
</tr>
</tbody>
</table>

Costs and health outcomes

Costs

The model captures direct medical costs associated with both screening and treatment. Screening costs cover the time spent completing the questionnaire and discussing results with mothers. The screening time is assumed to take three minutes under the new proposal and five minutes with current practice. The new programme is expected to consume less time due to the more concise nature of the three-question screener. Olson et al (2006) reported that more than three quarters of Well Child visits in their study required no longer three minutes of screening time using PHQ-2\(^8\). Similar duration can thus be anticipated when employing the three-question screener. The discussion time between the GP and the mother is 30 minutes for both the proposed programme and for current practice. Women that screen positive for PND with the practice nurse/WCP are required to visit a GP to confirm/reject the results of the screening instrument. The average time required to do this assessment is assumed to be 30 minutes.

Treatment costs are broken down into three types of treatment: (i) social support, (ii) psychological therapy, and (iii) a combination of antidepressants and psychological therapy. A proportion of mothers with severe depression may need inpatient care at a secondary healthcare provider, such as a hospital. The model assumes that half of

---

\(^5\) Birth and Death, Statistics New Zealand

\(^6\) Demographic Trend 2006 report, Statistics New Zealand

\(^7\) Source: ‘Criteria for assessing screening programmes’ from Client

\(^8\) Time included some discussion

Screening for postnatal depression within the Well Child Tamariki Ora Framework.
severely depressed non-responders need one day of hospital care and a further GP consultation. Given the known high rate of non-compliance with treatment and/or follow-up in women with postnatal depression, all treatment costs have been adjusted for patients who discontinue treatment. Ten percent of total treatment costs are applied to women who do not comply with therapy.

A number of costs are excluded from the analysis because they fall beyond the scope of this report or because of limitations of the available data. For example, costs associated with infant care, costs of productivity loss, and intangible costs such as the impact that a depressed mother has on her infants’ development have not been captured in these analyses.

It is anticipated that there will be little or no training costs required for implementation of the three-question screener because of its simplicity. Hence, training costs are not incorporated in the model. Media costs are also excluded at this stage. They should be considered if a television or radio campaign is instigated to raise awareness of the new programme in the New Zealand community. Experience from an Australian perspective in raising public awareness of PND screening and the training of relevant health care professionals can be found in the final report of the beyondblue PND Research Program (Buist & Bilszta, 2006).

**Health Outcomes**

The benefits of PND screening are captured in the model in terms of maternal health as well as health-related quality of life. The key health outcomes are: (1) the number of mothers with resolved PND (who are not depressed at endpoint), (2) the number of PND cases detected, and (3) maternal Quality Adjusted Life Years (QALY). QALYs measure changes in the quality of life by assigning utility weights to each health state provided by a programme. One well-known advantage of the QALYs measure is that it allows decision makers to make comparisons across a broad range of similar programmes. **Figure 2** illustrates three main health states used in the current model.

In reality, the benefits of a PND screening programme would not be limited to maternal health outcomes, with health benefits accruing to their children and to society in general. However, there is a lack of reliable and quantifiable data linking maternal PND and its resolution to cases of child maltreatment or child mental and physical development (see the background section for discussion on this). Consequently, the current analysis considers maternal health outcomes only. Discounting of benefits is not required as the time horizon of the model is 12 months.
Cost data and resource use

The cost estimates used in the model are derived by combining the New Zealand unit prices with typical healthcare resource use information. The Well Child Tamariki Ora Framework Options paper (July 2007) briefly outlines resources required for the screening component of the programme but it does not define in any detail the resource requirements for the various treatment strategies. The data on current screening practice have been drawn from discussion with relevant professionals. Resource use data have been drawn from NICE guidance (2004, 2007). Given that there is no intention to change treatment strategies, the treatment options and procedures are assumed to be identical for current practice and the proposed programme. In other words, any change to the number of PND cases detected will not influence how these PND cases are subsequently managed.

Discounting of costs is not required as the time horizon of the model is 12 months. Table 2 shows the unit cost prices (measured in 2006/2007 New Zealand dollars) applied to the economic model. Note that the unit cost per hour for a clinical psychologist and the unit cost per visit for a GP are from the perspective of the Ministry of Health (rather than private practice). Resource use data are presented in Table 3.
### Table 2  Unit costs applied in the economic model

