

Outcomes of Intended Home Births in Nurse-Midwifery Practice: A Prospective Descriptive Study

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Objective: To describe the outcomes of intended home birth in the practices of certified nurse-midwives.

Methods: Twenty-nine US nurse-midwifery practices were recruited for the study in 1994. Women presenting for intended home birth in these practices were enrolled in the study from late 1994 to late 1995. Outcomes for all enrolled women were ascertained. Validity and reliability of submitted data were established.

Results: Of 1404 enrolled women intending home births, 6% miscarried, terminated the pregnancy or changed plans. Another 7.4% became ineligible for home birth prior to the onset of labor at term due to the development of perinatal problems and were referred for planned hospital birth. Of those women beginning labor with the intention of delivering at home, 102 (8.3%) were transferred to the hospital during labor. Ten mothers (0.8%) were transferred to the hospital after delivery, and 14 infants (1.1%) were transferred after birth. Overall intrapartum fetal and neonatal mortality for women beginning labor with the intention of delivering at home was 2.5 per 1000. For women actually delivering at home, intrapartum fetal and neonatal mortality was 1.8 per 1000.

Conclusion: Home birth can be accomplished with good outcomes under the care of qualified practitioners and within a system that facilitates transfer to hospital care when necessary. Intrapartum mortality during intended home birth is concentrated in postdates pregnancies with evidence of meconium passage. (*Obstet Gynecol* 1998;92:461-70. © 1998 by The American College of Obstetricians and Gynecologists.)

Many accept the premise that because of modern technology, hospitals are the safest place to give birth. Since the 1960s, most births in the United States have taken

place in hospitals with physicians in attendance.¹ Nonetheless, there are also more than 40,000 out-of-hospital births in the United States annually, most in birth centers, clinics, and the home.² Of these, nearly 25,000 are residential births. Over the past years, the frequency of home births has remained stable at approximately 0.6% of all births (Table 1).³⁻⁸

Home birth is a controversial issue. Debates about the safety of home births focus on the risk of preventable perinatal morbidity and mortality, and on broader issues of appropriate screening and referral. Questions also are raised about the ability to predict which women can safely give birth at home and about the risk of unforeseen complications that require emergency transport to a hospital. Published studies on intended home birth have demonstrated low perinatal mortality and morbidity but have stressed the necessity of planning, risk-assessment and well-qualified attendants.⁹⁻²⁴ However, international studies report data from countries in which medical and obstetric care systems may be dissimilar from those in this country and in which the reporting criteria for neonatal and perinatal deaths also may vary, making international comparative data less interpretable.⁹⁻²⁰ Some US studies of home birth are limited by small size; others reflect limited geographic areas or homogeneous populations.²¹⁻³⁰ Finally, many studies have inadequate methodology for addressing certain issues. Studies using birth certificate data, for example, cannot identify perinatal mortality that may be attributable to planned home birth but occur after transfer to the hospital.

Certified nurse-midwives have attended approximately 3000 home births annually (1989-1994) in the United States.² A 1995 retrospective study by one of the authors (PAM) reported outcomes of 11,788 planned home births.³⁰ The intrapartum and neonatal mortality among women intending home birth at the onset of labor was two per 1000. Although a large sample, the

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Table 1. Home Births in the United States, 1990–1995

Year	Total births	Total home births	% of all births
1990 ³	4,158,212	27,678	0.67
1991 ⁴	4,110,907	27,480	0.67
1992 ⁵	4,065,014	25,923	0.64
1993 ⁶	4,000,240	25,084	0.63
1994 ⁷	3,952,767	24,694	0.62
1995 ⁸	3,899,589	24,276	0.62

findings were limited by the retrospective nature of the report. A prospective evaluation of home birth outcomes in the practices of certified nurse-midwives in the United States was then designed and implemented. This article reports the results of this prospective study.

