Planned home and hospital births in South Australia, 1991–2006: differences in outcomes

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Since 1981, the proportion of planned home births in South Australia has fluctuated between 0.2% and 0.5% of all births,[1] similar to the proportion nation-wide.[2] Until recently, most were attended by independent midwives without formal support from the health care system and, since 2001, also without professional indemnity insurance. Between 1992 and 2006, the proportion of women giving birth in birth centres attached to major hospitals steadily increased from 0.6% to 6.9%,[1] suggesting that there is a small but increasing demand for alternatives to mainstream obstetric care, which is characterised by high intervention rates,[3] including caesarean section rates above 30%.[1,2]

In response to this demand, a publicly funded community midwifery project was started in 1998 in the northern metropolitan area of SA, with around 10% of women in this project having a home birth. Other changes have also occurred. In 2002, direct-entry Bachelor of Midwifery courses were introduced in SA, which may increase the number of midwives wishing to practise more autonomously. Some public hospitals have introduced midwifery group practice models of care with the option of home birth after the introduction of the Policy for Planned Birth at Home in South Australia in 2007.[4] These changes may have an impact on the frequency and outcomes of home births in the future.

A study of planned home births in SA between 1976 and 1987 showed lower intervention rates during labour and child-birth in planned home births, but also a higher incidence of postpartum haemorrhage and a five times higher standardised perinatal mortality ratio compared with hospital births.[5] Concerns were expressed about deaths from intrapartum asphyxia and sudden infant death syndrome. Studies of planned home births in Western Australia[6] and Victoria[7] also found low intervention rates. The Western Australian study, which looked at home births during the period 1981–1987, showed higher rates of post-term births and postpartum haemorrhage compared with hospital births. An Australia-wide study of home births from 1985 to 1990 confirmed the higher risk of perinatal

ABSTRACT

Objective: To examine differences in outcomes between planned home births, occurring at home or in hospital, and planned hospital births.

Design and setting: Population-based study using South Australian perinatal data on all births and perinatal deaths during the period 1991–2006. Analysis included logistic regression adjusted for predictor variables and standardised perinatal mortality ratios.

Main outcome measures: Perinatal death, intrapartum death, death attributed to intrapartum asphyxia, Apgar score < 7 at 5 minutes, use of specialised neonatal care, operative delivery, perineal injury and postpartum haemorrhage.

Results: Planned home births accounted for 0.38% of 300 011 births in South Australia. They had a perinatal mortality rate similar to that for planned hospital births (7.9 v 8.2 per 1000 births), but a sevenfold higher risk of intrapartum death (95% CI, 1.53–35.87) and a 27-fold higher risk of death from intrapartum asphyxia (95% CI, 8.02–88.83). Review of perinatal deaths in the planned home births group identified inappropriate inclusion of women with risk factors for home birth and inadequate fetal surveillance during labour. Low Apgar scores were more frequent among planned home births, and use of specialised neonatal care as well as rates of postpartum haemorrhage and severe perineal tears were lower among planned home births, but these differences were not statistically significant. Planned home births had lower caesarean section and instrumental delivery rates, and a seven times lower episiotomy rate than planned hospital births.

Conclusions: Perinatal safety of home births may be improved substantially by better adherence to risk assessment, timely transfer to hospital when needed, and closer fetal surveillance.

death among planned home births,[8] but also indicated that the excess mortality was largely due to accepting home birth for women with well known risk factors,[4,9,10] such as post-term pregnancies, twins and breech births.[8]

In view of these data, we conducted a retrospective population-based study of planned home and hospital births to assess current practice and outcomes, and to provide a baseline for evaluating the impact of the Policy for Planned Birth at Home in South Australia and changes to the types of maternity care available to pregnant women.

METHODS

The study was approved by the SA Health Human Research Ethics Committee. Data were obtained from two collections held at the Pregnancy Outcome Unit of SA Health: the collection of perinatal statistics for all births in SA[1] and the collection of statistics on perinatal deaths in SA for the years 1991

to 2006.[11] Data from the births collection do not allow differentiation between transfers before or during labour, but this is known for perinatal deaths as an expert committee reviews all perinatal deaths in SA.[11]

Perinatal outcomes studied were perinatal death, intrapartum death (fetal death during labour), death attributed to intrapartum asphyxia (ie, death of a normally formed baby of at least 1500 g attributed to hypoxia during labour), Apgar score < 7 at 5 minutes, and use of specialised neonatal care, including paediatric intensive care. Maternal outcomes assessed were operative delivery, postpartum haemorrhage and perineal injury after vaginal birth. Data for episiotomy and perineal injury were available for 1998–2006 only.

