

BMJ Open Characteristics and changes in characteristics of women and babies admitted to residential parenting services in New South Wales, Australia in the first year following birth: a population-based data linkage study 2000–2012

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ABSTRACT

Objective To examine the characteristics of women and babies admitted to the residential parenting services (RPS) of Tresillian and Karitane in the first year following birth.

Design A linked population data cohort study was undertaken for the years 2000–2012.

Setting New South Wales (NSW), Australia.

Participants All women giving birth and babies born in NSW were compared with those admitted to RPS.

Results During the time period there were a total of 1 097 762 births (2000–2012) in NSW and 32 991 admissions to RPS. Women in cohort 1: (those admitted to RPS) were older at the time of birth, more likely to be admitted as a private patient at the time of birth, be born in Australia and be having their first baby compared with women in cohort 2 (those not admitted to an RPS). Women admitted to RPS experienced more birth intervention (induction, instrumental birth, caesarean section), had more multiple births and were more likely to have a male infant. Their babies were also more likely to be resuscitated and have experienced birth trauma to the scalp. Between 2000 and 2012 the average age of women in the RPS increased by nearly 2 years; their infants were older on admission and women were less likely to smoke. Over the time period there was a drop in the numbers of women admitted to RPS having a normal vaginal birth and an increase in women having an instrumental birth.

Conclusion Women who access RPS in the first year after birth are more socially advantaged and have higher birth intervention than those who do not, due in part to higher numbers birthing in the private sector where intervention rates are high. The rise in women admitted to RPS (2000–2012) who have had instrumental births is intriguing as overall rates did not increase.

INTRODUCTION

Many parents experience difficulties with early parenting, in particular with breast

Strengths and limitations of this study

- The uniqueness of this study is in establishing the most comprehensive study undertaken over more than a decade of all women and babies admitted to residential parenting services (RPS) in New South Wales.
- Women who access RPS in the first year after birth are more socially advantaged and have higher birth intervention than those who do not access RPS.
- Changes over time show a significant rise in women admitted to RPS who have had instrumental births.
- Lack of maternal body mass index data which would enable further examination of associated factors.
- Visits to general practitioners, community based and outpatient facilities are not included in the datasets.

feeding, settling an infant, especially if they cry excessively.^{1–4} Sleep and settling problems with infants are reported to be severe by over 30% of women in Australian studies.⁵ This can lead to maternal exhaustion and poorer mental and physical health in women.⁶ While parenting issues are of concern, they are often a sign of maternal dysregulation as an outcome of maternal distress and mental illness.⁷ The infant's behaviour is frequently the reason for seeking professional assistance. If left untreated physical and mental health problems can impact women and babies both in the short and long term.⁸

In Australia residential parenting services (RPS) such as Tresillian and Karitane (in New South Wales (NSW)) support parents experiencing parenting difficulties, such as feeding and settling. Both baby and mother/father are

admitted to these units. RPS are identified as tertiary level services and are an escalation of the universal child and family health services available within Australia that has been established for over 100 years. Admission to an RPS requires a referral from a universal child and family health service, general practitioner (family doctor), midwife or allied health professional. There is no preference given to women with private or public insurance status. Referral is based on need. However, we know women who are more advantaged and hence more likely to have private insurance engage more with services and seek support more readily than those from lower socioeconomic backgrounds.

These RPS services are registered nurse-led. The nurses have additional qualifications in child and family health nursing and increasingly many also have qualifications in adult and/or infant mental health nursing. The nurses have a close working relationship with onsite psychologists and social workers. Medical support is provided by visiting paediatricians, psychiatrists, and in the last 5 years also by general practitioners. The nurses are responsible for physical and psychosocial assessment of the caregiver (primarily mothers) and her infant during admission to the residential unit, working collaboratively with the parent to design targeted parenting interventions, and supporting the implementation and evaluation of these interventions. When mothers are identified as requiring additional psychosocial (including housing, financial concerns, child protection or family violence) and mental health support or medical intervention a referral is made to the residential psychologist, social worker or the appropriate visiting medical specialist.

Due to the initial focus on parenting issues (feeding, sleep and settling problem), once the mother is admitted mental health concerns of depression, anxiety and other forms of mental illness and psychosocial risk are regularly identified. The mother is then referred for specialist assessment and if required treatment is commenced.

RPS are funded as not-for-profit health affiliated or government services. Parents and their infants or young children are able to access these services without out-of-pocket costs once admitted as a public or private patient. There is close alignment to the population-based child and family health nursing service offered to all children and families following birth (similar to the English health visiting service) and they follow a parent and infant centred approach to the provision of care. In NSW (Australia's most populous state) around 3400 women (3.5% of the birthing population) use the RPS of Tresillian (three RPS) and Karitane (two RPS) each year.^{9 10} Overall there are significant similarities between the two services in NSW as there is often collaboration in the development of clinical guidelines. In states such as Victoria around 5% of women are admitted to RPS.¹¹ Referrals to these organisations come from all over NSW.^{12 13} The demand for RPS is high with waiting lists reported between 4 and 10 weeks in most states.¹⁴ Less is known about changes in the populations' characteristics and reasons for seeking RPS care over time.

Aim

The aim of this study is to examine the characteristics of a cohort of women and babies admitted to RPS of Tresillian and Karitane in the first year following birth in NSW, as well as examine changes in characteristics that have occurred over a decade.

METHODS

Data sources

Birth data for the time period 1 January 2000 till 31 December 2012 of all births was provided by the NSW Department of Health as recorded in the NSW Perinatal Data Collection (PDC). This population-based surveillance system contains maternal and infant data on all births of greater than 400 g birth weight or 20 weeks gestation. Admission data following the birth were obtained from the NSW Admitted Patient Data Collection (APDC) until 31 December 2013 to allow for 12-month follow-up. This collection records all admitted patient services provided by NSW Public Hospitals, Public Psychiatric Hospitals, Public Multi-Purpose Services, Private Hospitals and Private Day Procedures Centres. The records of all infants and mothers who were admitted to either of the two services were noted and linked to their pregnancy and birth details record (PDC) as well as subsequent hospital admission record (APDC) utilising the common de-identified numeric identifier. Australian Bureau of Statistics Socio-Economic Indexes for Areas (SEIFA) codes were applied to the cohort in order to establish socioeconomic and education status.¹⁵ The SEIFA indices are provided by the Australian Bureau of Statistics and are calculated from National census information collected in 2011 and published in 2013 based on postcode and were applied to all admissions. The indices are standardised with a lower index reflecting a lower level of income or education level for that postcode or grouped postcodes.