<table>
<thead>
<tr>
<th>Items</th>
<th>Unit costs (2006/2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical psychologist per hour &lt;sup&gt;a&lt;/sup&gt;</td>
<td>$40</td>
</tr>
<tr>
<td>Registered nurse per hour &lt;sup&gt;b&lt;/sup&gt;</td>
<td>$28</td>
</tr>
<tr>
<td>GP per visit (assumed 15 minutes per visit) of patient contact &lt;sup&gt;c, d&lt;/sup&gt;</td>
<td>$14</td>
</tr>
<tr>
<td>Qualified community counsellor per hour (nurse rate as a proxy)</td>
<td>$28</td>
</tr>
<tr>
<td>40mg/day generic fluoxetine (2 capsules per day), for 12 weeks &lt;sup&gt;e&lt;/sup&gt;</td>
<td>$9.90</td>
</tr>
<tr>
<td>Hospital care per day &lt;sup&gt;f&lt;/sup&gt;</td>
<td>$676</td>
</tr>
<tr>
<td>Prescription charges over 12 weeks of fluoxetine &lt;sup&gt;g&lt;/sup&gt;</td>
<td>$14</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- **GP:** general practitioner
- **a** Psychologist Workforce in New Zealand 2003, Ministry of Health New Zealand
- **b** Mental Health & Public Health Nursing, Lower North Island, PSA & DHB MECA
- **c** PHARMAC: Prescription for Pharmacoeconomic Analysis – Method for cost-utility analysis
- **d** Consumer Price Index, Weighted average retail prices of selected item, September 07 – December 06 quarter
- **e** PHARMAC – New Zealand Pharmaceutical Schedule, August 2007
- **f** National Hospital Cost Data Collection Cost Report Round 9 (2004-05), Mental Health Treatment (U60Z)
- **g** PHARMAC – interactive schedule (Adult with Community Services Cards)

### Table 3  Resource use data <sup>a</sup>

<table>
<thead>
<tr>
<th>Resource use</th>
<th>Cost per person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Psychological therapy (IPT or CBT): 8 sessions (50 minutes each), provided by a clinical psychologist</td>
<td>$268</td>
</tr>
<tr>
<td>Social support: 3 groups sessions (5 women) + 3 phone contacts by a qualified counsellor (30 minute each)</td>
<td>$59</td>
</tr>
<tr>
<td>Combination therapy: 16 sessions (50 minute each) of psychological therapy by a clinical psychologist and 12 week’s antidepressant therapy</td>
<td>$561</td>
</tr>
</tbody>
</table>

**Abbreviations:**
- **CBT:** cognitive behavioural therapy; **IPT:** interpersonal therapy
- **a** Source: NICE 2004 and 2007

### Model parameters

Where available, the model parameters and their values are drawn from the literature. Some parameters are adjusted based on discussions with New Zealand healthcare professionals as well as the published literature.

**Table 4** shows the base case parameter values applied to the screening component of the model. It is assumed that the proportion of mothers screened for PND will be higher under the proposed programme than is currently the case. It is clear from the background discussion that a large proportion of new mothers in New Zealand are not currently screened for PND. However, evidence from other jurisdictions indicates that
even with a routine screening programme in place, not all mothers will be screened, amongst other things because some children will be taken to the visit by a caretaker instead of the mother (Armstrong & Small, 2007). Additionally, some drop-out can be expected between Well Child visits (Olson et al 2006). Thus, it is assumed in the model that 50% of women would be screened under current practice (without formalised screening), while in the proposed programme 85% will be screened at the first screening visit (assuming that 15% of mothers will not be screened) and 70% at the second screening visit (allowing for 15% drop-out).

It is anticipated that 16% of New Zealand women suffer from PND (Thio et al 2006). This is within the range seen internationally (10 to 20%, see background discussion). The model assumes that 78% of these women have an onset of PND prior to six weeks postpartum, the remaining 22% of women develop PND between 6 weeks and 4 months postpartum (Stowe et al 2005).

Given if there is no routine screening in place (as in current practice in New Zealand), it is still reasonable to assume that all cases of severe depression will nonetheless be detected. Olson et al (2006) found that 6% of new mothers have depression that is classified as severe. Thus, it is assumed in the model that current practice will detect depression in 6% of postnatal women.

Thio et al (2006) reported that 14% of mothers had sub-threshold levels of depression that may develop into major depression over time if left untreated. These women have been captured in the current model, and it is assumed that they will receive support group therapy. The model assumes that under the proposed programme 14% of women with sub-threshold symptomatology will be detected. As for women who screen positive, the detection of women with sub-threshold symptomatology is proportioned in the model between the first and second screening visit. It is assumed that current practice detects half (i.e., 7%) of women with sub-threshold levels of depression.

The three-question screener is assumed to have the same diagnostic performance in detection of PND as observed in general depression, i.e., sensitivity 96% and specificity 89% (Arroll et al 2005). In the base case of the model, current practice using the EPDS is assumed to have the same sensitivity and specificity as the three-question screener. This assumption is tested in sensitivity analyses.