Perinatal deaths were defined according to Australian definitions as the sum of still-births and neonatal deaths within 28 days of birth.[11] Causes of perinatal deaths were classified by the Maternal, Perinatal and Infant Mortality Committee using the

amended Whitfield classification,[11] which includes categories such as congenital anomalies and intrapartum asphyxia.

Occupational status in the SA perinatal statistics was classified according to the Australian Standard Classification of Occupations of the Australian Bureau of Statistics.[1] For mothers with a partner we used the higher of the two occupations. Births classified as small for gestational age were defined as being of a birthweight smaller than the 10th centile by gender-specific Australian standards.[12] Perinatal mortality ratios were standardised by gestational age groups and birthweight groups after excluding deaths attributed to congenital anomalies.[5,11]

Odds ratios were adjusted for predictors of outcome, including maternal age, parity, occupational status, smoking, plurality, medical and obstetric complications (eg, antepartum haemorrhage, diabetes, hypertension), gestational age, small for gestational age, congenital anomalies, city or country hospital, and mode of delivery. Predictors with significance probabilities of < 0.25, as indicated by χ^2 and Fisher exact tests, were included in unconditional logistic regression models using Stata statistical software, version 10 (Stata Corporation, College Station, Tex, USA). Variables with likelihood ratios not significant at the 5% level were removed from the models and checked for confounding. The models were checked with conditional (fixed-effects) logistic regression because of low frequencies, with home birth as a predictor and other predictors in the unconditional model used to define strata. Exact logistic regression, which does not rely on distributional assumptions, was not possible for the models owing to software limitations. Where conditional logistic regression was an inadequate fit due to sparse data, Mantel–Haenszel stratified estimates of the common odds ratio were calculated.

RESULTS

Of 300 011 births during the period 1991–2006 (consisting of all livebirths as well as stillbirths of at least 400 g birthweight or 20 weeks' gestation), 461 that were terminations of pregnancy and 1217 with no antenatal care were excluded. The remaining 298 333 were divided into 297 192 planned hospital births and 1141 (0.38%) planned home births. The latter were defined as any birth that, at the time of antenatal booking, was intended to occur at home. Of these,

1 Perinatal mortality for planned home births (n = 1141), occurring at home (n = 792) or in hospital after transfer (n = 349), compared with planned hospital births (n = 297 192) in South Australia, 1991–2006

	No. of deaths	Rate per 1000 births	Adjusted odds ratio* (95% CI)	P
Perinatal deaths				
Planned hospital births	2440	8.2	1.00	
Planned home births	9	7.9	1.38 (0.56–3.41)	0.48
Born at home	2	2.5	0.48 (0.06–3.61)	0.48
Born in hospital	7	20.1	2.50 (0.85–7.35)	0.10
Intrapartum deaths				
Planned hospital births	247	0.8	1.00	
Planned home births	2	1.8	7.42 (1.53–35.87)	0.01
Born at home	1	1.3	6.58 (0.77–56.32)	0.09
Born in hospital	1	2.9	8.64 (0.85–88.22)	0.07
Deaths attributed to intrapartum asphyxia				
Planned hospital births	87	0.3	1.00	
Planned home births	3	2.6	26.69 (8.02–88.83)	< 0.001
Born at home	1	1.3	13.69 (1.81–103.7)	0.03
Born in hospital	2	5.7	47.95 (11.39–201.8)	< 0.001

* Adjusted for various predictor variables (described in Methods). As the frequency of death is low in all groups, odds ratios are very similar to risk ratios (relative risks). ◆

792 (69.4%) did occur at home and 349 occurred in hospital after transfer.