Linkage of the datasets was conducted by the NSW Centre for Health Record Linkage (CHeReL). The CHeReL utilises probabilistic data linkage techniques for these purposes and de-identified datasets were provided for analysis. Probabilistic record linkage software assigns a 'linkage weight' to pairs of records. For example, records that match perfectly or nearly perfectly on first name, surname, date of birth and address have a high linkage weight, and records that match only on date of birth have a low linkage weight. If the linkage weight is high it is likely that the records truly match, and if the linkage weight is low it is likely that the records are not truly a match. This technique has been shown to have a false positive rate of 0.3% of records.¹⁶

Subjects

Maternal characteristics: age, parity, pre-existing (prepregnancy diabetes and chronic hypertension)

and pregnancy related medical conditions (pregnancy related diabetes and hypertensive disorders of pregnancy and following birth), labour onset, delivery type, pain relief utilised, perineal status. Labour onset was categorised as spontaneous, induced (by means of prostaglandins, synthetic oxytocins and/or mechanic devices), augmented (by means of synthetic oxytocins) or 'No Labour' (caesarean section before labour) available from the PDC. Factors available for analysis in the APDC included International Classification of Diseases V10 Australian Modification (ICD 10-AM) coding¹⁷ for admission diagnoses, comorbidities, length of stay and frequency of admission. Infant characteristics: included birth weight, gestation at birth, presentation and Apgar Scores from the PDC and diagnostic codes for admission and co-morbidities.

Time periods were broken into three epochs to allow for changes in admission details over time to be examined including 2000–2003, 2004–2008, 2009–2012.

Mothers and babies are admitted to the RPS for a variety of reasons including infant based diagnoses: issues with settling, feeding and crying and/or maternal focused diagnoses: including anxiety, depression and parenting issues. Referral for admission is made by the general practitioner, paediatrician, family and community health nurse as well as self-referral. The two sites are independent from each other and both requested they be named in the study.

Data analysis

The analyses were conducted between the two cohorts (women and babies admitted to an RPS and those who were not) utilising contingency tables and results are reported as χ^2 analyses. Continuous variables were compared with Student's t-tests when normally distributed reported as means and SD or with Mann-Whitney U for non-parametric results, reported as medians and IQR. Variables with missing data greater than 1.0% were excluded from the analyses. Cells with $n < 5$ were not included when conducting statistical comparisons. Proportional results with more than two categories were examined utilising the χ^2 statistic for all groups as reported in tables and

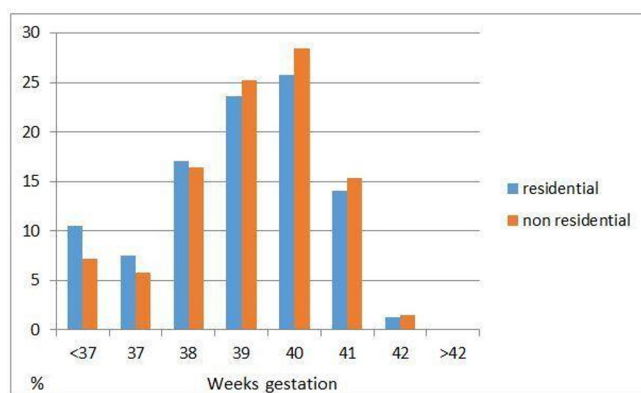


Figure 1 Gestational age at birth comparison between babies admitted to residential parenting services and those not admitted—all gestation comparisons $p < 0.01$.

figure 1. Taking into account the size of the cohort and the number of analyses undertaken, results were considered significant at the level $p < 0.01$. Results were reported to three decimal points for all those > 0.001 and all results less than 0.001 were reported as < 0.001 . Analysis was undertaken with IBM SPSS V.23.

Patient and public involvement

There was no patient involvement in this study as it used de-identified data that had already been gathered.

RESULTS

During the time period there were 1 097 762 births to 355 100 women in NSW. There were 32 991 women admitted to the RPS of Tresillian and Karitane in NSW.

Demographic and admission details

The demographic and admission details comparing the two cohorts (women and babies who were admitted to RPS to those who were not) are displayed in table 1. When compared with women who were not admitted to RPS, women admitted to RPS were on average 2 years older, more likely to be born in Australia and almost half as likely to smoke. Nearly three quarters (72.5%) were > 5 th decile for socioeconomic advantage and disadvantage and over two-thirds (67.2%) were > 5 th decile for education and occupation. On average women stayed 4.4 days in the RPS. Women admitted to RPS, when compared with women who were not admitted to RPS, were more likely to have a multiple birth and be primiparous. While the vast majority of women were admitted for one baby, some had several admissions for the same child and some women had admissions for subsequent children during the time period (2000–2012) (table 1).

Birth and neonatal outcomes

The majority of women admitted to RPS had their babies in hospital, as is the case with the rest of the NSW population. Substantially fewer women who were admitted to RPS had a normal vaginal birth and more had an instrumental birth or caesarean section, induction of labour, epidural or episiotomy compared with women not admitted to RPS (table 2). There were significant differences in the incidence of hypertensive disease of pregnancy and diabetes in women who were admitted to RPS. More women who were admitted to the RPS had male babies. Babies were more likely to have been born at 37 and 38 weeks gestation and less likely to be born over 40 weeks compared with babies who did not get admitted to an RPS (figure 1). Neonatal outcomes at birth tended to be worse for babies of women admitted to RPS, with more Special Care Nursery/Neonatal Intensive Care (SCN/NICU) admissions and resuscitation at birth. Birth trauma was also examined (figure 2) and women admitted to RPS were more likely to have given birth to a neonate who suffered scalp trauma.