Methods

A community-based nurse-midwifery practice network was recruited in 1994. Nurse-midwifery practices providing home birth services were identified by a mailed survey to the membership of the American College of Nurse-Midwives, advertisements placed in professional publications, and referral from other midwives. Forty-five active nurse-midwifery home birth practices were identified in 1994. Of these, twenty-nine practices (64%) providing home birth services agreed to participate in the network. Three participating practices later withdrew from full participation because they perceived continued participation to be an excessive work burden but did contribute full data on all patients who were enrolled up to a particular date determined by the investigator. Solo and group practices participated, enrolling as few as two to as many as 150 planned home births in the enrollment year; practices were located in rural and urban settings. Six were located in California, and five in Pennsylvania. New York and Virginia were each represented by three—Illinois and Texas each by two. Eight other states were represented by one nurse-midwife home birth practice each.

The study was approved by the Institutional Review Board of the principal investigator's institution. Eligible subjects were pregnant women age 18 years or older who requested home birth and were eligible for home birth services according to the practice guidelines of the individual nurse-midwifery practices. The researchers made no attempt to evaluate the equivalency of these practice guidelines, nor to establish practice-related standards.

Uniform data collection forms were developed and pilot tested in several practices prior to initiation of the study. The forms included demographic and perinatal risk information about individual patients, as well as the outcomes of prenatal, intrapartum, and postpartum care.

Patients were enrolled between December 1994 and December 1995. All new patients seeking home birth in participating practices were invited to enroll; enrollment generally occurred at a first or second prenatal visit. Initial data were forwarded to the central study office at this time; additional data were collected and forwarded at the time of birth and the postpartum visit. Any referral to another provider for care or to a planned hospital birth was recorded. Hospital records were requested for all women and newborn infants who were transferred to a hospital during labor or immediately after birth. Data were reviewed for completeness and logical consistency by clinically experienced study personnel upon receipt in the study office. When data were called into question, practices were contacted with a request for clarification.

Data reliability was evaluated by comparing duplicate records serendipitously received during the course of the study and in a 3% random sample of duplicate records specifically requested from each practice. Study office personnel abstracted these latter records onto study forms. Intrarater and interrater reliability were calculated by simple percent agreement, comparing each item on one form to its counterpart. Agreement ranged from 92% to 96% for the 143 items compared on both duplicate and random samples. Agreement for major outcome variables (such as site of birth, perinatal mortality, and primary birth outcomes) was 100%.

Accuracy of data submitted for transfers was assessed by examining hospital records requested for all women transferred to the hospital in late pregnancy, during labor, or after birth. The condition of mother and infant on arrival in the hospital and birth outcomes were verified. Eighty percent of hospital records requested were received and were fully consistent with information provided by the practice. Full information was obtained on all intrapartum transfers. In addition, midway through the enrollment year, surveys were sent to women who still were eligible for home birth in late pregnancy. The surveys were mailed 2 months after the estimated date of delivery and included requests for data on the birth, as well as information about patient satisfaction. Three quarters of the surveys were returned, and again, the data were found to be consistent with data submitted by the practice.

Data were analyzed primarily as descriptive statistics. Group comparisons were assessed with χ^2 and *t* test procedures. The probability value for statistical significance was set at .05.

Results

One thousand four hundred four eligible women enrolled in the study. Participating practices reported 11

Table 2. Characteristics of Women Intending Home Birth

Characteristic	Initially enrolled and eligible (n = 1404)	Eligible for home birth at labor onset (n = 1221)
Married/Consensual union	97.6%	98.0%
White	94.6%	95.2%
Parity > = 1	76.8%	77.8%
Age		
Mean	29.8 y (SD 5.4 y)	29.8 y (SD 5.4 y)
18–24 y	17.5%	17.1%
25–29 y	30.6%	31.0%
30–34 y	30.8%	31.3%
35–39 y	17.6%	17.3%
40–46 y	3.6%	3.3%
Primary occupation as homemaker	58.5%	60.8%
Education		
<12 y	33.1%	33.9%
College graduate or higher	36.3%	36.0%
Payment		
Self-pay	59.0%	59.7%
Commercial/Military insurance (includes HMOs)	34.0%	34.4%
Medicaid/Other government	6.0%	4.5%
Other payment (barter, etc)	1.0%	1.4%
Low socioeconomic status	39.6%	39.0%
Amish/Mennonite	32.0%	33.5%
Drug/Substance use	1.1%	0.7%
Alcohol use: ≥7 drinks per wk	0.1%	0
Smokes ≥1 cigarette per wk	1.6%	1.3%
Previous cesarean delivery (multiparas only)	6.6%	4.7%
Prenatal care in 1st trimester	53.6%	52.5%
Number of prenatal visits	9.6	9.8