The evidence in the literature suggests that despite screening positive for PND, a substantial proportion of women may not commence treatment. There are a number of issues that affect rates of treatment, primarily related to: (i) availability of resources, and (ii) patient willingness to receive treatment. However, in the absence of reliable data regarding likely uptake rates in New Zealand, the treatment up-take rates used in the base case of the model are assumed to be 100%. The base case scenario therefore assumes that all diagnosed patients have adequate and timely access to treatment (with this assumption explored in sensitivity analyses).
Table 4  Model parameters - screening

<table>
<thead>
<tr>
<th>Model parameter</th>
<th>Value Proposed</th>
<th>Value Current</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportions of mothers screened</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First screen</td>
<td>85%</td>
<td>50%</td>
<td>Assumes 15% of mothers will not be screened because they refuse to or do not attend the visit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Based on personal communication with a WCP</td>
</tr>
<tr>
<td>Second screen</td>
<td>70%</td>
<td>-</td>
<td>Assumes 15% drop-out (Olson et al 2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportions of mothers with PND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First screen (&lt; 6 weeks postpartum)</td>
<td>12%</td>
<td>6%</td>
<td>Thio et al (2006), Stowe et al (2005)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Olson et al (2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of women who have sub-threshold symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First screen</td>
<td>11%</td>
<td>7%</td>
<td>Thio et al (2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Based on personal communication with a WCP</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Screening test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>96%</td>
<td>96%</td>
<td>Arroll et al (2005)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arroll et al (2005)</td>
</tr>
<tr>
<td>Specificity</td>
<td>89%</td>
<td>89%</td>
<td>Arroll et al (2005)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Arroll et al (2005)</td>
</tr>
<tr>
<td>Uptake of treatment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uptake of treatment</td>
<td>100%</td>
<td>100%</td>
<td>Assumes that all diagnosed patients have access to treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Assumes that all diagnosed patients have access to treatment</td>
</tr>
</tbody>
</table>

Abbreviations: PND, postnatal depression; WCP, Well Child Provider

Table 5 presents the parameters used in the treatment components of the economic model. It is important to note that the introduction of the routine screening programme does not change the subsequent treatment protocols offered to women with PND, nor does it alter the effect of this treatment. Therefore the treatment parameters used in the model are identical for both the proposed and current arms of the model.
Table 5  Model parameters - treatment

<table>
<thead>
<tr>
<th>Model parameter</th>
<th>Value</th>
<th>Source</th>
<th>(\text{Source} )</th>
<th>(\text{Source} )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PND disease severity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Clinical outcome parameters</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probability of continuing and completing treatment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination therapy (severe)</td>
<td>75%</td>
<td>75%</td>
<td>NICE (2007)</td>
<td>NICE (2007)</td>
</tr>
<tr>
<td>Probability of mothers responding after completing treatment:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination therapy (severe)</td>
<td>62%</td>
<td>62%</td>
<td>NICE (2007)</td>
<td>NICE (2007)</td>
</tr>
<tr>
<td>Probability of mothers responding after prematurely discontinuing:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social support (sub-threshold)</td>
<td>77%</td>
<td>77%</td>
<td>NICE (2004)</td>
<td>NICE (2004)</td>
</tr>
<tr>
<td>Combination therapy (severe)</td>
<td>38%</td>
<td>38%</td>
<td>NICE (2007)</td>
<td>NICE (2007)</td>
</tr>
</tbody>
</table>

Abbreviations: NICE, National Institute for Health and Clinical Excellence; PND, postnatal depression

Utility values were obtained from Revicki and Wood (1998), which reported health state utilities for a general patient population with depression, using antidepressant medication (Table 6). Their findings are used as a proxy for our cost-utility analysis for PND because no studies were found reporting utility weights specific to women with PND.

Table 6  Health state utility values

<table>
<thead>
<tr>
<th>Health state utility</th>
<th>Value</th>
<th>(\text{Source} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe symptoms</td>
<td>0.30</td>
<td>Revicki and Wood (1998)</td>
</tr>
<tr>
<td>Mild or moderate symptoms</td>
<td>0.63</td>
<td>Revicki and Wood (1998)</td>
</tr>
<tr>
<td>Sub-threshold symptoms</td>
<td>0.80</td>
<td>Revicki and Wood (1998)</td>
</tr>
<tr>
<td>Response, drug + psychological treatment</td>
<td>0.80</td>
<td>Revicki and Wood (1998)</td>
</tr>
<tr>
<td>Response, without drug-associated disutility</td>
<td>0.86</td>
<td>Revicki and Wood (1998)</td>
</tr>
</tbody>
</table>

Figure 3 shows a simplified diagram of utility weights by week for a typical patient treated for PND. Notice that a responder who receives antidepressants does not fully recover to a normal health state. This is due to adverse effects of treatment with antidepressants. By contrast, psychological treatment and social support are not expected to have any significant side effects. Therefore a responder to either of these
treatments would experience a full recovery to normal health (i.e., a return to a utility weight of 0.86). Appendix 2 presents graphical presentations of utility weights by week in mild/moderate and severe health states, as used in the model.