Table 1 Demographic and admission details

	NSW (not admitted) n=1 064 727 (births)	Admitted both facilities n=33 035 (births)	P value	Karitane n=6663 (births)	Tresillian n=26 372 (births)
Age					
Mother (at time of birth in years*)	30.4 (5.60) Range 12–54	32.2 (5.36) Range 12–54	<0.001	31.6 (5.25) Range 13–51	32.4 (5.37) Range 12–54
Baby (at time of admission in days†)		228 (12–336) Range 3 days – 4 years 206 days		243 (11–334) Range 6 days–4 years 206 days	227 (9–325) Range 3 days–3 years 117 days
Smoking	13.9%	7.4%	<0.001	7.2%	7.4%
Australian born	70.6%	78.1%	<0.001	73.8%	79.2%
SEIFA (>5th decile for index of socioeconomic advantage and disadvantage)	55.4%	72.5%	<0.001	58.8%	75.7%
SEIFA (>5th decile for index of education and occupation)	51.8%	67.2%	<0.001	57.9%	69.4%
Length of stay in RPS		Mean 4.4 (SD 1.35) Range 0–29		Mean 4.1 (SD 1.47) Range 1–16	Mean 4.4 (SD 1.32) Range 0–29
Discharge type					
Standard		99.8%		99.3%	99.9%
Own risk		0.2%		0.7%	0.1%
Plurality‡					
Singletons	1 080 541 (98.5%)	31 294 (94.7%)	<0.001	6359 (95.4%)	24 935 (94.6%)
Twins	16 892 (1.5%)	1698 (5.1%)		298 (4.5%)	1400 (5.3%)
Triplets	317 (0.0%)	40 (0.1%)		6 (0.1%)	34 (0.1%)
Quads	12 (0.0%)	3 (0.0%)		0 (0.0%)	3 (0.0%)
Parity‡					
Primiparous	42.2%	62.8%	<0.001	61.1%	63.2%
Multiparous	57.8%	37.2%		38.9%	36.8%
No. of admissions (mothers with different babies)					
		1–23 595		1–4426	1–19 169
		2–9076		2–2141	2–6935
		3–331		3–84	3–247
		4–32		4–12	4–20
		5–1		5–0	5–1
No. of admissions (mothers with same baby)					
		1–32 991		1–6651	1–26 340
		2–16		2–6	2–16
Health Insurance status for birth‡					
Public—Medicare only	768 733 (72.2%)	17 214 (52.1%)	p<0.001	3357 (50.4%)	13 857 (52.5%)
Private health insurance—utilised on hospital admission	235 305 (22.1%)	15 799 (47.8%)		3305 (49.6%)	12 494 (47.4%)
Other (eg, overseas visitor)	60 689 (5.7%)	22 (0.1%)		1 (0.0%)	21 (0.1%)

All analyses conducted on data at time of birth (for both mother and baby) unless indicated otherwise.

*Mean and SD.

†Median and IQR.

‡ χ^2 analysis undertaken across all groups.

NSW, New South Wales; RPS, residential parenting services; SEIFA, Socio-Economic Indexes for Areas.

Common ICD 10 codes for babies and mothers admitted to RPS

The most common ICD 10 codes recorded for babies were sleep, crying infant and feeding disorders. Tresillian

services were most likely to use the code R68.1 (non-specific symptoms peculiar to infancy-excessive crying, irritable infant) (98.7%) and Karitane were more likely to use F51.9/F51.2 (non-organic sleep disorder unspecified/

Table 2 Birth and neonatal outcomes

	NSW (not admitted) n=1 064 727 (births to 322 109 women)	Admitted both facilities n=33 035 (births to 32 991 women)	P value	Karitane n=6663 (births to 6651 women)	Tresillian n=26 372 (births to 26 340 women)
Place of birth*					
Hospital	96.8%	96.9%	0.323	96.9%	96.9%
Birth centre	2.5%	2.8%		2.7%	2.8%
Home birth	0.2%	0.1%		0.1%	0.1%
Born before arrival	0.5%	0.2%		0.1%	0.2%
Place of birth*					
Public hospital	59.2%	49.5%	<0.001		
Private hospital	36.1%	50.5%			
Other (eg, overseas visitor)	4.6%	0.0%			
Type of delivery*					
Vaginal	60.5%	48.9%	<0.001	51.8%	48.2%
Forceps	3.6%	5.3%		5.7%	5.2%
Vacuum extraction	7.0%	9.9%		9.8%	9.9%
Vaginal breech	0.6%	0.8%		0.5%	0.9%
Caesarean section	28.3%	34.8%		32.3%	35.5%
Elective	16.3%	18.9%		18.1%	19.1%
Emergency	12.0%	15.9%		14.3%	16.3%
Episiotomy	11.6%	15.0%	<0.001	15.8%	15.0%
Labour induced	25.1%	27.8%	<0.001	27.2%	28.0%
Pain relief					
None	15.1%	9.4%	<0.001	8.9%	9.5%
Epidural	25.4%	38.4%		36.4%	39.0%
Hypertensive disorders of pregnancy	6.8%	8.3%	<0.001	7.2%	8.6%
Diabetes	5.3%	4.9%	<0.001	5.6%	4.7%
Baby sex male	51.4%	55.4%	<0.001	54.6%	55.6%
Gestation at delivery (in weeks)†	38.9 (2.20)	38.8 (2.10)	0.714	38.8 (2.10)	38.7 (2.10)
Birth weight (in g)†	3369.5 (602.80)	3309.4 (615.79)	<0.001	3310.9 (617.75)	3303.1 (607.99)
Apgar<7	2.1%	1.4%	<0.001	1.6%	1.4%
Admitted SCN/NICU	15.6%	20.1%	<0.001	19.5%	20.3%
Neonatal resuscitation (any form)	38.5%	43.8%	<0.001	41.5%	44.4%

* χ^2 analysis undertaken across all groups.

†Means and SD.

SCN/NICU, Special Care Nursery/Neonatal Intensive Care.

non-organic disorder of the sleep wake cycle) (30.9%) (tables 3 and 4).

The most common ICD 10 codes recorded for women when combined were malaise/fatigue and mental health disorders followed by feeding issues. However, Tresillian was most likely to record social/other reasons for admission (tables 5 and 6).

