Health service use and costs for infant behaviour problems and maternal stress

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Short title: Service use in six months post-partum.

Abbreviation: EPDS - Edinburgh Postnatal Depression Scale; MCH- Maternal and child health; GP- General Practitioners; HS- Health services.

Key words: infant behaviour, maternal depression, health service use.

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What is already known on this topic: (40 words)

Problems with feeding, sleeping and crying are prevalent in infancy and associated with postnatal depression and high service use in the first year. Costs of service use associated with these infant problems or maternal depressive symptoms have not been reported.

What this study adds: (40 words)

Costs for relevant services over the first six months post-partum are higher for infants with feeding problems, and mothers experiencing depressive symptoms. Single mothers have higher service use for depressive symptoms. Non-English speaking may be a barrier to service use.

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Contributors' Statement

Mrs Ha D.N Le: contributed to the study design, conducted the analysis in conjunction with Drs Gold and Mensah, drafted the manuscript, revised and reviewed the manuscript.

Associate Professor Lisa Gold: contributed to the design of the study and data analysis, revised and reviewed the manuscript.

Dr Fiona Mensah: contributed to the design and data analysis of the study, revised and reviewed the manuscript.

Dr Fallon Cook: contributed to the design and data analysis of the study, coordinated the implementation of the trial and revised and reviewed the manuscript.

Associate Professor Jordana Bayer: contributed to the conceptualization of the study, revised and reviewed the manuscript.

Associate Professor Harriet Hiscock: contributed to the conceptualization and the design of the study, revised and reviewed the manuscript.

All authors approved the final manuscript as submitted.

Abstract

Objective: Health Service (HS) use by mothers is high in the first postnatal year. Infant crying, feeding or sleeping problems are the most common reasons for parents to seek professional help. We aim to describe health service use in the first six months post-partum and to examine the associations between service costs, infant behaviour and maternal depressive symptoms.

Methods: Participants were 781 infants and mothers in Melbourne, Australia. Mothers reported infant feeding, sleeping and crying problems, depressive symptoms, and HS use. Costs were valued in 2012 Australian dollars.

Results: The most common services used were Maternal Child Health Nurses (MCHN), General Practitioners (GP) and allied health. Infant feeding problems were associated with increased costs for services relevant to infant behaviour including MCHN ($p=.007$), GP ($p=.008$) and paediatricians ($p=.03$). Maternal depressive symptoms were associated with increased costs for services relevant to depressive symptoms including parenting centres ($p=.04$), GP ($p=.004$), psychiatrists ($p=.02$) and psychologists ($p=.001$). Mothers who completed high school had higher service costs for infant problems than those with lower education ($p=.02$). Single mothers had increased costs for services used for their depressive symptoms than partnered mothers ($p<.001$). Mothers with English as a second language had lower service costs for their depressive symptoms ($p=.02$).

Conclusions: Infant feeding problems and maternal depressive symptoms are associated with higher costs for health services relevant to these conditions. Cost-effective strategies to manage these conditions are needed with accessibility being ensured for mothers who are experiencing social adversity.

Background

Understanding patterns of health care utilisation is important for planning and developing services, to inform policy-makers of efficient funding allocation, and to train an adequate professional workforce.

Health service (HS) use by mothers is high in the first year of a child's life.¹ Following childbirth, maternal physical health problems such as back pain, fatigue,² and anaemia are common.^{3,4} Infant 'regulatory' problems with sleeping and crying are also reported by 15-35% and 14-28% of parents, respectively and sleep and crying problems often co-exist.⁵ During the first postnatal year, parents often seek help because of excessive infant crying or poor infant feeding or sleeping behaviour.⁶ Australia's Medicare program provides universal access to medical and hospital services.⁷ In Victoria, families have free access to the maternal and child health (MCH) nursing service and most have wholly-subsidised access to general practitioners' (GPs) services. Gunn et al. used aggregated Medicare data to examine the use of GPs services by mothers and babies in the six months post-partum with a sample of Victorian babies born in 1993.⁸ They found that mothers and infants made an average of 3.5 visits and 4.2 visits to a GP, respectively. However, the use of aggregated data limited the matching of mothers and their babies preventing ascertainment of the extent to which combined consultations occurred, and socio-demographic factors associated with service use were not considered.