**Figure 3** Utility weight over time for a patient diagnosed and treated for severe depression

Assumptions

The following assumptions underpin the exploratory economic analysis and must be kept in mind when interpreting the results:

1. at the beginning of the model, all mothers are in a normal health state
2. all mothers who are screened positive for PND have access to a GP consultation
3. GPs correctly identify all women with PND (i.e., true positives) and exclude women with false positive test results
4. on average, mothers begin experiencing PND at the end of the fourth week postpartum. 78% develop PND symptoms over the next four weeks and the remaining 22% develop the symptoms more slowly over the next three and a half months (Stowe et al 2005)
5. on average, treatment is initiated two weeks after detection
6. women who respond to treatment return to normal utility six weeks after initiation of therapy. ‘Normal’ utility is 0.86 for social support and psychological therapy, and 0.80 for combination therapy (due to the disutility associated with antidepressant drug therapy)
7. half of non-responders who receive social support and psychological therapy have their depression resolved within six months of PND onset
8. non-responders with severe depression remain depressed for the entire model. Non-responders with mild or moderate depression resolve spontaneously within six months. Spontaneous resolution to their normal health state occurs over the last weeks of the six month period.

9. there are likely to be no significant adverse effects in women who receive a false positive result from screening. Any effects are likely to be transient and brief because it is assumed that all women who screen positive for PND will see a GP and be correctly diagnosed.

10. deterioration and improvements between health states always occur in a linear fashion over time.

11. undetected cases remain in the depressed health states throughout the modelling period.

12. all treatments take place at publicly-funded organisations.

**Results**

The results of the economic analysis are presented in five ways:

1. the total programme costs
2. the incremental programme costs
3. the incremental cost per PND case detected
4. the incremental cost per PND case resolved
5. the cost per QALY gained.

The incremental cost-effectiveness of the proposed programme is expressed as additional costs per unit of outcome or benefit associated with the proposal screening programme compared with current practice. Similarly the cost per QALY gained is stated as additional costs per QALY associated with the proposal screening programme compared with current practice. The base case results are presented in Table 7 and results from the sensitivity analyses are presented in Table 8.

**Table 7  Base case results from the economic analysis**

<table>
<thead>
<tr>
<th>Title</th>
<th>Proposed programme</th>
<th>Current practice</th>
<th>Incremental difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total programme cost</td>
<td>$3,854,716</td>
<td>$1,722,479</td>
<td>$2,132,238</td>
</tr>
<tr>
<td>Screening cost</td>
<td>$783,519</td>
<td>$304,831</td>
<td>$478,688</td>
</tr>
<tr>
<td>Treatment cost</td>
<td>$3,071,197</td>
<td>$1,417,648</td>
<td>$1,653,549</td>
</tr>
<tr>
<td>PND cases detected</td>
<td>13,781</td>
<td>6,361</td>
<td>7,420</td>
</tr>
<tr>
<td>PND cases resolved</td>
<td>9,900</td>
<td>4,570</td>
<td>5,330</td>
</tr>
<tr>
<td>Total QALYs gained</td>
<td>46,875</td>
<td>46,259</td>
<td>616</td>
</tr>
<tr>
<td>Cost per additional case of PND detected</td>
<td>$287</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per additional case of PND resolved</td>
<td>$400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost per additional QALY gained</td>
<td>$3,461</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Abbreviations: PND, postnatal depression; QALY, quality adjusted life year*
The total annual cost of implementing routine screening for PND is estimated to be approximately $3,854,716 compared with current practice which is estimated to cost $1,722,479. This yields an incremental total annual cost of $2,132,238. On a yearly basis, the cost per year of routine screening is clearly more expensive but it is associated with considerable maternal health benefits. The number of mothers who have depressive symptoms resolved at endpoint in the proposed programme is estimated to be 9,900 compared with 4,570 estimated under current practice.

The total cost of the programme ($3,854,716) incorporates costs associated with (i) screening ($783,519), and (ii) treatment ($3,071,197). Thus, the treatment component represents the greater part (80%) of the total cost of the programme, and will be shared between the Ministry, PHARMAC, and the District Health Boards.