Trends over time of characteristics of women using RPS

The trends over time divided into three epochs were examined regarding the characteristics of women admitted to RPS. Women admitted to RPS were significantly older in the

third time period when compared with the first when they gave birth and their babies were older at admission between the two epochs. The rate of women who were smoking had more than halved over the same time period. We also found that women admitted were much less likely to have had a normal vaginal birth and much more likely to have an instrumental birth in the last time period compared with the first. Babies admitted to RPS were also less likely to have been admitted to SCN/NICU (table 7). The target group for admission to the NSW RPS has remained consistent during the 12-year period examined.

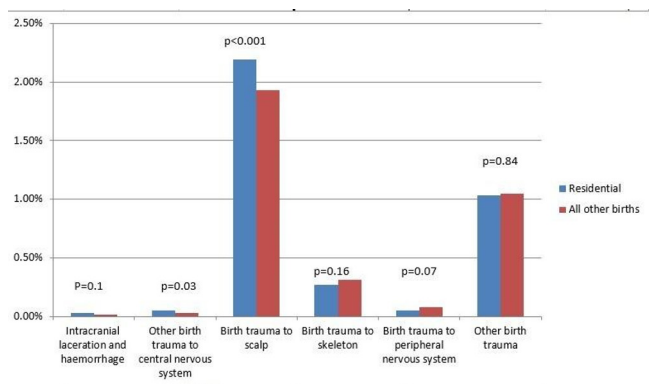


Figure 2 Birth trauma as coded on birth admission for babies who enter residential parenting services as compared with all other babies.

DISCUSSION

This is the largest study to date examining the characteristics of all women and babies admitted to RPS in NSW over more than a decade. Women who access RPS in the first year after birth are more socially advantaged, have higher rates of birth intervention and their babies have more neonatal complications than those who do not access RPS. Sleeping, crying and feeding issues are the main reasons these babies are admitted to RPS.

Sociodemographic differences in women who attend RPS and those who don't

We found in this study that the women who attend RPS in NSW in the year following birth were more socially advantaged than those not admitted. The women were slightly older and the average age increased over the decade of the study reflecting both Australian and international trends.¹⁸ The women were also more likely to be born in Australia

but this declined over the decade which is also reflective of changing demographics in NSW.^{19,20} Women attending RPS were also more likely to be a private patient and more likely to be having their first baby or have had twins or triplets. We also found the SEIFA index was higher among women admitted which correlates with the other characteristics described above. Other indications of social advantage in the RPS population are the fact they are nearly half as likely to smoke compared with women who do not attend RPS. In previous studies we found that women who have private health cover and give birth in private hospitals tend to be more socially advantaged and were much more likely to have their labour induced and much less likely to have a normal vaginal birth without intervention.²¹ This was also the case in this study. Previous research has shown that women who attend RPS appear to be more socioeconomically advantaged and more likely to have a university education with a professional or semi-professional occupation.¹¹

Even though these women are identified as socially and economically advantaged they may still lack the social support necessary to develop the confidence in their ability to parent while adjusting to the parenting role and changes in lifestyle that occurs with motherhood.²² Social isolation or perceived lack of social support has a significant impact on parenting.²³ Social support from partner, family and friends appeared to be the most significant in assisting mothers develop maternal competence and lowering anxiety. Importantly, not all social support is helpful for mothers.²³ Attending to the social support needs of mothers is crucial in reducing the risk or managing maternal depression and anxiety²⁴ and also postpartum post-traumatic stress disorder (PTSD).²⁵

The fact that more socioeconomically advantaged women access RPS raises questions about the disparity

Table 3 The seven most commonly recorded ICD 10-AM code for babies at Karitane grouped

Issue	ICD 10-AM codes	% of n=6651	Description
Sleep	F51.9/F51.2	30.9	Non-organic sleep disorder unspecified/non-organic disorder of the sleep wake cycle
Crying	R68.1	17.5	Non-specific symptoms peculiar to infancy-excessive crying, irritable infant
Feeding	P92.2/P92.3/P92.4/P92.5/ P92.8/P93.9/R63.3	14.2	Feeding difficulties and mismanagement/neonatal difficulty at feeding at breast/other feeding problems of newborn/slow feeding of newborn/underfeeding of newborn/feeding problem of newborn not specified
Reflux	K21.0/K21.9	11.7	GORD without oesophagitis/GORD with oesophagitis
Appearance/behaviour	R46.8	8.7	Other signs and symptoms involving appearance and behaviour
Psychiatric	F93.0/F93.3/F51.0/F91.8/ F93.2	5.6	Separation anxiety disorder of childhood/sibling rivalry disorder/non-organic insomnia/other conduct disorder/social anxiety disorder of childhood
Social/other	Z76.2/Z76.4	3.2	Health supervision and care of others healthy infant and child—adverse socioeconomic circumstances, awaiting foster or adoptive placement, maternal illness, no. of children at home preventing or interfering with normal care/other boarder in healthcare facility

GORD, gastroesophageal reflux disease ; ICD 10-AM, International Classification of Diseases V10 Australian Modification.

Table 4 The seven most commonly recorded ICD 10-AM codes for babies at Tresillian grouped

Issue	ICD 10-AM codes	% of n=26 340	Description
Crying	R68.1	98.7	Non-specific symptoms peculiar to infancy-excessive crying, irritable infant
Sleeping	F51.2/G47.2/G47.9/G47.0/ G47.8/G47.1	6.7	Non-organic disorder of the sleep wake cycle/disorders of the sleep wake cycle/sleep disorder unspecified/other sleep disorders/disorders of initiating and maintaining sleep/disorders of excessive somnolence
Feeding	R63.3/F98.2/P92.5/P92.8/P92.9	6.3	Feeding difficulties and mismanagement/feeding disorder on infancy and childhood/neonatal difficulty at feeding at breast/ other feeding problems of newborn/feeding problem of newborn not specified
Development	R62.0/R62.8/R62.9/F80.9	<1	Delayed milestone/other lack of expected physiological development/lack of expected normal physiological development/ developmental disorder of speech and language
Psychiatric	F84.0/F91.8/F91.9/F93.0/F68.1/ F41.9/F43.2/F51.4/F63.3/F91.3	<1	Childhood autism/other conduct disorder/conduct disorder unspecified/separation anxiety disorder of childhood/factitious disorder/anxiety disorder unspecified/PTSD/sleep terrors/ trichotillomania/oppositional defiant disorder
Reflux	K21.9	<1	GORD without oesophagitis
Social/other	Z76.2/Z76.8	<1	Persons encountering health services in unspecified circumstances/health supervision and care of others healthy infant and child—adverse socioeconomic circumstances, awaiting foster or adoptive placement

