

# Outcomes of planned home births with certified professional midwives: large prospective study in North America

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## Abstract

**Objective** To evaluate the safety of home births in North America involving direct entry midwives, in jurisdictions where the practice is not well integrated into the healthcare system.

**Design** Prospective cohort study.

**Setting** All home births involving certified professional midwives across the United States (98% of cohort) and Canada, 2000.

**Participants** All 5418 women expecting to deliver in 2000 using midwives with a common certification, who planned to deliver at home when labour began.

**Main outcome measures** Intrapartum and neonatal mortality, perinatal transfer to hospital care, medical intervention during labour, breast feeding, and maternal satisfaction.

**Results** 655 (12.1%) of women who intended to deliver at home when labour began were transferred to hospital. Medical intervention rates included epidural (4.7%), episiotomy (2.1%), forceps (1.0%), vacuum extraction (0.6%), and caesarean section (3.7%); substantially lower than for low risk US women having hospital births. The intrapartum and neonatal mortality among women considered at low risk at start of labour, excluding deaths concerning life threatening congenital anomalies, was 1.7 deaths per 1000 planned home births, similar to risks in other studies of low risk home and hospital births in North America. No mothers died. No discrepancies were found for perinatal outcomes independently validated.

**Conclusions** Planned home birth for low risk women in North America using certified professional midwives was associated with lower rates of medical intervention but similar intrapartum and neonatal mortality to that of low risk hospital births in the United States.

## Introduction

Despite a wealth of evidence supporting planned home birth as a safe option for women with low risk pregnancies,<sup>1</sup> the setting remains controversial in most high resource countries. Although several Canadian medical societies<sup>2,3</sup> and the American Public Health Association<sup>4</sup> acknowledge the viability of home births, the American College of Obstetricians and Gynecologists continues to oppose it.<sup>5</sup> Studies on home birth have been criticised if they have been too small to accurately assess perinatal mortality, unable to distinguish planned from unplanned home births accurately, or retrospective with the potential of bias from selective reporting. Studying direct entry midwifery practices across North America, we carried out the largest prospective study of planned home births to date, with direct entry midwives involved with

home births across North America. We compared perinatal outcomes with those of studies of low risk hospital births in the United States.

## Methods

The competency based process of the North American Registry of Midwives provides a certified professional midwife credential, primarily for direct entry midwives who attend home births. Our target population was all women who engaged the services of a certified professional midwife in Canada or the United States as their primary caregiver for a birth with an expected date of delivery in 2000. In autumn 1999, the North American Registry of Midwives made participation in the study mandatory for recertification and provided an electronic database of the 534 certified midwives whose credentials were current.

We contacted 502 of the midwives (94.0%). We sent data forms and information on the study to the 409 midwives actively practising. For each new client, the midwife listed identifying information on the registration log form at the start of care and updated this every three months, obtained consent, and completed a form on course of care. She had to account for all registered clients.

We reviewed the clinical details and circumstances of stillbirths and neonatal deaths, and we telephoned the midwives for confirmation and clarification. Information was verified through reports from coroners, autopsies, or hospitals on all but four deaths, for which we obtained peer reviews.

We contacted a stratified, random 10% sample, of over 500 mothers, including at least one client for every midwife in the study. The mothers were asked about the date and place of birth, any required hospital care, any problems with care, the health status of themselves and their baby, and 11 questions on level of satisfaction with care.

We focused on the mother's personal details, reasons for leaving care prenatally, the rates and reasons for transfer during labour and post partum, medical interventions, health and admission to hospital of the newborn or mother from birth up to six weeks post partum, intrapartum and neonatal mortality, and breast feeding. We compared medical intervention rates for the planned home births with data from birth certificates for all 3 360 868 singleton, vertex births at 37 weeks or more gestation in the United States in 2000,<sup>6</sup> as a proxy for a comparable low risk group. We also compared medical intervention rates with the listening to mothers survey.<sup>7</sup> Intrapartum and



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neonatal death rates were compared with those in other North American studies of at least 500 births that were either planned out of hospital births or comparable studies of low risk hospital births.