The additional cost of moving from the current practice to implementing a routine screening programme is $2,132,238 per year. The routine screening programme is expected to detect 7,420 extra cases and deliver 5,330 extra PND cases resolved. The incremental cost per additional case detected is $287 and the incremental cost per additional case resolved is $400.

In the base case, the cost per additional QALY gained with the introduction of a routine screening programme for PND is $3,461. The robustness of this estimate is tested in sensitivity analyses.

**Sensitivity analyses**

In any economic evaluation, it is important to examine the robustness of the results to the assumptions made to account for parameter uncertainty. Simple univariate and multivariate sensitivity analyses have been conducted to explore the effect of varying key assumptions on the final results.

The following tables present the results of the univariate (Table 8) and multivariate (Table 9) sensitivity analyses.
Table 8  Univariate sensitivity analyses

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total cost of proposed programme ($ million)</th>
<th>Cost per additional case of PND resolved</th>
<th>Cost per QALY gained (ICER)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base case results</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.461</td>
<td>-</td>
</tr>
<tr>
<td><strong>Unit costs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average subsidy rate per GP is $27</td>
<td>$4.575</td>
<td>$491</td>
<td>$4.245</td>
<td>MoH</td>
</tr>
<tr>
<td>Average subsidy rate per GP is $50</td>
<td>$5.816</td>
<td>$647</td>
<td>$5.596</td>
<td>PHARMAC</td>
</tr>
<tr>
<td>Hourly rate of clinical psychologist: $30</td>
<td>$3.280</td>
<td>$342</td>
<td>$2.959</td>
<td>MoH</td>
</tr>
<tr>
<td>Hourly rate of clinical psychologist: $100</td>
<td>$7.214</td>
<td>$739</td>
<td>$6.397</td>
<td>Assumption</td>
</tr>
<tr>
<td><strong>Screening component</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPDS: sensitivity of 68% and specificity of 96%</td>
<td>$3.855</td>
<td>$396</td>
<td>$3.216</td>
<td>Validity studies</td>
</tr>
<tr>
<td>EPDS: sensitivity of 88% and specificity of 78%</td>
<td>$3.855</td>
<td>$385</td>
<td>$3.241</td>
<td>Validity studies</td>
</tr>
<tr>
<td>Use PHQ-2 as a proposed screener - Specificity 78%</td>
<td>$4.075</td>
<td>$441</td>
<td>$3.819</td>
<td>Option paper</td>
</tr>
<tr>
<td>Treatment uptake is 60%</td>
<td>$2.626</td>
<td>$460</td>
<td>$5.568</td>
<td>Roman-Clarkson <em>et al</em> 1990, and McGill <em>et al</em> 1995</td>
</tr>
<tr>
<td>Treatment uptake is 30%</td>
<td>$1.705</td>
<td>$610</td>
<td>$9.607</td>
<td>beyondblue final report</td>
</tr>
<tr>
<td><strong>Treatment component</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-responders’ depression not resolved in 6 months</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.803</td>
<td>Assumption</td>
</tr>
<tr>
<td>Probability of responding after completing treatment for severe depression: 50%</td>
<td>$3.939</td>
<td>$419</td>
<td>$3.835</td>
<td>Assumption</td>
</tr>
<tr>
<td>Probability of responding after completing treatment for severe depression: 70%</td>
<td>$3.798</td>
<td>$388</td>
<td>$3.243</td>
<td>Assumption</td>
</tr>
<tr>
<td>Probability of responding after completing treatment for mild and moderate depression: 50%</td>
<td>$3.855</td>
<td>$419</td>
<td>$3.635</td>
<td>Assumption</td>
</tr>
<tr>
<td>Probability of responding after completing treatment for mild and moderate depression: 70%</td>
<td>$3.855</td>
<td>$385</td>
<td>$3.331</td>
<td>Assumption</td>
</tr>
<tr>
<td><strong>Utility weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Utility weight for severe depression 0.23</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.237</td>
<td>NICE 2004</td>
</tr>
<tr>
<td>Utility weight for severe depression 0.37</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.718</td>
<td>NICE 2004</td>
</tr>
<tr>
<td>Utility weight for mild and moderate depression 0.58</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.227</td>
<td>NICE 2007</td>
</tr>
<tr>
<td>Utility weight for mild and moderate depression 0.76</td>
<td>$3.855</td>
<td>$400</td>
<td>$4.264</td>
<td>NICE 2007</td>
</tr>
<tr>
<td>Utility weight for response 0.76</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.218</td>
<td>NICE 2007</td>
</tr>
<tr>
<td>Utility weight for response 0.84</td>
<td>$3.855</td>
<td>$400</td>
<td>$3.744</td>
<td>NICE 2007</td>
</tr>
</tbody>
</table>