Published studies that report on a wider range of HS used by mothers and babies, as well as on factors associated with use in the first six months post-partum, are scarce.^{1,8} In Melbourne, Australia, Goldfeld et al. described the patterns of HS use in the first 12 months post-partum of 173 first-born infants and their families.¹ They found that the mean number of visits to any HS was 35.7 during the 12 months, including medical, hospital, MCH services, pharmacists

and allied health. Predominantly middle class families and only first-born infants were included, and psychosocial factors associated with service use were not examined.

The influence of mother's psychosocial distress on use of HS for their children has been examined but there is a lack of clarity about how mother's distress was measured,⁹ and the results of the studies are inconclusive.¹⁰⁻¹³ Recently, McCallum et al.¹⁴ investigated factors associated with HS use by women with infants in Victoria, finding mothers and their infants on average used 2.8 services (excluding visits to MCHNs) during the first four months following birth and that unsettled infant behaviour was associated with increased use of multiple services. McCallum did not take into account birth order, maternal perception of support or infant health, all of which are associated with infant behaviour problems.¹⁵ Further research is needed to investigate maternal and infant HS use in the first 6 months post-partum and to identify factors associated with service use.

The most commonly used tool for identifying factors associated with HS use is the Behavioural Model of HS Use.¹⁶ The model classifies predictors of service use into three categories: predisposing (demographic, social structure and health beliefs), enabling (income, social support and care availability) and needs related factors.¹⁶ Among the predisposing characteristics, demographic factors such as age and gender, marital status, education and country of birth have been shown to be significant determinants of service utilisation among individuals with mental disorders.¹⁷ Family and social support can be positively or negatively associated with service utilisation.¹⁸ Needs-related factors (e.g. how people view their own health or professional judgment about people's health status) are most closely associated with HS utilisation.¹⁷

Aims: (1) To describe the patterns of HS use and related costs by mothers with infants in the first six months post-partum, and (2) to examine the associations between infant behaviour (sleeping, feeding and crying problems), maternal depressive symptoms and costs of HS for

these conditions. The aims are undertaken within the context of a health care seeking model where factors are chosen to reflect need and social context, specifically socio-economic position, maternal education, language spoken at home, infant gender, birth order, and the amount of support from the caregiver's partner.

Methods

Design

This paper includes participants from the Baby Business randomised controlled trial, drawing upon the data from the questionnaires at infant ages four and six months. We have previously reported on the methods for our trial⁵ and its outcomes.¹⁹ Briefly, Baby Business was a parent education intervention aiming to prevent infant sleep, feeding and crying problems and associated postnatal depression. Intervention parents received information about normal infant sleep and crying patterns, settling techniques, medical causes of crying and parent self-care, delivered via booklet and DVD (at infant age four weeks), telephone consultation (eight weeks) and parent group (13 weeks). Control parents received usual health care. This paper included families from both intervention and control arms as no significant difference in HS costs was found at infant age six months.¹⁹

Setting

The trial was undertaken in 42 MCH centres in four local government areas of north-western Melbourne, Australia. The centres covered a range of inner-urban and outer-urban locations and a broad socio-demographic range.^{5,19}

Participants and recruitment

Parents of healthy new-born infants (born after 32 weeks gestation) were eligible to participate if they were seen by a MCHN at their first home visit, and had sufficient English to complete the study questionnaires and take part in the intervention.

Ethics

Ethics approval was obtained from The Royal Children's Hospital Human Research Ethics Committee (HREC 28130). Research approval was obtained from the Victorian state Department of Education and Training.

Measures

Questionnaires included items about the socio-demographic characteristics of the families, infant behaviour, maternal depressive symptoms, and HS use for infant behaviour problems or maternal depressive symptoms, measured at infant age four and six months. Detail on these measures has been reported elsewhere.⁵ In brief, 'infant behaviour' was measured via parent report of infant sleep, crying and feeding problems (yes/no to each). The validated Edinburgh Postnatal Depression Scale (EPDS) with the cut point of > 9 for mothers in community samples was used to measure depressive symptoms.²¹ Socio-economic Indexes for Areas (SEIFA) mapping from family's home postcode was used to measure caregiver socioeconomic status (higher scores indicate less disadvantaged socioeconomic status).²²

For HS use, we used study-designed questions reported by caregivers at four and six months on where they sought help for their infant's behaviour or for their own mental health (symptoms of depression and anxiety, we refer to this as depressive symptoms throughout the

paper), selected from the list of: mother-baby/parenting centre (day stay or overnight stay), MCHN , outreach nurse, GP, paediatrician, obstetrician, psychiatrist, psychologist, chiropractor, osteopath, naturopath, hospital emergency department and other services (specified by parents) and the number of times they attended the services. Service utilisation unit costs were obtained from the standard national sources.²³ Costs were valued in 2012 Australian dollars (A\$1=US\$1.01 in July 2012 ²⁴), from the health care perspective. As the costs in this study relate to a 6-month period, discounting was not appropriate.