GORD, gastroesophageal reflux disease ; ICD 10-AM, International Classification of Diseases V10 Australian Modification; PTSD, post-traumatic stress disorder.

between them and women from socioeconomically disadvantaged groups. Removing any existing institutional or other barriers to accessing RPS needs to be prioritised, though with services already over capacity it is difficult to know how this need could be met. Some of the barriers for women from lower socioeconomic backgrounds may include: poor levels of health literacy, RPS service location, and a lack of knowledge and misinformation about services.²⁶ While some families willingly seek out an admission to an RPS due to the lack of stigma attached; ‘hard to reach’ families have been identified as having minimal informal and formal supports systems that limit their ability to successfully connect with services that can provide parenting support.²⁷ Previous experiences of insensitive professional approaches can leave parents with a sense of being judged and placed under surveillance.²⁷

Birth intervention

It was clear in this study that more women in the RPS group had experienced an intervention during the birth (induction of labour, instrumental birth, caesarean section, episiotomy, epidural) and were significantly less likely to have a normal birth. Their babies were more likely to be preterm or early term as well and this was partly to do with the fact, they were also more likely to have multiple births. The babies were also more likely to have been resuscitated and admitted to a SCN/NICU following their birth. These higher intervention rates may have been due to increased complexity in the pregnancy (also associated with older maternal age).¹⁸ Although

there was a statistically significant difference in the incidence of diabetes and hypertension between the two groups due to the large sample size, this was clinically quite a small difference. These differences in intervention rates have been shown to be associated with women who are socially advantaged and have private obstetric care in Australia,²⁸ with evidence of more morbidity for babies as a result, especially scalp trauma,²¹ which again was demonstrated in this study.

Infants born prematurely, small for gestational age (SGA) or with health problems are reported to be less attentive, difficult to sooth and more likely to have feeding difficulties,²⁹ and their atypical behaviour makes it difficult for parents to read their cues and respond appropriately.³⁰ Mothers of low birth weight infants report more stress related to care of their infants compared with mothers of normal weight infants^{29 31 32} and highly stressed parents of preterm infants are less sensitive and more controlling than mothers of full-term infants in dyadic play, with possible long lasting effects on mother–child interactional behaviour.³³ Studies also indicate that parents of SGA infants report their infant as being more fearful and negatively reactive compared with infants born appropriate for gestational age³⁴ and that mothers have difficulty in reciprocal play with an infant born SGA and their capacity to play with their infant moderates the relationship between infant mental development at 12 months of age.³⁵

It is particularly interesting to note that over time the numbers of women admitted to RPS who had an instrumental

birth has increased. There has been increasing attention in the media of late in Australia about maternal trauma (physical and mental) following instrumental births³⁶ (particularly forceps).³⁷ Women can be affected both physically and psychologically, as well as babies.^{21 38} Starting life as a baby with birth trauma and trying to mother with physical and psychological trauma is not ideal and may explain the apparent trend in more women going to RPS who have had caesareans and instrumental birth. However, while caesarean section has increased during this time period there was minimal change in the incidence of instrumental birth in NSW (10.7% in 2000 and 11.3% in 2012), so it is interesting to see this change in those who are seeking RPS. It could be possible practitioners are now less skilful with instruments, such as forceps, due to the increased use of vacuum delivery and this may be leading to increased maternal damage. More research is needed to unpick this intriguing observation. Other studies we have undertaken have shown the high rate of severe perineal trauma with instrumental birth.²⁰ In another study we undertook

looking at the medical records of women seeking RPS, we found caesarean section and forceps were both identified as contributing to birth trauma.³⁹

The impact of birthing practices on the newborn and early mothering are not insignificant.⁴⁰ Intrapartum synthetic oxytocin, for example, may disturb sucking and breastfeeding duration in the newborn,⁴¹ with animal research showing lasting effects on attachment, social interaction, feeding and sexual behaviour.⁴² Short and long term impact of mode of birth on the infant are also concerning indicating that vaginal birth may initiate important physiological trajectories that have implications for children and later on for adult health.⁴³ Unmedicated newborns are more aroused immediately following the birth⁴⁴ and able to breast feed without assistance if given skin to skin contact and freedom from intrusive procedures.^{45 46} Following caesarean section there is a significantly longer period of time compared with a normal vaginal birth before a mother touches and holds her newborn⁴⁷ and this impacts on early breast feeding.⁴⁸

Table 5 The six most commonly recorded ICD 10-AM codes for mothers at Karitane grouped

Issue	ICD 10-AM codes	% of n=6663	Description
Malaise	R53	37.9	Malaise and fatigue
Psychiatric	F53.0/F43.2/F32.21/F41.2/F41.1/F32.20/ F32.9/ F32.90/F41.9/F32.91/F34.1/F32.2/F43.0/ F32.11	16.8	Mild mental and behavioural disorders associated with the puerperium not elsewhere classified/ adjustment disorders/severe depressive episode without psychotic symptoms, arising in the postnatal period/mixed anxiety and depressive disorder/generalised anxiety disorder/severe depressive episode without psychotic symptoms, not specified as arising in the postnatal period/ depressive episode unspecified/depressive episode, unspecified, not specified as arising in the postnatal period/anxiety disorder unspecified/ depressive episode, unspecified, arising in the postnatal period/ dysthymia/severe depressive episode without psychotic symptoms/acute stress reaction/moderate depressive episode, arising in the postnatal period
Feeding	Z39.1/O92.50/O92.41/O92.11/O92.71/ O92.10	3.7	Care and examination of lactating mother/ suppressed lactation, without mention of attachment difficulty/hypogalactia, with mention of attachment difficulty/cracked nipple associated with childbirth, with mention of attachment difficulty/ other and unspecified disorders of lactation, with mention of attachment difficulty/cracked nipple associated with childbirth, without mention of attachment difficulty
Social/other	Z76.8/Z60.1/Z63.0/Z63.2/Z63.7	3.5	Persons encountering health services in other specified circumstances/atypical parenting situation/problems in relationship with spouse or partner/inadequate family support/other stressful life events affecting family and household
Sleep	G47.0	3.2	Disorders of initiating and maintaining sleep
Multiparity	Z64.1	1.1	Problems related to multiparity

ICD 10-AM, International Classification of Diseases V10 Australian Modification.