Abbreviations: EPDS, Edinburgh Postnatal Depression Scale; GP, general practitioner; ICER, incremental cost-effectiveness ratio; NICE, National Institute for Health and Clinical Excellence; PHQ, Patient Health Questionnaire; PND, postnatal depression; QALY, quality adjusted life year

* Psychologist Workforce in New Zealand 2003, Ministry of Health

Screening for postnatal depression within the Well Child Tamariki Ora Framework.
### Table 9  Multivariate sensitivity analyses

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Total cost of proposed programme ($ million)</th>
<th>Cost per additional case of PND resolved</th>
<th>Cost per QALY gained (ICER)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment uptake of 60% and GP subsidy is $50</td>
<td>$4.579</td>
<td>$870</td>
<td>$8,637</td>
<td>Roman-Clarkson et al 1990, McGill et al 1995, and PHARMAC</td>
</tr>
<tr>
<td>Treatment uptake of 60% and GP subsidy is $27</td>
<td>$3.343</td>
<td>$810</td>
<td>$6,062</td>
<td>Roman-Clarkson et al 1990, McGill et al 1995, and MoH</td>
</tr>
</tbody>
</table>

*Abbreviations:* GP, general practitioner; ICER, incremental cost-effectiveness ratio; PND, postnatal depression; QALY, quality adjusted life year

### Comparison of cost-utility ratios in New Zealand

The National Screening Unit (NSU) is currently responsible for five screening programmes, with several others under evaluation. A search was conducted of the NSU and MoH websites for publications relating to these programmes. These publications were searched for cost-utility analyses. Where available, the cost per QALY of each of the screening or vaccination programmes was tabulated (Table 10). Compared with other New Zealand screening programmes, the PND programme as it is modelled herein appears to be highly cost-effective.
### Table 10  Comparison of cost-utility ratios in New Zealand

<table>
<thead>
<tr>
<th>Economic evaluation</th>
<th>Author</th>
<th>Population</th>
<th>Interventions compared</th>
<th>Economic analysis</th>
<th>Cost ($) per QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmes under the National Screening Unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenatal HIV screening programme</td>
<td>No relevant documents located</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BreastScreen Aotearoa</td>
<td>Szeto KL and Devlin NJ, 1996</td>
<td>All people aged 50-64 years</td>
<td>No screening</td>
<td>Cost-utility</td>
<td>19,000 – 22,000</td>
</tr>
<tr>
<td>Newborn Metabolic Screening Programme</td>
<td>No relevant documents located</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Universal Newborn Hearing Screening Programme</td>
<td>Centre for Health Services Research and Policy, School of Population Health, School of Population Health, University of Auckland.</td>
<td>Current practice</td>
<td></td>
<td>Cost-effectiveness</td>
<td>-</td>
</tr>
<tr>
<td>Antenatal screening for Down syndrome</td>
<td>Stone P, Auckland UniServices Limited, Feb 2006</td>
<td>Cost-effectiveness not conducted</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Colorectal cancer screening</td>
<td>Health Outcomes International for the National Screening Unit, March 2006</td>
<td>All people aged 50-74 years</td>
<td>FOBTg, FOBTi, FS, vs no screening programme</td>
<td>Cost per life year gained, cost-utility</td>
<td>FOBTg 20,000 a, FOBTi 22,000–45,000 a,b, SG 100,000–106,000 a,c</td>
</tr>
<tr>
<td>Chlamydia Screening</td>
<td>Sherwood J, MoH, July 2006</td>
<td>Reports cost per case of sequelae averted</td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
**Table 10  Comparison of cost-utility ratios in New Zealand (continued)**

<table>
<thead>
<tr>
<th>Economic evaluation</th>
<th>Author</th>
<th>Population compared</th>
<th>Interventions compared</th>
<th>Economic analysis</th>
<th>Cost ($) per QALY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccination against meningococcal disease</td>
<td>Milne et al, Nov 2001</td>
<td>(i) All individuals &lt;20 years of age; (ii) individuals &lt;20 years of age living in high-risk regions; (iii) all individuals &lt;5 years of age</td>
<td>Vaccination against serogroup B meningococcal disease vs no vaccination programme</td>
<td>Cost-utility</td>
<td>$&lt;70,000\text{ d}</td>
</tr>
</tbody>
</table>