## Results

A total of 409 certified professional midwives from across the United States and two Canadian provinces registered 7623 women whose expected date of delivery was in 2000. Eighteen midwives (4.4%) and their clients were excluded from the study because they failed to actively participate and had decided not to recertify. Sixty mothers (0.8%) declined to participate. (See [bmj.com](http://bmj.com) for the screening choices of women through the study.)

We focused on the 5418 women who intended to deliver at home at the start of labour. These women were on average older, of a lower socioeconomic status and higher educational achievement, and less likely to be African-American or Hispanic than full gestation, vertex, singleton hospital births in the US in 2000 (see [bmj.com](http://bmj.com)). Of the 5418 women, 655 (12.1%) were transferred to hospital intrapartum or post partum (table 1). Five out of every six women transferred (83.4%) were transferred before delivery, half (51.2%) for failure to progress, pain relief, and/or exhaustion. After delivery, 1.3% of mothers and 0.7% of newborns were transferred to hospital, most commonly for maternal haemorrhage (0.6% of total births), retained placenta (0.5%), or respiratory problems in the newborn (0.6%). The midwife considered the transfer urgent in 3.4% of cases. Transfers were four times as common among primiparous women (25.1%) as among multiparous women (6.3%).

Individual rates of medical intervention for home births were consistently less than half those in hospital, whether compared with a relatively low risk group (singleton, vertex, 37 weeks or more gestation) that will have a small percentage of higher risk births or the general population having hospital births (table 2). Compared with the relatively low risk hospital group, intended home births were associated with lower rates of medical interventions. The caesarean rate for intended home births was 8.3% among primiparous women and 1.6% among multiparous women.

No maternal deaths occurred. Excluding three babies with fatal birth defects, five deaths were intrapartum and six occurred during the neonatal period (2.0 deaths per 1000 intended home births; see [bmj.com](http://bmj.com)). Excluding planned breeches and twins (not considered low risk), intrapartum and neonatal mortality was 1.7 deaths per 1000 low risk intended home births.

Breech and multiple births at home are controversial among home birth practitioners. Among the 80 planned breeches at home there were two deaths and none among the 13 sets of twins. In the 694 births (12.8%) in which the baby was born under water, there was one intrapartum death (birth at 41 weeks, five days) and one fatal birth defect death.

Apgar scores were reported for 94.5% of babies; 1.3% had Apgar scores below 7 at five minutes. Immediate neonatal complications were reported for 226 newborns (4.2% of intended home births).

**Table 1** Transfers to hospital among 5418 women intending home births with a certified professional midwife in the United States, 2000, according to timing, urgency, and reasons

Variable	No (%) needing urgent transfer	No (%) needing transfer
<b>Timing of transfers</b>		
Stage before delivery:		
1st*	62 (1.1)	380 (7.0)
2nd*	51 (0.9)	134 (2.5)
Not specified	4 (0.1)	32 (0.6)
After delivery:		
Maternal transfers	43 (0.8)	72 (1.3)
Newborn transfers	25 (0.5)	37 (0.7)
All	185 (3.4)	655 (12.1)
<b>Reasons for transfer†</b>		
During labour:		
Failure to progress in 1st stage	4 (0.1)	227 (4.2)
Failure to progress in 2nd stage	12 (0.2)	80 (1.5)
Pain relief	4 (0.1)	119 (2.2)
Maternal exhaustion	1 (<0.1)	112 (2.1)
Malpresentation	20 (0.4)	94 (1.7)
Thick meconium	13 (0.2)	49 (0.9)
Sustained fetal distress	31 (0.6)	49 (0.9)
Baby's condition	5 (0.1)	21 (0.4)
Prolonged or premature rupture of membranes	0 (0.0)	19 (0.4)
Placenta abruptio or placenta previa	5 (0.1)	10 (0.2)
Haemorrhage	5 (0.1)	7 (0.1)
Pre-eclampsia or hypertension	5 (0.1)	13 (0.2)
Cord prolapse	3 (0.1)	6 (0.1)
Breech	1 (<0.1)	3 (0.1)
Other	9 (0.2)	17 (0.3)
Post partum:		
Newborn transfers:		
Respiratory problems	14 (0.3)	33 (0.6)
Evaluation of anomalies	2 (<0.1)	8 (0.1)
Other reasons	9 (0.2)	17 (0.3)
Maternal transfers:		
Haemorrhage	21 (0.4)	34 (0.6)
Retained placenta	14 (0.3)	28 (0.5)
Suturing or repair of tears	1 (<0.1)	14 (0.2)
Maternal exhaustion	2 (<0.1)	4 (0.1)
Other reasons	5 (0.1)	8 (0.1)

\*104 of these women were transferred to hospital after midwives' first assessment of labour (1.9% of labours), 38 of which were considered urgent.