Table 6 The five most commonly recorded ICD 10-AM codes for mothers at Tresillian grouped

Issue	ICD 10-AM codes	% of n=26 372	Description
Social/other	Z76.8/Z60.8/Z63.0	46.0	Persons encountering health services in other specified circumstances/other problems related to social environment/problems in relationship with spouse or partner
Psychiatric	F43.2/F41.9/F53.0/F32.90/F43.9/F32.01/F43.8/F41.1/ F32.91/F43.1/F41.2/F32.20/F32.00/F32.9/ F31.9/F41.0/F32.21/F43.0/R45.81	42.7	Adjustment disorders/anxiety disorder unspecified/mild mental and behavioural disorders associated with the puerperium not elsewhere classified/depressive episode, unspecified, not specified as arising in the postnatal period/reaction to severe stress unspecified/mild depressive episode, arising in the postnatal period/other reactions to severe stress/generalised anxiety disorder/depressive episode, unspecified, arising in the postnatal period/PTSD/mixed anxiety and depressive disorder/severe depressive episode without psychotic symptoms, not specified as arising in the postnatal period/mild depressive episode, not specified as arising in the postnatal period/depressive episode unspecified/bipolar affective disorders unspecified/panic disorder episodic paroxysmal anxiety/severe depressive episode without psychotic symptoms, arising in the postnatal period/acute stress reaction/suicidal ideation
Malaise	R53	30.8	Malaise and fatigue
Feeding	Z39.1/R63.3	<1	Care and examination of lactating mother/feeding difficulties and mismanagement
Multiparity	Z64.1	<1	Problems related to multiparity

ICD 10-AM, International Classification of Diseases V10 Australian Modification; PTSD, post-traumatic stress disorder.

In NSW as whole there were significant changes in demographics and obstetric interventions which clearly are also impacting on some of the changes, we saw over time in the RPS admission characteristics. Smoking declined NSW wide from 17.3% in 2000 to 10.4% in 2012. Maternal age increased from 29.28 to 30.31 years in the time period. Women giving birth who were themselves born in Australia declined from 72.2% to 65.1%. Instrumental birth remained relative stable between 2000 and 2012 (10.7%–11.3%). Vaginal birth declined from 67.4% to 57% and the caesarean section rate changed from 21.8% to 31.8% over the time period. The majority of the change to the spontaneous vaginal birth rate came from an increase of 10 percentage points in the caesarean section rate over 12 years.

In Australia, many women experience significant physical and psychological distress in the year following birth and this can be increased with the use of obstetric interventions. In the first 6–7 months following birth, a large Victorian study found 94% of women reported one or more health problems, with tiredness and backache among the most commonly reported.⁴⁹ Compared with women who had spontaneous vaginal births, women who had instrumental births reported more physical health problems.⁴⁹

Some studies have shown the resolution of symptoms such as exhaustion, backache, lack of sleep associated with baby crying and perineal/pelvic floor morbidities between 8 and 24 weeks post partum, but no significant changes in headache/migraines, sexual problems and depression over the first 6 months.⁵⁰ Longitudinal studies in Europe identified that symptoms such as backache, anxiety and extreme tiredness are higher at 12 months than at 5 months following childbirth, showing certain symptoms may increase over time, not decrease.⁵¹ Maternal emotional well-being is linked to physical health in the postnatal period. A recent review on the literature on postnatal PTSD showed operative delivery (caesarean section/instrumental birth) were both risk factors for developing PTSD following the birth.²⁵

Sleeping crying and feeding difficulties main reasons for admission to RPS

Administrative data indicate that the most common admissions to RPS relate to infant feeding and sleep and settling concerns.^{14 52 53} The most common ICD 10 codes recorded for babies admitted to RPS were sleep, crying and feeding disorders. The services used more frequently, such as R68.1 (non-specific symptoms peculiar to infancy-excessive crying,

Table 7 Trends over time of characteristics of women using RPS (n=32 071 women, 33 035 infants)

	2000–2003	2004–2008	2009–2012	P value (epoch 1 compared with epoch 3)
Maternal age (in years*)	30.3 (5.66)	30.9 (5.85)	32.0 (6.13)	<0.001
Infant age (in days†)	97 (0–224)	140 (13–267)	167 (40–294)	<0.001
Smoking	13.6%	8.5%	5.4%	<0.001
Australian born	76.9%	78.7%	75.6%	<0.001
Hypertension	10.6%	10.4%	11.7%	0.541
Diabetes	4.9%	5.7%	5.0%	0.454
Plurality				
Singletons	93.8%	94.7%	94.9%	0.451
Multiples	5.2%	5.3%	5.1%	
Parity				
Primiparous	63.2%	63.0%	63.0%	0.762
Multiparous	36.8%	37.0%	37.0%	
Place of birth‡				
Hospital	96.9%	96.8%	96.9%	
Birth centre	2.8%	2.7%	2.8%	
Home birth	0.1%	0.1%	0.1%	
Born before arrival	0.2%	0.4%	0.2%	
Place of birth				
Public hospital	33.4%	35.1%	34.8%	0.544
Private hospital	66.4%	64.9%	65.2%	
Type of birth				
Vaginal	52.5%	45.1%	41.6%	<0.001
Instrumental	17.2%	18.4%	23.3%	
Caesarean section	30.3%	36.4%	35.0%	
Gestation (in weeks§)	38.5	38.5	38.6	1.00
Admitted to SCN/NICU	26.6%	24.5%	20.9%	<0.001

*Mean and SD.

†Median and IQR.

‡Cell count <5 statistics unable to be calculated.

§Calculated from last menstrual cycle or earliest ultrasound undertaken.