Women in the planned home birth group were older (mean age, 31.3 [SD, 5.5] years) than those in the planned hospital birth group (mean age, 29.2 [SD, 5.5] years), less likely to be nulliparous (31.2% v 41.0%, $P < 0.001$) or Indigenous (1.0% v 2.2%, $P = 0.003$), and more likely to have higher occupational status ($P < 0.001$) and to live in the metropolitan area (79.8% v 76.0%, $P = 0.003$). Post-term pregnancies (≥ 42 weeks' gestation) were more common in the planned home birth group compared with the planned hospital birth group (3.8% v 1.2%, $P < 0.001$). In the planned home birth group, 25 infants of 43 post-term pregnancies (58%) were born at home, and five infants of five sets of twins were born at home. From 1998 to 2006, 56 of 635 women (8.8%) with a previous caesarean section planned a home birth, of whom 32 (57%) gave birth at home.

Perinatal mortality

There were nine deaths in the planned home birth group — a rate of 7.9 per 1000 births, compared with 8.2 per 1000 births for planned hospital births (Box 1) — with no trend over time. Two were among the 792

infants born at home (2.5 per 1000 births). One of these two infants had congenital anomalies suspected on ultrasound; the parents declined further investigation, and the infant had palliative care and died from lethal anomalies. The other was a fresh stillbirth from a water birth. Although birth under water was thought not to have contributed to the death, closer monitoring during labour may have changed the outcome.

Of the seven perinatal deaths among the 349 women transferred to hospital (20.1 per 1000 births), two occurred in pregnancies that were not low risk at booking. In one of these two pregnancies, the mother had haematological abnormalities, went post-term and had labour induced; the infant died from a lethal anomaly. In the other, a twin pregnancy, the parents had had unsatisfactory hospital experiences during previous pregnancies and persisted in their home birth choice despite advice against it. Delay in transfer and access to hospital contributed to the death of the second twin from intrapartum asphyxia.

For five of the perinatal deaths among the women transferred to hospital, the pregnancies had been low risk at booking. In three of these there was an antepartum death that was unrelated to the type of antenatal care

received. One was a hydropic fetus with a non-lethal congenital anomaly; one was growth-restricted with suspected abnormal karyotype; and the other was unexplained with an umbilical cord that was interlocked and wound tightly around the neck four times, but autopsy was not performed. In the other two, the parents declined intervention after a change in risk status had occurred. One involved early prelabour rupture of the membranes, which resulted in neonatal death from pulmonary hypoplasia; and in the other, the pregnancy became seriously post-term, referral was resisted and fetal monitoring was refused after eventual hospital admission, resulting in a stillbirth attributed to intrapartum asphyxia.

Unadjusted mortality was 4.5 per 1000 births for infants weighing $\geqslant 2500$ g and 3.8 per 1000 births for term infants (37–41 weeks) in the planned home birth group, compared with 2.4 per 1000 births for both infants $\geqslant 2500$ g and term infants in the planned hospital birth group.

Intrapartum deaths and standardised perinatal mortality

Excluding congenital anomalies, there was no statistical difference in perinatal mortality between planned home and planned hospital births (4.5 v 6.7 per 1000 births, P=0.46), but this does not take into account large differences in gestational age and birthweight between the groups. One third of deaths (3 of 9) among planned home births were due to intrapartum asphyxia compared with 3.6% among planned hospital births. Both intrapartum deaths and deaths attributed to intrapartum asphyxia were considerably more frequent in the home birth group than in the hospital birth group (Box 1). Perinatal mortality ratios standardised by gestation and birthweight groups were higher for planned home births than for planned hospital births, but reached statistical significance only in the group transferred to hospital (Box 2).

Neonatal morbidity

Overall, there was no statistical difference in the frequency of Apgar scores of <7 at 5 minutes and use of specialised neonatal care between liveborn infants from planned home and hospital births (Box 3). Infants born after transfer to hospital were three times more likely to have an Apgar score of <7 at 5 minutes than infants from planned hospital births (Box 3). Infants born at home were half as likely to receive specialised

2 Perinatal mortality ratios standardised by gestational age and birthweight groups for planned home births (n = 1141), occurring at home (n = 792) or in hospital after transfer (n = 349), compared with planned hospital births (n = 297 192) in South Australia, 1991–2006*

	No. of deaths observed*	No. of deaths expected[†]	Perinatal mortality ratio[‡] (95% CI)	P
Standardised by gestational age groups				
Planned home births	7	3.2	2.18 (0.87–4.50)	0.09
Born at home	1	1.6	0.62 (0.14–4.50)	0.95
Born in hospital	6	1.6	3.74 (1.37–8.15)	0.01
Standardised by birthweight groups				
Planned home births	7	3.0	2.36 (0.95–4.86)	0.06
Born at home	1	1.3	0.75 (0.17–5.38)	0.77
Born in hospital	6	1.6	3.69 (1.34–8.03)	0.01