†Totals for urgent transfers are based on primary reason for transport only, but column for all transfers adds up to more than number transported as both primary and secondary reason (if reported) for transport to hospital are presented.

Health problems in the six weeks post partum were reported for 7% of newborns. Among the 5200 (96.0%) mothers who returned for the six week postnatal visit, 98.3% of babies and 98.4% of mothers had good health, and no residual health problems were reported. Among the stratified, random 10% sample of women contacted directly by study staff to validate birth outcomes, no new transfers to hospital during or after the birth were reported and no new stillbirths or neonatal deaths were uncovered. Mothers' satisfaction with care was high for all 11 measures, with over 97% reporting that they were extremely or very satisfied.

## Discussion

Women who intend at the start of labour to have a home birth with a certified professional midwife had a low rate of intrapartum and neonatal mortality, similar to that in most studies of low risk hospital births in North America. A high degree of safety and maternal

**Table 2** Intervention rates for 5418 planned home births attended by certified professional midwives and hospital births in the United States. Values are numbers (percentages) unless stated otherwise

Intervention	No (%) of intended home births with certified professional midwives in US, 2000 (n=5418)	Singleton, vertex births at $\geq 37$ weeks gestation in US, 2000* (n=3 360 868) (%)	Survey of singleton births in all risk categories in US, 2000-1† (n=1583) (%)
Electronic fetal monitoring	520 (9.6)	84.3	93
Intravenous	454 (8.4)	NR	85
Artificial rupture of membranes	272 (5.0)	NR	67
Epidural	254 (4.7)	NR	63
Induction of labour‡	519 (9.6)	21.0	44
Stimulation of labour	498 (9.2)	18.9	53
Episiotomy	116 (2.1)	33.0	35
Forceps	57 (1.0)	2.2	3
Vacuum extraction	32 (0.6)	5.2	7
Caesarean section	200 (3.7)	19.0	24

NR=not reported on birth certificate.

\*Based on data from birth certificates for all 3 360 868 such births in United States in 2000. Data reported by National Center for Health Statistics.<sup>10</sup> This subset of birthing women would generally be low risk, but would include a small percentage of higher risk women who would likely require more medical intervention.

†Results from listening to mothers survey, October 2002. Percentages weighted to reflect US population of birthing women, aged 18-44.<sup>5</sup> Includes about 20% of women not at low risk who may experience higher intervention rates.

‡For certified professional midwives 2000 study and listening to mothers survey, both attempted and successful inductions were reported; for US birth certificate data only successful inductions are reported.

satisfaction were reported, and over 87% of mothers and neonates did not require transfer to hospital.

A randomised controlled trial would be the best way to tackle selection bias of mothers who plan a home birth, but a randomised controlled trial in North America would be unfeasible. Prospective cohort studies remain the most comprehensive instruments available.

Our results for intrapartum and neonatal mortality are consistent with most other North American studies of intended births out of hospital and studies of low risk hospital birth (see [bmj.com](http://bmj.com)). A meta-analysis<sup>8</sup> and research in several countries,<sup>1 9 10-12</sup> have reinforced support of home birth. Researchers reported high overall perinatal mortality in a study of home birth in Australia,<sup>13</sup> qualifying that low risk home births in Australia had good outcomes but that high risk births gave rise to a high rate of avoidable death at home. Two prospective studies in North America found positive outcomes for home birth,<sup>14 15</sup> but the studies were not of sufficient size to provide stable perinatal death rates. None of this evidence, including ours, is consistent with a study in Washington State based on birth certificates.<sup>16</sup> That study reported an increased risk with home birth but lacked an explicit indication of planned place of birth, creating the potential inclusion of high risk unplanned, unattended home births.<sup>17 18</sup>

Our study has several strengths. Internationally, it is the largest of the few prospective studies of home birth done to date. We accurately identified births planned at home at the start of labour and included independent verification of birth outcomes for a sample of 534 planned home births. We obtained data from almost 400 midwives from across the continent.