SD = standard deviation; HMO = health maintenance organization.

women who refused to enroll, primarily from Amish communities. Reasons given were cultural or privacy concerns. Table 2 describes the sample of women intending a home birth. Socioeconomic status was derived from payment source, occupation of patient and partner, income (if reported by the patient), and an estimate by the nurse-midwife based on family size, reported income, and special circumstances. Thirty-two percent of the women were members of Amish and Mennonite communities, which contributed to the educational and socioeconomic profile of the sample.

There was little evidence of behavioral perinatal risk among the women in this study. Few women reported the use of tobacco, alcohol, or other substances prior to or during pregnancy (Table 2). All but 2% had at least five prenatal visits. Evidence of prior medical or obstet-

ric risk in the sample was also minimal. Among parous women in the sample, 60% had had a previous home birth and 14% a previous birth center birth; overall 68.8% of the parous women had a previous out-of-hospital birth experience. Twenty-two percent of the parous women in the sample had a history of one or more intrapartum or neonatal factors that required intervention, possibly indicating a higher perinatal risk potential in the current pregnancy. These included a history of pregnancy-induced hypertension (5.1%), assisted vaginal delivery (7.2%), stillborn fetus or neonatal death (3.1%), low birth weight infant (2.1%), or postpartum hemorrhage (9.3%). A specific question about previous shoulder dystocia was added to the instrument midway through the enrollment year. Data on previous shoulder dystocia thus are available for only 212 parous women; 2.4% of this smaller sample had a history of previous shoulder dystocia. Of the 71 women who had a previous cesarean delivery (6.6% of parous women), 93% also had had a subsequent successful vaginal birth following cesarean.

One hundred eighty-three women left or were referred out of the home birth practice during the pregnancy and prior to labor at term. Eighty-six (6.1%) miscarried, terminated the pregnancy, moved away, or changed their minds about home birth. Only seven of these women reported financial problems or lack of insurance coverage as the reason for deciding against home birth. Of the remaining 1318 women, 97 (7.4%) were referred for hospital-based care prior to the onset of term labor. This group includes those women who developed preterm labor or preterm premature rupture of membranes. According to the protocols of the practices, women were referred directly for hospital labor and birth management if labor or membrane rupture occurred prior to a designated gestational age (usually 37 weeks). Table 3 presents specific indications for antepartum transfers, and the outcomes of these pregnancies in known cases.

Women leaving the home birth service during the antepartum period were more likely to be unmarried (5% compared with 2%, $P < .05$), nonwhite (8% compared with 5%, $P < .05$), nulliparous (30% compared with 22%, $P < .05$) or to have Medicaid (5.4% compared with 4.0%, $P < .05$) when compared with women who remained eligible for a home birth. Amish and Mennonite women were less likely to be referred out of the home birth practice ($P < .05$).

Follow-up data were obtained for 83.2% of the antepartum referrals that occurred after 26 weeks' gestation for medical or obstetric risk factors; all of these women had planned hospital births due to the presence of medical or obstetric problems. There were four immediate neonatal deaths reported in this group: three due

Table 3. Antepartal Referrals for Obstetric or Hospital-Based Management*

Reason	<i>n</i>	% of eligible sample [†]	Known infant outcomes
PTL or preterm PROM <37 wk gestation (26–36 wk)	23	1.7	12: Good 5: Hospitalized 2: NND (includes 1 also with anomalies) 4: Unknown
Multiple gestation	5	<1.0	3: Good 2: Unknown
Diagnosis of congenital anomalies	6 (Excluding 1 above)	0.5	2: Stable 2: IUFD 2: NND
Antepartum fetal demise	8 (Excludes those due to anomalies above)	0.6	
Fetal malpresentation	14	1.0	12: Good 2: Unknown 90% Cesarean delivery rate
Vaginal bleeding/placenta previa	6	0.5	5: Good 1: Unknown 60% Cesarean delivery rate
Suspected macrosomia	2	0.2	2: Good
Suspected fetal growth restriction	3	0.2	2: Good 1: Unknown
Other suspicion of fetal compromise	4	0.3	4: Good
Medical problems	17	1.2	14: Good 1: Hospitalized 2: Unknown
PROM at term	4	<1.0	4: Good
Pregnancy exceeding 42 wk	5	0.4	5: Good

PTL = preterm labor; PROM = premature rupture of membranes; NND = neonatal death; IUFD = intrauterine fetal demise.