* Excluding deaths attributed to congenital anomalies. † Deaths that would have been expected if the death rate had been the same as that for all births in SA within similar gestational age or similar birthweight groupings. ‡ Standardised mortality ratios in planned home births versus 1.00 for planned hospital births. ◆

3 Neonatal morbidity of liveborn infants from planned home births (n = 1136), occurring at home (n = 791) or in hospital after transfer (n = 345), compared with planned hospital births (n = 295 568) in South Australia, 1991–2006

	No. (%)	Adjusted odds ratio* (95% CI)	P
Apgar score < 7 at 5 minutes			
Planned hospital births	4243 (1.4%)	1.00	
Planned home births	12 (1.1%)	1.43 (0.66–3.07)	0.36
Born at home	4 (0.5%)	0.62 (0.15–2.49)	0.50
Born in hospital	8 (2.3%)	3.20 (1.24–8.26)	0.02
Specialised neonatal care			
Planned hospital births	44 410 (15.0%)	1.00	
Planned home births	88 (7.7%)	0.80 (0.62–1.03)	0.08
Born at home	27 (3.4%)	0.51 (0.34–0.76)	0.001
Born in hospital	61 (17.7%)	1.27 (0.90–1.80)	0.18

* Adjusted for various predictor variables (described in Methods). ◆

neonatal care as infants from planned hospital births (Box 3).

Maternal morbidity

Operative delivery rates (caesarean section and instrumental delivery) were significantly lower in the planned home birth group (Box 4). Women in both home birth subgroups (born at home and born in hospital) were more likely to have an intact perineum (OR, 3.35; 95% CI, 2.78–4.03), mainly due to fewer episiotomies, after adjustment for known predictors including obstetric history. Frequencies of third or fourth degree perineal tears and postpartum haemorrhage were not significantly different

between planned home births and planned hospital births (Box 4).

DISCUSSION

In our study of births and perinatal deaths in SA during the period 1991–2006, planned home births had a perinatal mortality rate similar to that of planned hospital births, but had a sevenfold higher risk of intrapartum death and a 27-fold higher risk of death from intrapartum asphyxia.

Discussions on the safety of planned home birth have been raging for decades, not only in Australia[13,14] and the US,[15,16] where the proportion of home births is well below 1%,[2,10,15] or the UK,[17,18] with a pro-

4 Interventions and maternal morbidity for women who had planned home births (n = 1136), occurring at home (n = 790) or in hospital after transfer (n = 346), compared with women who had planned hospital births (n = 292 469) in South Australia, 1991–2006

	No. (%)	Adjusted odds ratio* (95% CI)	P
Caesarean section			
Planned hospital births	79 238 (27.1%)	1.00	
Planned home births	104 (9.2%)	0.27 (0.22–0.34)	< 0.001
Instrumental delivery			
Planned hospital births	37 386 (12.8%)	1.00	
Planned home births	50 (4.4%)	0.33 (0.25–0.44)	< 0.001
Episiotomy†			
Planned hospital births	24 422 (21.7%)	1.00	
Planned home births	21 (3.6%)	0.14 (0.08–0.23)	< 0.001
Born at home	2 (0.4%)	0.03 (0.01–0.11)	< 0.001
Born in hospital	19 (15.8%)	0.49 (0.27–0.89)	0.02
Third or fourth degree perineal tears†			
Planned hospital births	2030 (1.8%)	1.00	
Planned home births	6 (1%)	0.77 (0.34–1.74)	0.53
Born at home	2 (0.4%)	0.37 (0.09–1.49)	0.16
Born in hospital	4 (3.3%)	1.74 (0.62–4.89)	0.29
Postpartum haemorrhage			
Planned hospital births	16 200 (5.5%)	1.00	
Planned home births	50 (4.4%)	0.72 (0.47–1.11)	0.14
Born at home	24 (3.04%)	0.67 (0.39–1.14)	0.14
Born in hospital	26 (7.5%)	0.84 (0.42–1.69)	0.63