Regardless of methodology, residual confounding of comparisons between home and hospital births will always be a possibility. Women choosing home birth may differ for unmeasured variables from women choosing hospital birth. On the other hand, women who choose hospital birth may have a psychological advantage in North America associated with not having to deal with social pressures on their choice of birth place.

Our results may be generalisable to a larger community of direct entry midwives. The North American Registry of Midwives was created in 1987 to develop the certified professional midwife credential—a route for formal certification for midwives involved in home birth who were not nurse midwives and who came from diverse educational backgrounds. Thus the women who chose to become certified professional midwives were a subset of the larger community of direct entry midwives in North America whose diverse educational backgrounds and midwifery practice were similar to certified professional midwives. From 1993 to 1999, using an earlier iteration of the data form, we collected largely retrospective data on a voluntary basis mainly from direct entry midwives involved with home births approached through the Midwives Alliance of North America Statistics and Research Committee and the Canadian Midwives Statistics' Collaboration. This unpublished data of over 11 000 planned home births showed similar rates of intervention, transfers to hospital, and adverse outcomes.

Our main limitation was the inability to develop a workable design from which to collect a national prospective low risk group of hospital births to compare morbidity and mortality directly. Forms for vital statistics do not reliably collect the information on medical risk factors required to create a retrospective hospital birth group of precisely comparable low risk,<sup>19-21</sup> and hospital discharge summary records for all births are not nationally accessible for sampling.

One exception, and an important adjunct to our study, was Schlenzka's study in California. The author was able to establish a large defined retrospective cohort of planned home and hospital births with similar low risk profiles because birth and death certificates in California include intended place of birth and these had been linked to hospital discharge abstracts for 1989-90 for a caesarean section study. When the author compared 3385 planned home births with 806 402 low risk hospital births, he consistently found a non-significantly lower perinatal mortality in the home birth group.

### What is already known on this topic

Planned home births for low risk women in high resource countries where midwifery is well integrated into the healthcare system are associated with similar safety as low risk hospital births

Midwives involved with home births are not well integrated into the healthcare system in the United States

Evidence on safety of such home births is limited

### What this study adds

Planned home births with certified professional midwives in the United States had similar rates of intrapartum and neonatal mortality to those of low risk hospital births

Medical intervention rates for planned home births were lower than for planned low risk hospital births

An economic analysis found that an uncomplicated vaginal birth in hospital in the United States cost on average three times as much as a similar birth at home with a midwife.<sup>22</sup> Our study of certified professional midwives suggests that they achieve good outcomes among low risk women without routine use of expensive hospital interventions. This evidence supports the American Public Health Association's recommendation<sup>3</sup> to increase access to out of hospital maternity care services with direct entry midwives in the United States.

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Competing interests: None declared.

Ethical approval: Ethical approval was obtained from an ethics committee created for the North American Registry of Midwives to review epidemiological research involving certified professional midwives.

1 Macfarlane A, McCandlish R, Campbell R. Choosing between home and hospital delivery. There is no evidence that hospital is the safest place to give birth. *BMJ* 2000;320:798.