Analysis

Mean HS costs related to service use for help with infant behaviour were compared between infants with and without sleeping, crying and feeding problems, reported at either baseline, four months or six months using the independent two sample t-test. Similarly, mean HS costs related to service use for help with maternal depressive symptoms was compared between mothers with and without depressive symptoms (i.e. EPDS scores > 9), reported at baseline, four months or six months. Multivariable linear regression was conducted to explore the association between demographic and psychosocial factors and the costs of services used in the first six months (total costs and cost of visits to specific relevant services such as MCHN, GP, psychiatrist, etc.).

Within the analytic sample (participants who returned the questionnaires at both four and six months), 11% of cost data were missing. The analyses were repeated using multiple imputation to examine the sensitivity of the results to loss of these participants with missing data.²⁵ The analyses with imputed data showed similar results to analyses that excluded participants with missing data, thus the analyses based on participants with complete data are presented. Data were analysed using Stata Version 12.0.²⁶

Results

We recruited 770 families (55% of all eligible families), which included 781 infants due to 6 sets of twins. Follow-up questionnaires at infant four months and six months of age were completed by 520/781 (66.6%).

Sample characteristics

Selected characteristics of the analytic sample (N=520) are presented in Table 1. Most primary caregivers were mothers (99.6% and we refer to ‘mothers’ throughout for this reason), with a mean age of 33 years, had partners (97.9%), and spoke English as a first language (91.7%). Slightly more than half of infants were firstborn (57.3%). Around one quarter of parents reported infant feeding or crying problems and 35% of infants were reported to have a sleep problem. The analytic sample was comparable to the study sample with regards to these characteristics.

Overall health service use patterns

In the first six months post-partum, the most common services that families used were MCHNs, GPs, and allied HS (including chiropractors, osteopaths and naturopaths) (Table 2). Mothers reporting infant feeding problems were associated with higher HS costs for their own mental health ($p = .02$) (Table 4). The presence of an infant sleeping or crying problem did not significantly alter HS costs for the infant or the mother (Tables 3 and 4). Although somewhat higher, we also found no statistically significant increase in the costs of HS for infant behaviour or maternal depressive symptoms amongst mothers experiencing depressive symptoms (Tables 3 and 4).

Factors associated with health service costs for infant behaviour or maternal depressive symptoms

Tables 3 and 4 indicate that speaking a language other than English was associated with lower HS costs for maternal depressive symptoms ($p=.02$). Single mothers reported higher HS costs for their depressive symptoms ($p<.001$). Mothers with higher levels of education were associated with higher HS costs for infant behaviour problems than mothers who did not complete high school ($p=.02$) but differences in service costs for maternal depressive symptoms were less marked ($p=.25$).

There was no differences in overall HS costs for infants with sleep, crying or feeding problems, or mothers experiencing depressive symptoms once social and demographic factors were adjusted for in the regression models (as shown in Tables 3 and 4). Feeding problems and maternal depressive symptoms were associated with increased costs for relevant services (Tables 5 and 6). Mothers seeking help with their infant feeding problem reported higher costs of specific services relevant to infant feeding, such as their GP ($p=.008$), MCHN ($p=.007$), or paediatrician ($p=.03$). Similarly, mothers experiencing depressive symptoms reported higher costs for relevant services such as GP ($p=.004$), mother-baby centre ($p=.04$), psychiatrist ($p=.02$) and psychologist ($p=.001$).

HS costs were not significantly associated with the infant's gender or birth order. Costs by socioeconomic status were affected by two families with high use of parenting centres in the 4th SEIFA quintile, with no evident differences in costs by socioeconomic status when these two families are excluded. We included such high-cost outliers as the need to access high-cost parenting centre care for infant behaviour is valid, but we do not interpret any overall pattern in costs by socioeconomic group.