RPS, residential parenting services; SCN/NICU, Special Care Nursery/Neonatal Intensive Care.

irritable infant) (98.7%) or F51.9/F51.2 (non-organic sleep disorder unspecified/non-organic disorder of the sleep wake cycle), show the dominance of the three main factors (sleep, crying and feeding).

A recent study identifies a link between infant sleep problems and maternal depression and anxiety.⁵⁴ Importantly, maternal-and-infant sleep behaviour is bidirectional in nature.⁷ For example, maternal sleep issues may be in response to infant behaviour or the infant's behaviour could be in response to the mother's depression and anxiety.⁷ Field advises that most of the protective or risk factors associated with infant sleep problems relate to parental management activities.⁵⁵ This confirms the necessity to focus on both the mother's mental health and the infant's behaviour in any intervention. A residential parenting unit is able to provide

such holistic approaches to working with mothers (parents) and their infants.

Limitations

This paper examines admissions to hospitals and day stay facilities only and therefore is limited by the fact that visits to general practitioners, community based and outpatient facilities are not included in the datasets. This paper only presents simple data analyses which do not include any adjustment or stratification. This methodology was utilised due to the absence of data not included in the PDC and APDC which have been shown previously to influence health outcomes, such as body mass index and whether a diagnosis was new or pre-existing that admission.

It is not possible to draw a direct link between higher rates of intervention during the birth and increased likelihood of having an admission to a RPS as other factors such as having higher socioeconomic and education levels that comes with social advantage could lead to an increased uptake of services and these women are also more likely to receive private obstetric care which is also associated with increased intervention. The variations in the psychiatric diagnoses of the women accessing RPS may also be an association that is not directly linked and further research is needed to confirm this. We could not include fathers in the analysis and this is another acknowledged limitation of this study.

CONCLUSION

This is the largest study to date examining the characteristics of all women and babies admitted to RPS in NSW over 12 years. Women who access RPS in the first year after birth are more socially advantaged, have higher rates of birth intervention and their babies have more neonatal complications than those who do not access RPS. Sleeping, crying and feeding issues are the main reasons these babies are admitted to RPS.

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Contributors HGD formulated the study with VS and CF. CT analysed the data. RM, GO'L and JS assisted in writing of the paper and proofing.

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Patient consent for publication A waiver of consent was obtained for the undertaking of this research with consideration of the fact of the difficulty in obtaining consent considering the retrospective nature of the study and the fact that only deidentified information was recorded from the medical records reviewed.

Ethics approval Ethical approval was obtained from the NSW Population and Health Services Research Ethics Committee, Protocol No.2010/12/291. Approval was also granted by the RPS services for release of de-identified data from each site.

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Data availability statement Data may be obtained from a third party and are not publicly available.

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REFERENCES

1. Coyle SB, concern M. Maternal concern, social support, and health-related quality of life across childhood. *Res Nurs Health* 2011;34:297–309.
2. Matthey S, Speyer J. Changes in unsettled infant sleep and maternal mood following admission to a parentcraft residential unit. *Early Hum Dev* 2008;84:623–9.
3. Taylor J, Johnson M. How women manage fatigue after childbirth. *Midwifery* 2010;26:367–75.
4. Waylen A, Stewart-Brown S. Factors influencing parenting in early childhood: a prospective longitudinal study focusing on change. *Child Care Health Dev* 2010;36:198–207.
5. Bayer JK, Hiscock H, Hampton A, *et al*. Sleep problems in young infants and maternal mental and physical health. *J Paediatr Child Health* 2007;43:66–73.
6. Taylor J, Johnson M. The role of anxiety and other factors in predicting postnatal fatigue: from birth to 6 months. *Midwifery* 2012;pii: S0266-6138:00065–4.
7. Sadeh A, Tikotzky L, Scher A. Parenting and infant sleep. *Sleep Med Rev* 2010;14:89–96.
8. Lupien SJ, McEwen BS, Gunnar MR, *et al*. Effects of stress throughout the lifespan on the brain, behaviour and cognition. *Nat Rev Neurosci* 2009;10:434–45.
9. Karitane. Karitane 2012 annual report Karitane; 2012.
10. Tresillian. Tresillian annual report 2011 Tresillian; 2011.
11. Hammarberg K, Rowe HJR, Fisher JRW. Early post-partum adjustment and admission to parenting services in Victoria, Australia after assisted conception. *Hum Reprod* 2009;24:2801–9.
12. Tresillian family care centres 2015 Tresillian: annual report 2015. Belmore Tresillian; 2015.
13. Karitane. Karitane 2014 Annual Report 2014. Karitane 2014;Carramar.
14. Rowe HJ, Fisher JRW. The contribution of Australian residential early parenting centres to comprehensive mental health care for mothers of infants: evidence from a prospective study. *Int J Ment Health Syst* 2010;4:6.
15. Australian Bureau of Statistics. Australian Bureau of statistics. Profiles of health, Australia 2011–12; 2012. <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4338.0main+features152011-13>
16. CHeReL. Centre for health record linkage (CHeReL). Quality assurance report 2012, 2012. Available: http://www.cherelorgau/media/24160/qa_report_2012.pdf
17. Commonwealth of Australia. The International classification of diseases and health related problems. tenth revision, Australian modification (ICD-10-AM) 2012. Sydney, Australia; 2012.
18. Walker KF, Thornton JG. Advanced maternal age obstetrics. *Gynaecology & Reproductive Medicine* 2016;26:354–7.
19. Dahlen HG, Schmied V, Dennis C-L, *et al*. Rates of obstetric intervention during birth and selected maternal and perinatal outcomes for low risk women born in Australia compared to those born overseas. *BMC Pregnancy Childbirth* 2013;13.
20. Dahlen HG, Priddis H, Thornton C. Severe perineal trauma is rising, but let us not overreact. *Midwifery* 2015;31:1–8.
21. Dahlen H, Tracy S, Tracy MB, *et al*. Rates of obstetric intervention and associated perinatal mortality and morbidity among low-risk women giving birth in private and public hospitals in NSW (2000–2008): a linked data population-based cohort study. *BMJ Open* 2014;2014:e004551.
22. Fowler C, Rossiter C, Maddox J, *et al*. Parent satisfaction with early parenting residential services: a telephone interview study. *Contemp Nurse* 2012;43:64–72.
23. Chavis L. Mothering and anxiety: social support and competence as mitigating factors for first-time mothers. *Soc Work Health Care* 2016;55:461–80.
24. Sword W, Clark AM, Hegadoren K, *et al*. The complexity of postpartum mental health and illness: a critical realist study. *Nurs Inq* 2012;19:51–62.
25. Simpson M, Schmied V, Dickson C, *et al*. Postnatal post-traumatic stress: an integrative review. *Women Birth* 2018;31:367–79.
26. Barkin JL, Bloch JR, Hawkins KC, *et al*. Barriers to optimal social support in the postpartum period. *Journal of Obstetric, Gynecologic & Neonatal Nursing* 2014;43:445–54.
27. Winkworth G, McArthur M, Layton M, *et al*. Opportunities Lost—Why some parents of young children are not well-connected to the