*Abbreviations:* FOBTg, Guaiac foetal occult blood testing; FOBTi, immunochromatographic foetal occult blood testing; QALY, quality adjusted life year; SG, flexible sigmoidoscopy

\textsuperscript{a} Discounted at 5%; 40% participation rate

\textsuperscript{b} $22,000$ at 8% positivity, $30,000$ at 4% positivity, $45,000$ at 2% positivity

\textsuperscript{c} $100,000$ at 60 years only; $106,000$ at 55 and 65 years

\textsuperscript{d} Discounted at 5%

**Discussion**

Based on the incremental cost per QALY in the exploratory economic model, the analyses indicate that the introduction of a formalised screening programme for postnatal depression during Well Child visits is likely to provide good value for money when compared to current practice. Given that no published formal economic evaluations of PND screening programmes are available, we are unable to compare our findings internationally. However, comparisons against other New Zealand screening programmes reveal that the PND programme appears cost-effective (see Table 10). This is not surprising given the significant improvements in morbidity associated with the successful treatment of PND, the low cost of applying the screening tool, and the low cost of antidepressant therapy in New Zealand.

The cost-effectiveness of the proposed PND screening programme falls below the level that would have been considered for funding under the PHARMAC model. Based on World Health Organisation (WHO) criteria, a study by Resch \textit{et al} (2006) suggested a cost-utility ratio that was less than the per capita GDP to be highly cost-effective. The New Zealand per capita GDP at 2006/2007 (March year) was $31,036.\textsuperscript{9} Using this criterion, the introduction of a formalised screening programme for PND appears to represent good value for money.

It is estimated that the total cost to government of introducing a formalised PND screening programme could be between $1.7 million and $7.2 million. Approximately 70% of these costs are due to the cost of the psychosocial and pharmaceutical treatment of PND. Screening costs such as the cost of time spent completing the questionnaire and discussing positive results with a GP explain the vast majority of the remaining costs.

\textsuperscript{9} Gross Domestic Product: June 2007 quarter, Statistics NZ (production measure)
In sensitivity analyses, the exploratory economic model was found to be most sensitive to the proportion of mothers that were diagnosed with PND that accessed and initiated appropriate treatment. The ICER increases from $3,461 to $5,568 when treatment up-take was reduced from 100% to 60%. The ICER further increased to $9,607 when treatment up-take rate was reduced to 30%. This emphasises the importance of ensuring that women who have PND have timely access to adequate treatment. As discussed in the literature (NICE 2007, Olson et al 2006, and Buist & Bilszta, 2006), it is important to ensure that an appropriate referral pathway is in place if screening for PND is to be of value in New Zealand.

Given the sensitivity of the model results to the treatment uptake estimate, and the average level of subsidy a GP receives, we examined the robustness of these two key parameters simultaneously. The multivariate analyses showed the cost-effectiveness ratio to be reasonably sensitive to the combined effect of the two parameters (Table 9). The ratio, however, remains below the theoretical cost-effectiveness threshold of WHO and below the level at which funding might be considered under the PHARMAC model. Furthermore, increasing the cost of clinical psychologist visits to $100 per hour (a level which is thought to better reflect costs in private practice) increased the ICER to $6,397 per QALY, which is still well within the bounds of what would be considered cost-effective in the New Zealand context.

It is important to note that the three-question screener has not been validated in Asian and Pacific Island mothers. There is no information available on the use of this screening instrument in these populations. Due to this lack of information the economic model assumes that the screening device has the same diagnostic performance in these populations as seen in the general community. It is worthwhile noting that Asian and Pacific Island mothers represent approximately 21% of the total cohort of mothers in New Zealand. But although this represents a gap in the knowledge of the performance of the screening tool, it is unlikely to alter the results of the exploratory economic model markedly.

It is also important to note that the economic model does not capture the psychosocial impact on a women’s health-related quality of life of being incorrectly identified as being at risk of PND. This impact is difficult to quantify and, in general, is likely to be transient and brief and therefore unlikely to significantly alter the results of the exploratory model.

The economic model captures some of the costs of women being incorrectly identified as being at risk of PND. These women are assumed to visit their GP where they are correctly diagnosed. Therefore, the lower the specificity of the screening instrument the less cost-effective the screening programme becomes.

It is important to note that this analysis focuses on maternal outcomes and maternal health-related quality of life improvements. The model does not capture the impact of the successful treatment of PND to children and society in general. Therefore, the ICER results from the exploratory model can be considered conservative. Some of the additional benefits to society that readers may wish to consider include: the reduction in the rates of divorce, reduced rates of suicide and infanticide, improved

---

10 Demographic trend 2006, Statistics NZ
opportunities for normal child development, improvements in productivity, and the reduction in dependence on social welfare services and resources.