Discussion

Mothers of infants with feeding problems and mothers experiencing depressive symptoms were more likely to access HS relevant to these needs and thus have higher costs for these

specific services. We also found that single mothers had increased HS costs for their own mental health. English as a second language may be a barrier to HS access. High school completion may encourage access to HS particularly to help with infant behaviour.

The finding of a relationship between maternal depressive symptoms and the higher cost to psychologists, psychiatrists and mother-baby centres is consistent with many previous studies demonstrating that parental depression is a driver of HS use and costs.²⁷⁻²⁹ Higher service costs for single mothers seeking help for their depressive symptoms, is consistent with previous studies that report higher rates of physical and psychiatric illness compared to mothers who are partnered,³⁰⁻³² as well as reduced social support,³³ and the use of more mental HS.^{31,34} In our study, single mothers did not report increased HS costs for their infant's behaviour. Single mothers more frequently experience financial hardship, physical and mental health problems, and difficulties in caring for their children which may explain this finding.^{32,35} Our finding that mothers with English as a second language reported lower costs of HS for their depressive symptoms supports evidence of language- and culture-based barriers to access in Australian community health care.^{36,37} Finally, maternal completion of high school was associated with higher HS costs for infant's behaviour problems and to some extent maternal depressive symptoms, in line with Steele et al.³⁸ who found that depressed individuals who have completed high school have a higher rate of mental HS use than those who did not complete high school.

Strengths of our study include a large community sample, the use of individual cost data, inclusion of a broad range of HS, and the inclusion of predictors of HS use in a health care seeking model including socio-demographic resources and maternal perception of support. We used multiple imputation to account for missing data with similar results suggesting that sample attrition or incomplete data had not biased our findings. Limitations include the use of caregiver report and a lack of blinding of the intervention which may lead to responder bias.¹⁹

However, no significant difference in service use between the two treatment groups was found in the first six months post-partum. The possible effect on HS use of receiving the Baby Business program in the intervention group would therefore be very minimal.

Upskilling and integrating services within primary care to (1) prevent and detect postnatal depression early on, (2) to improve social support services, and (3) to enhance health care access for mothers experiencing a higher level of need, such as the government-funded National Perinatal Depression Initiative (which provided universal screening for depression during the perinatal period),³⁹ should be evaluated for effectiveness and cost-effectiveness. The immediate costs of higher levels of care provision could be offset with reduced future costs to society by increased workforce participation and/or work productivity. The findings also reflect the importance of investment in strategies to enhance services for non-English speaking mothers of young infants and to improve the awareness of the available services such as culturally competent health promotion programs.⁴¹

Conclusions

Mothers access multiple sources of help for their infant's behaviour and their own mental health in the first six months post-partum. Infant feeding problems and maternal depressive symptoms are associated with higher costs for health services that are relevant to these conditions. There is a need for cost-effective strategies to manage infant behaviour problems and maternal depressive symptoms, to recognise mothers for whom there is a high level of need for these services such as single mothers, and to ensure accessibility of services for mothers with English as a second language and lower levels of education.

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Table 1: Selected characteristics of the sample

Characteristics	Baseline sample (N=768)	Analytic sample* (N=520)
Primary caregiver (99.61% mothers)		
Age (years, M (SD))	33.2 (4.5)	33.6 (4.3)
Relationship status (%)		
Married or partnered	96.9	97.9
Language (%)		
English	87.8	91.7
Education status (%)		
Did not complete high school	6.2	4.2
Completed high school, no degree	15.8	12.9
Completed university	77.9	82.9
SEIFA ¹ of postcode (%)		
1 st quintile (least disadvantaged)	10.8	11.8
2 nd quintile	9.6	11.2
3 rd quintile	61.6	61.5
4 th quintile	6.0	5.2
5 th quintile (most disadvantaged)	12.1	10.4
Infant characteristics		
Age at baseline (weeks, Mean, (SD))	4.0 (1.4)	3.9 (1.3)
Child gender (%)		
Boy	50.8	52.2
Birth weight (grams, Mean, (SD))	3432.7 (532.3)	3480.1 (513.2)
Birth order (%)		
1 st	55.4	57.3
2 nd	31.6	31.1
3 rd	9.2	9.1
4 th or more	3.8	2.5
Infant behaviour characteristics		
Feeding problem (%)	25.5	23.8
Sleeping problem (%)	38.7	34.6
Crying problem (%)	27.6	25.2

*Analytic sample included participants who returned questionnaires at both 4 months and 6 months.