- 2 College of Physicians and Surgeons of Ontario. Reports from council. *Home birth policy rescinded*. Toronto: CPSO, 2001.
- 3 Society of Obstetricians and Gynecologists of Canada. Policy statement No 126. Midwifery. *J Obstet Gynaecol Can* 2003;25:5.
- 4 American Public Health Association. 2001-3: increasing access to out-of-hospital maternity care services through state-regulated and nationally-certified direct-entry midwives. *Am J Public Health* 2002;92:453-5.
- 5 American College of Obstetricians and Gynecologists. Frequently asked questions about having a baby in the 21st century [monograph]. Washington; 12 Dec 2001. [www.acog.org/from\\_home/publications/press\\_releases/nr12-12-01-4.cfm](http://www.acog.org/from_home/publications/press_releases/nr12-12-01-4.cfm) (accessed 3 Apr 2005).
- 6 Martin JA, Hamilton BE, Ventura SJ, Menacker F, Park MM. Births: final data for 2000. *National vital statistics reports*. Hyattsville, MD: National Center for Health Statistics, 2002;50(5).
- 7 Declercq ER, Sakala C, Corry MP, Applebaum S, Risher P. Listening to mothers: report of the first national US survey of women's childbearing experiences [monograph]. New York: Maternity Center Association; 2002. [www.maternitywise.org/listeningtomothers/](http://www.maternitywise.org/listeningtomothers/) (accessed 3 Apr 2005).
- 8 Olsen O. Meta-analysis of the safety of home birth. *Birth* 1997;24:4-13.
- 9 Campbell R, Macfarlane A. *Where to be born: the debate and the evidence*, 2nd ed. Oxford: National Perinatal Epidemiology Unit, 1994.
- 10 Collaborative survey of perinatal loss in planned and unplanned home births. Northern Region Perinatal Mortality Survey Coordinating Group. *BMJ* 1996;313:1306-9.
- 11 Ackermann-Lieblich U, Voegeli T, Gunter-Witt K, Kunz I, Zullig M, Schindler C, et al. Home versus hospital deliveries: follow up study of matched pairs for procedures and outcome. Zurich Study Team. *BMJ* 1996;313:1313-8.
- 12 Wieggers TA, Keirse MJ, van der ZJ, Berghs GA. Outcome of planned home and planned hospital births in low risk pregnancies: prospective study in midwifery practices in the Netherlands. *BMJ* 1996;313:1309-13.
- 13 Bastian H, Keirse MJ, Lancaster PA. Perinatal death associated with planned home birth in Australia: population based study. *BMJ* 1998;317:384-8.
- 14 Murphy PA, Fullerton J. Outcomes of intended home births in nurse-midwifery practice: a prospective descriptive study. *Obstet Gynecol* 1998;92:461-70.
- 15 Janssen PA, Lee SK, Ryan EM, Etches DJ, Farquharson DF, Peacock D, et al. Outcomes of planned home births versus planned hospital births after regulation of midwifery in British Columbia. *CMAJ* 2002;166:315-23.
- 16 Pang JW, Heffelfinger JD, Huang GJ, Benedetti TJ, Weiss NS. Outcomes of planned home births in Washington State: 1989-1996. *Obstet Gynecol* 2002;100:253-9.
- 17 Rooks JP. Safety of out-of-hospital births in the United States. *Midwifery and childbirth in America*. Philadelphia: Temple University Press, 1997:345-84.
- 18 Johnson KC, Daviss BA. Outcomes of planned home births in Washington State: 1989-1996. *Obstet Gynecol* 2003;101:198-200.
- 19 Buescher PA, Taylor KP, Davis MH, Bowling JM. The quality of the new birth certificate data: a validation study in North Carolina. *Am J Public Health* 1993;83:1163-5.
- 20 Piper JM, Mitchel EF Jr, Snowden M, Hall C, Adams M, Taylor P. Validation of 1989 Tennessee birth certificates using maternal and newborn hospital records. *Am J Epidemiol* 1993;137:758-68.
- 21 Woolbright LA, Harshbarger DS. The revised standard certificate of live birth: analysis of medical risk factor data from birth certificates in Alabama, 1988-92. *Public Health Rep* 1995;110:59-63.
- 22 Anderson RE, Anderson DA. The cost-effectiveness of home birth. *J Nurse Midwifery* 1999;44:30-5.

### Corrections and clarifications

#### *Paying for bmj.com*

The statement made in this editorial from 2003 by Tony Delamothe and Richard Smith (*BMJ* 2003;327:241-2) that "[library subscriptions to the *BMJ* are] 9% lower than the same time last year, whereas the publishing group's 26 specialist journals, 25 of which have access controls, have experienced falls of only 4%" is based on an underestimation of the true fall in subscriptions to specialist journals. At that time, our fulfilment system was overcounting electronic subscriptions to the group's specialist journals, so their true fall is likely to be greater. While we cannot recover the correct figures for mid-2003, we can report that in the seven years between December 1997 (when none of the group's journals had full text websites) and December 2004 (the last month before *bmj.com* went behind access controls) library subscriptions to the *BMJ* fell by 44.5% compared with a fall of 39.7% for the group's specialist journals.