- service systems designed to assist them. *Australian Social Work* 2010;63:431–44.
28. Dahlen HG, Tracy S, Tracy M, *et al.* Rates of obstetric intervention among low-risk women giving birth in private and public hospitals in NSW: a population-based descriptive study. *BMJ Open* 2012;2:e001723.
 29. Spielman V, Taubman-Ben-Ari O. Parental self-efficacy and stress-related growth in the transition to parenthood: a comparison between parents of pre- and full-term babies. *Health Soc Work* 2009;34:201–12.
 30. Als H, Butler S, Kosta S, *et al.* The assessment of preterm infants' behavior (APIB): furthering the understanding and measurement of neurodevelopmental competence in preterm and full-term infants. *Ment Retard Dev Disabil Res Rev* 2005;11:94–102.
 31. Davis L, Edwards H, Mohay H, *et al.* The impact of very premature birth on the psychological health of mothers. *Early Hum Dev* 2003;73:61–70.
 32. Kaarensen PI, Ronning JA, Ulvund SE, *et al.* A randomized, controlled trial of the effectiveness of an early-intervention program in reducing parenting stress after preterm birth. *Pediatrics* 2006;118:e9–19.
 33. Forcada-Guex M, Borghini A, Pierrehumbert B, *et al.* Prematurity, maternal posttraumatic stress and consequences on the mother–infant relationship. *Early Hum Dev* 2011;87:21–6.
 34. Pesonen A-K, Räikkönen K, Strandberg TE, *et al.* Do gestational age and weight for gestational age predict concordance in parental perceptions of infant temperament? *J Pediatr Psychol* 2006;31:331–6.
 35. Halpern LF, Garcia Coll CT, Meyer EC, *et al.* The contributions of temperament and maternal responsiveness to the mental development of small-for-gestational-age and appropriate-for-gestational-age infants. *J Appl Dev Psychol* 2001;22:199–224.
 36. Dahlen HG. The politicisation of risk. *Midwifery* 2016;38:6–8.
 37. O'Mahony F, Hofmeyr GJ, Menon V, *et al.* Choice of instruments for assisted vaginal delivery. *Cochrane Database Syst Rev* 2010;16.
 38. Muraca GM, Skioll A, Lisonkova S, *et al.* Perinatal and maternal morbidity and mortality among term singletons following midcavity operative vaginal delivery versus caesarean delivery. *BJOG* 2017.
 39. Priddis H, Thornton C, Fowler C, *et al.* Characteristics and service needs of women and babies admitted to residential parenting units in New South Wales: a mixed-methods study. *J Clin Nurs* 2018;27:2963–73.
 40. Smith L. Impact of birthing practices on the breastfeeding dyad. *J Midwifery Womens Health* 2007;52:621–30.
 41. Olza Fernández I, Marin Gabriel M, Malalana Martínez A, *et al.* Newborn feeding behaviour depressed by intrapartum oxytocin: a pilot study. *Acta Paediatr* 2012;101:749–54.
 42. Carter CS. Developmental consequences of oxytocin. *Physiol Behav* 2003;79:383–97.
 43. Hyde MJ, Mostyn A, Modi N, *et al.* The health implications of birth by caesarean section. *Biol Rev Camb Philos Soc* 2012;87:229–43.
 44. McLaughlin FJ, O'Connor S, Deni R. Infant state and behavior during the first postpartum hour. *Psychol Rec* 1981;31:455–8.
 45. Widstrom A-M, Ransjo-Arvidson AB, Christensson K, *et al.* Gastric suction in healthy newborn infants effects on circulation and developing feeding behaviour. *Acta Paediatr* 1987;76:566–72.
 46. Righard L. How do newborns find their mother's breast? *Birth* 1995;22:174–5.
 47. Fisher J, Astbury J, Smith A. Adverse psychological impact of operative obstetric interventions: a prospective longitudinal study. *Aust N Z J Psychiatry* 1997;31:728–38.
 48. Prior E, Santhakumaran S, Gale C, *et al.* Breastfeeding after cesarean delivery: a systematic review and meta-analysis of world literature. *Am J Clin Nutr* 2012;95:1113–35.
 49. Brown S, Lumley J. Maternal health after childbirth: results of an Australian population based survey. *BJOG* 1998;105:156–61.
 50. Thompson JF, Roberts CL, Currie M, *et al.* Prevalence and persistence of health problems after childbirth: associations with parity and method of birth. *Birth* 2002;29:83–94.
 51. Saurel-Cubizolles MJ, Romito P, Lelong N, *et al.* Women's health after childbirth: a longitudinal study in France and Italy. *BJOG* 2000;107:1202–9.
 52. Fisher JRW, Rowe HJ, Hammarberg K. Admission of women, with their infants, for psychological and psychiatric causes in Victoria, Australia. *Aust N Z J Public Health* 2011;35:146–50.
 53. Hanna B, Rolls C. How do early parenting centres support women with an infant who has a sleep problem? *Contemp Nurse* 2001;11:153–62.
 54. Petzoldt J, Wittchen H-U, Einsle F, *et al.* Maternal anxiety versus depressive disorders: specific relations to infants' crying, feeding and sleeping problems. *Child: Care, Health and Development* 2016;42:231–45.
 55. Field T. Infant sleep problems and interventions: a review. *Infant Behav Dev* 2017;47:40–53.