¹SEIFA quintiles were calculated from 2011 Victorian SEIFA data (Australian Bureau of Statistics). The first quintile represents the least disadvantaged one-fifth of the Victorian population and the fifth represents the most disadvantaged one-fifth of the Victorian population.

Table 2: Health service use and costs for help with infant behaviour and maternal depressive symptoms in the first 6 months post-partum

Health services	Unit cost* (A\$)	Reference	Health service use at 1-6 months for infant behaviour		Health service use at 1-6 months for maternal depressive symptoms	
			Total visits to health services	Cost (A\$)	Total visits to health services	Cost (A\$)
			n (%)	Mean (SD)	n (%)	Mean (SD)
Day-stay Mother/baby parenting centre	350.0	<i>Expert's opinion</i>	82 (3%)	55.3 (210.3)	7 (0.6%)	4.7 (107.5)
Night-stay Mother/baby parenting centre	688.8	<i>MBS, 2012</i>	71 (3%)	94.2 (555.8)	5 (0.4%)	6.6 (151.2)
MCHN	20.6	<i>MBS, 2012</i>	1498 (52.8%)	59.3 (50.6)	420 (36.1%)	16.6 (90.3)
Home visiting	27.8	<i>MBS, 2012</i>	148 (5.2%)	7.9 (22.6)	71 (6.1%)	3.8 (18.5)
GP	35.6	<i>MBS, 2012</i>	359 (12.7%)	24.6 (42.2)	129 (11.1%)	8.8 (28.3)
Paediatrician	148.1 - initial 74.1 - review	<i>MBS, 2012</i>	179 (6.3%)	42.7 (103.3)	-	-
Chiropractor	61.6	<i>MBS, 2012</i>	160 (5.7%)	19.0 (107.5)	114 (9.8%)	13.5 (102.2)
Osteopath	61.6	<i>MBS, 2012</i>	95 (3.3%)	11.3 (61.5)	83 (7.1%)	9.9 (61.5)
Naturopath	61.6	<i>MBS, 2012</i>	14 (0.5%)	1.7 (13.7)	11 (1%)	1.3 (12.9)
Hospital Emergency Department	208.6	<i>MBS, 2012</i>	51 (1.8%)	20.5 (72.2)	8 (0.7%)	3.2 (28.8)
Obstetrician	42.2	<i>MBS, 2012</i>	-	-	22 (1.9%)	1.8 (9.3)
Psychiatrist	255.5 - initial 180.3 - review	<i>MBS, 2012</i>	-	-	50 (4.3%)	18.9 (194.3)
Psychologist	61.6	<i>MBS, 2012</i>	-	-	87 (7.5%)	10.3 (63.5)
Other health services	Varied	<i>MBS, 2012</i>	179 (6.3%)	17.9 (182.8)	156 (13.4%)	15.1 (101.4)

*Costs were valued in 2012 Australian dollars.

Table 3: Costs of overall service use for infant behaviour in the first six months post-partum by infant behaviour problems, maternal depressive symptoms and factors affecting help seeking

Factors				Individual unadjusted effects			Adjusted effects within health service use model (N ranged from 458 to 462)		
	N	Mean (A\$)	SD	Mean difference (A\$)	95% CI	p-value	Mean difference (A\$)	95% CI	p-value
Infant behaviour difficulties									
No problem	37	268.6	492.7	(reference)					
Sleep problem	100	323	756.2	54.4	(-165.5, 274.2)	0.62	58.1	(-227.5, 343.7)	0.69
Cry problem	97	300.3	613.9	31.7	(-171.7, 235.0)	0.76	18.6	(-268.8, 305.9)	0.9
Feed problem	229	443.6	812.5	175.4	(-18.3, 369.1)	0.07	170.8	(-95.6, 437.2)	0.21
Met community criteria for postnatal depression									
No	371	367.5	743.3	(reference)					
Yes	92	398.9	740.2	31.3	(-139.2, 201.9)	0.72	8.1	(-151.8, 201.9)	0.78
Language spoken at home - other than English							-64.9	(-330.3, 200.4)	0.63
First child							58.5	(-83.8, 200.9)	0.42
SEIFA ² (1st quintile as reference)									
2nd quintile							-14.2	(-294.8, 266.4)	0.92
3rd quintile							143.8	(-71.9, 359.5)	0.19
4th quintile							593.1	(221.3, 964.9)	<.001 ^a
5th quintile							135.4	(-159.5, 430.2)	0.37
Gender -girl							-84.4	(-221.8, 52.9)	0.23
Education (Less than high school as reference)									
No degree, completed high school							519.4	(96.5, 942.4)	0.02 ^a
Tertiary or postgraduate							365.8	(-20.8, 752.5)	0.06
Support from partner (have enough support from partner as reference)									
Have not had enough support from partner							-27.6	(-288.3, 233.1)	0.84
Do not have a partner							-188.1	(-802.7, 426.5)	0.55
Study group							3.3	(-134.7, 141.3)	0.96