**Conclusion**

In the New Zealand context the proposed routine screening programme for PND within the Well Child framework appears to be highly cost-effective from a government perspective, when compared with current practice. However, one must keep in mind that the economic study conducted herein is only intended to be an exploratory analysis and is based on a number of necessary assumptions, which represent ‘best estimates’ of current practice and the likely costs and benefits associated with the introduction of formalised screening.

It is important to recognise that the value of any screening programme for PND will be dependent on the resources available locally and the ability of the woman and her primary care team to access these resources. Thus, screening for PND will only be effective if coupled with systems changes so that women can be appropriately diagnosed and treated. Many of the changes to practice needed to achieve better PND-related outcomes are currently not publically funded to sufficient levels (e.g., support groups and psychologist sessions). Consequently, consideration may need to be given as to whether such costs should be funded by government if the proposed PND screening programme is to be effective at a national level.
References


Boath E, Major K, Cox J. When the cradle falls II: the cost-effectiveness of treating postnatal depression in a psychiatric day hospital compared with routine primary care. J Affective Disorders 2003;74:159-166.


Screening for postnatal depression within the Well Child Tamariki Ora Framework.


Appendix 1

This report involved broad searching of the grey literature, Government websites, the Cochrane Library, and health technology assessment agencies. In addition, Medline and EMBASE were searched using EMBASE.com to identify:

- economic evaluations of screening programmes for PND
- PND articles specific to New Zealand
- child health outcomes as a consequence of PND.

The search strategies are shown below.

<table>
<thead>
<tr>
<th>Search terms</th>
<th>Number of articles identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search for economic evaluations</td>
<td></td>
</tr>
<tr>
<td>#1: ‘puerperal depression/syn a</td>
<td>2,882</td>
</tr>
<tr>
<td>#2: ‘screening’/exp OR ‘screening’</td>
<td>379,708</td>
</tr>
<tr>
<td>#3: #1 AND #2</td>
<td>393</td>
</tr>
<tr>
<td>#4: (‘cost effectiveness analysis’/exp OR ‘cost effectiveness analysis’) OR (‘economic evaluation’/exp OR ‘economic evaluation’) OR (‘health economics’/exp OR ‘health economics’) OR (‘cost minimization analysis’/exp OR ‘cost minimization analysis’) OR (‘cost minimisation analysis’) OR (‘cost utility analysis’/exp OR ‘cost utility analysis’) OR (‘quality adjusted life year’/exp OR ‘quality adjusted life year’) OR (‘qaly’/exp OR ‘qaly’) OR (‘life year saved’)</td>
<td>399,148</td>
</tr>
<tr>
<td>#5: #3 AND #4</td>
<td>18</td>
</tr>
<tr>
<td>Search for PND articles specific to New Zealand</td>
<td></td>
</tr>
<tr>
<td>#1: ‘puerperal depression/syn a</td>
<td>2,903</td>
</tr>
<tr>
<td>#2: ‘New Zealand’/exp OR ‘New Zealand’</td>
<td>114,545</td>
</tr>
<tr>
<td>#3: #1 AND #2</td>
<td>74</td>
</tr>
<tr>
<td>Search for child health outcomes</td>
<td></td>
</tr>
<tr>
<td>#1: ‘child behavior’/exp OR ‘child abuse’/exp OR ‘child welfare’/exp OR ‘mother child relation’/exp OR ‘child health care’/exp OR (‘behavior disorder’/exp AND (‘child’/exp OR ‘child’ OR ‘children’/exp OR ‘children’ OR ‘baby’/exp OR ‘baby’ OR ‘offspring’/exp OR ‘offspring’ OR babies))</td>
<td>157,485</td>
</tr>
<tr>
<td>#2: ‘puerperal depression/syn a</td>
<td>575</td>
</tr>
</tbody>
</table>

* Synonym term includes depression, postpartum; depression, puerperium; post partum depression; postnatal depression; postpartum depression; puerperium depression
Appendix 2

Figure 4  Utility weights over time in the mild/moderate health state

CURRENT: Weekly QALY weights as used in mild/moderate PND

PROPOSED: Weekly QALY weights as used in mild/moderate PND

Abbreviations: PND, postnatal depression; QALY, quality-adjusted life year
Figure 5  Utility weights over time in the severe health state

CURRENT: Weekly QALY weights as used in severe PND

PROPOSED: Weekly QALY weights as used in severe PND

**Abbreviations:** PND, postnatal depression; QALY, quality-adjusted life year

Screening for postnatal depression within the Well Child Tamariki Ora Framework.