* Adjusted for various predictor variables (described in Methods). † Numbers and percentages represent women who had vaginal births from 1998 to 2006 (112 737 planned hospital births and 577 planned home births [457 born at home; 120 born in hospital]). ◆

portion of 2%–3%,[19] but also in the Netherlands,[20,21] where home births still account for 30% of births.[20,22] Both proponents and opponents of home birth have compelling arguments. Opponents argue that unexpected complications do arise, with appropriate help more likely to be available in hospital.[18] Proponents[14,16] argue that such complications are rare, and are disproportionate to the frequency of childbirth interventions that have their own complications in most obstetric departments.[3]

The advent of evidence-based medicine has seen attempts to resolve this dilemma by the ultimate evidence: a randomised controlled trial (RCT). Not surprisingly, such attempts have failed.[22,23] RCTs require equipoise. The available evidence shows that few women have such equipoise, even if their caregivers appear to have it.[22-24] RCTs also require either very large numbers of participants or sufficiently frequent adverse outcomes to show statistically significant differences between home and hospital births. Neither sufficient numbers nor sufficient frequencies are likely to apply to an Australian population. Thus, observational studies such as ours and others[19,21,25] remain important for detecting patterns of avoidable problems.[8,19]

Our study has the bias of observational studies, as women who had home births were self-selected. Their characteristics were similar to those in other studies: on average older,[5,7] of higher socioeconomic status[5,15] and less likely to be nulliparous[7] than women with a planned hospital birth. Factors in this self-selection include cultural and spiritual factors, the desire to be in control of a normal process, to feel secure in familiar surroundings with family and friends, and to have a known midwife, as well as distance from birthing services, and negative experiences with hospitals.[4,15]

Although our study has shown few adverse outcomes from planned home births in SA, small numbers with large confidence intervals limit interpretation of these data. Although mortality did not differ overall when compared with planned hospital births, the risk of the infant dying from intrapartum asphyxia was higher than for planned hospital births after adjusting for predictor variables, and those transferred to hospital had higher perinatal mortality ratios adjusted for gestation or birthweight.

Nonetheless, in the 16-year study period there were only three perinatal deaths for which one can reasonably assume that a different choice of care provider, location of birth, or timing of transfer to hospital might have made a difference to the outcome. Characteristics of these births were post-term pregnancy, twin pregnancy, and inadequate fetal surveillance during labour. These factors have been identified as responsible for excess perinatal mortality in other planned home birth studies[8,10] and might have been avoided if the Policy for Planned Birth at Home in South Australia[4] had been available and followed. Several women accepted for home birth also had previous caesarean sections.

It is reassuring that the rate of postpartum haemorrhage, which had been of concern in earlier Australian studies,[5,6] was not higher for planned home births than planned hospital births. It is tempting to attribute this to wider adoption of oxytocic prophylaxis in home births, but we have no data to confirm or refute this hypothesis. The lower operative delivery and episiotomy rates in planned home births are consistent with other studies showing fewer interventions than in planned hospital births.[5-7]

Similar to other studies,[5,8,19] we could not differentiate all planned home births according to whether transfer to hospital had occurred before or during labour, or the reasons for transfer, which limits the interpretation of differences in outcome between those with and without transfer. Data from the Netherlands indicate that about 40% of nulliparous women who start labour at home are referred to hospital during labour compared with less than 15% of parous women.[20] Not all of these require intervention, let alone urgent attention.[25] However, as the need for transfer mostly reflects a change in risk status, outcomes after transfer during labour will generally compare unfavourably with those not transferred or already in hospital. Nonetheless, the extent of the difference and audit of such cases may

provide important lessons on how to reconcile a woman's right of autonomy with the duty of care that practitioners have to the woman, but also and separately to the baby.[4] For some perinatal deaths in our study this was clearly an issue. Whether appropriate information tailored to women choosing home birth and their caregivers, as provided by the Policy for Planned Birth at Home in South Australia,[4] will help to address this remains to be seen. Integration of home birth practitioners into the health system with supervision and backup may help to dissuade women from undertaking high-risk home births and reduce avoidable adverse outcomes.

Although it is not anticipated that large numbers of women will opt for home birth, women's autonomy in choosing reproductive behaviour is a fundamental human right enshrined in Australian law.[4] Respecting their choices and achieving the best outcome for all concerned is likely to remain a challenge that will require more light and less heat than it has received thus far.

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