^a significant p-value.

²SEIFA quintiles were calculated from 2011 Victorian SEIFA data (Australian Bureau of Statistics). The first quintile represents the least disadvantaged one-fifth of the Victorian population and the fifth represents the most disadvantaged one-fifth of the Victorian population.

Table 4: Costs of overall service use for maternal depressive symptoms in the first six months post-partum by infant behaviour problems, maternal depressive symptoms and factors affecting help seeking

Factors				Individual unadjusted effects			Adjusted effects within health service use model (N ranged from 458 to 462)		
	N	Mean (A\$)	SD	Mean difference (A\$)	95% CI	p-value	Mean difference (A\$)	95% CI	p-value
Infant behaviour difficulties									
No problem	37	34.9	126.1	(reference)					
Sleep problem	100	103.6	428.2	68.8	(-25.4, 162.9)	0.15	33.2	(-71.2, 137.6)	0.53
Cry problem	97	59.2	189.1	24.3	(-31.8, 80.4)	0.39	-13.8	(-118.8, 91.3)	0.8
Feed problem	229	99.4	241.2	64.6	(12.6, 116.6)	0.02 ^a	39.2	(-58.2, 136.6)	0.43
Met community criteria for postnatal depression									
No	371	78.4	243.3	(reference)					
Yes	92	120.2	387.2	41.8	(-42.0, 125.6)	0.32	52.5	(-12.1, 117.2)	0.11
Language spoken at home - other than English							-112.1	(-209.0, -15.1)	0.02 ^a
First child							25.6	(-26.4, 77.7)	0.33
SEIFA ² (1st quintile as reference)									
2nd quintile							-51.4	(-154.0, 51.2)	0.33
3rd quintile							-22.1	(-101.0, 56.7)	0.58
4th quintile							-26.4	(-162.3, 109.5)	0.7
5th quintile							-8.8	(-116.6, 99.0)	0.87
Gender -girl							-37.4	(-87.7, 12.8)	0.14
Education (Less than high school as reference)									
No degree, completed high school							90.2	(-64.4, 244.8)	0.25
Tertiary or postgraduate							93.1	(-48.3, 234.4)	0.2
Support from partner (have enough support from partner as reference)									
Have not had enough support from partner							66.9	(-28.4, 162.2)	0.17
Do not have a partner							663.2	(438.6, 887.8)	<.001 ^a
Study group							-1.9	(-52.4, 48.5)	0.94

^asignificant p-value.

Table 5: Costs of different types of service use for infant behaviour in the first six months post-partum by infant behaviour problems and maternal depressive symptoms

Factors	Adjusted effects on Health Service cost (A\$, 2012) for (Mean difference (95%CI))							
	Parenting centre (night-stay)	MCH nurse	Home visiting nurse	GP	Paediatrician	Allied health	Hospital Emergency department	Others
<i>Infant behaviour difficulties</i>								
No problem	(reference)							
Sleep problem	93.2 (-127.2, 313.8)	12.3 (-6.7, 31.2)	-1.1 (-10.1, 7.8)	6.0 (-10.2, 22.2)	15.2 (-25.8, 56.2)	-26.5 (-82.5, 29.5)	-3.4 (-31.7, 24.9)	-31.5 (-104.4, 41.3)
Cry problem	38.4 (-183.7, 260.5)	9.3 (-9.7, 28.4)	-1.3 (-10.4, 7.7)	8.8 (-7.5, 25.1)	15.1 (-26.2, 56.3)	-21.4 (-77.9, 35.2)	9.8 (-18.7, 38.3)	-31.9 (-105.2, 41.6)
Feed problem	56.3 (-149.2, 261.9)	24.6 (6.9, 42.2) ^a	-1.5 (-9.9, 6.8)	20.5 (5.4, 35.6) ^b	42.0 (3.8, 80.2) ^c	-10.2 (-62.4, 42.1)	18.6 (-7.8, 45.0)	5.3 (-62.6, 73.2)
<i>Met community criteria for postnatal depression</i>								
No	(reference)							
Yes	19.9 (-116.8, 156.5)	35.4 (-1.9, 72.7)	4.1 (-1.5, 9.6)	8.6 (-1.4, 18.6)	-0.7 (-26.1, 24.7)	93.5 (-17.2, 204.2)	12.0 (-75.2, 36.4)	-26.8 (-71.9, 18.3)

The analyses were adjusted for infant behaviour problems (sleep, crying or feeding), child gender, child birth order, socio-economic status, maternal education, language spoken at home, maternal depressive symptoms (meet the community criteria for postnatal depression or not), whether the mother had a partner and amount of support received from her partner. Results were presented as A\$ mean difference (95% CI). Sample size ranged from 458 to 462.

^a significant p-value (p=.007) ; ^b significant p-value (p=.008); ^c significant p-value (p=.03).

Table 6: Costs of different types of service use for maternal depressive symptoms in the first six months post-partum by infant behaviour problems and maternal depressive symptoms

Factors	Adjusted effects on Health Service cost (A\$, 2012) for (Mean difference (95%CI))									
	Parenting centre (night-stay)	MCH nurse	Home visiting nurse	GP	Obstetrician	Psychiatrist	Psychologist	Allied health	Hospital Emergency department	Others
<i>Infant behaviour difficulties</i>										
No problem	(reference)									
Sleep problem	32.3 (-30.2, 94.9)	7.9 (-29.0, 44.8)	3.2 (-4.0, 10.4)	3.6 (-7.4, 14.5)	0.6 (-3.1, 4.4)	-16.6 (-93.6, 60.5)	-5.8 (-31.4, 19.9)	-21.6 (-80.9, 37.8)	3.5 (-7.7, 14.8)	-15.5 (-48.1, 17.0)
Cry problem	-0.3 (-63.3, 62.7)	1.1 (-36.1, 38.2)	0.5 (-6.8, 7.7)	-0.6 (-11.6, 10.3)	0.7 (-3.1, 4.6)	22.9 (-54.7, 100.5)	-8.2 (-34.0, 17.7)	9.6 (-50.2, 69.4)	-0.6 (-11.9, 10.8)	8.7 (-24.0, 41.5)
Feed problem	-5.5 (-63.8, 52.8)	13.9 (-20.5, 48.3)	0.6 (-6.1, 7.4)	10.6 (0.4, 20.8) ^a	1.5 (-2.0, 5.0)	6.7 (-65.1, 78.6)	8.9 (-14.9, 32.8)	22.2 (-33.1, 77.5)	3.9 (-6.7, 14.4)	1.9 (-28.4, 32.2)
<i>Met community criteria for postnatal depression</i>										
No	(reference)									
Yes	41.1 (2.4, 79.9) ^b	-10.6 (-33.5, 12.3)	3.2 (-1.3, 7.7)	9.8 (3.1, 16.6) ^c	-1.5 (-3.8, 0.9)	56.8 (9.0, 104.6) ^d	26.3 (10.4, 42.2) ^e	2.9 (-33.9, 39.7)	1.6 (-5.4, 8.6)	3.0 (-17.2, 23.2)

The analyses were adjusted for infant behaviour problems (sleep, crying or feeding), child gender, child birth order, socio-economic status, maternal education, language spoken at home, maternal depressive symptoms (meet the community criteria for postnatal depression or not), whether the mother had a partner and amount of support received from her partner. Results were presented as A\$ mean difference (95% CI). Sample size ranged from 458 to 462.

^a significant p-value (p=.04); ^b significant p-value (p=.04); ^c significant p-value (p=.004); ^d significant p-value (p= .02); ^e significant p-value. (p=.001).

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