* These women were no longer eligible for home birth.

[†] *n* = 1318. Excludes from antepartal group spontaneous abortions, voluntary terminations, and those who changed their mind or moved out of the area (*n* = 86).

to congenital anomalies and one due to complications of prematurity. Two (20%) of ten antepartum fetal demises were associated with lethal anomalies. Among those in this group for whom follow-up data were available, 40% had cesarean deliveries.

One thousand two hundred twenty-one women remained eligible for home birth at the time of labor onset. Of these, 102 (8.3%) were transferred to the hospital during labor, and 1119 gave birth at home. Ten women and 14 neonates were transferred to the hospital after birth (Tables 4 and 5). Forty women (3.3%) delivered before the midwife arrived at the home; all infants and mothers were well after these unattended births.

Mean birth weight for infants born at home was 3704 g (standard deviation 470). Only four infants (0.3%) weighed less than 2500 g at birth, 299 infants (25%) weighed more than 4000 g at birth, and 68 of these (5.5% of all births) weighed more than 4500 g. Of those low birth weight infants born at home, infants ranged from 35 to 41 weeks' gestation and weights ranged from 2013 to 2494 g. No births at home were assisted with vacuum or forceps; four infants were born in breech presentation. Forty-six infants (3.8%) were

reported as not having spontaneous respirations; 38 of these (3.2%) were reported to have had some type of resuscitation procedure (Ambu bag, cardiac massage, or intubation). Thirty-three of these (2.7%) had 1 minute Apgar scores of less than 7; only 14 infants had 5 minute Apgars of less than 7 (1.2% of attended home births).

Participating midwives were asked to report on actual or potential obstetric problems occurring during labor and delivery at home. These are listed in Table 6.

Twenty-seven percent of nulliparous women and 5.7% of parous women were transferred during labor ($P < .05$). Hospital transfer during the intrapartum period was not related to preexisting obstetric risk factors. It was significantly related to a number of actual or potential intrapartum problems (see Table 6). Gestational age of 42 weeks or more and the presence of meconium were factors that greatly increased the risk of transfer to hospital and perinatal mortality. Seventeen percent of laboring women with meconium-stained fluid were transferred to the hospital during labor, compared with 5.5% of women with clear fluid. Seventeen percent of women at 42 weeks' gestation or more who intended to deliver at home were transferred

Table 4. Intrapartum/Postpartum/Neonatal Transfers to Hospital

Reason	<i>n</i>	Eligible sample (%)*	Comment
Intrapartum transfer			
Changed mind regarding home birth	2	0.2	Selfreferred to hospital at labor onset
Midwife unable to attend home birth	4	0.3	Transferred to birth center due to other clients in labor or environmental problems in the home
No fetal heart tones	2	0.2	Fetal demise diagnosed at the first assessment of the patient in labor
Nonvertex fetal presentation	12	1.0	1 woman converted to vertex in hospital and returned home for labor and birth
Fetal distress	13	1.0	One infant stillborn in the hospital after assisted delivery for meconium and fetal distress; others in good condition
Moderate to thick meconium	3	0.2	Excludes the stillborn infant mentioned above; all infants well at 1 mo
Vaginal bleeding	2	0.2	Mothers and infants well
Prolonged labor or rupture of membranes	63	5.2	All infants well
Cord prolapse	1	0.1	Infant born in good condition
Postpartum transfer			
Perineal suturing	4	0.3	Discharged after suturing
Retained placenta	3	0.2	Discharged after placental delivery
Postpartum bleeding	3	0.2	Discharged after 3 d; all well
Infant transfer			
Stillborn	1	0.1	Resuscitation unsuccessful; meconium and postdates
Respiratory problems	7	0.6	6 hospitalized; all well at 1 mo
Evaluation of anomalies	4	0.3	Stable at 1 mo, given condition
Evaluation for sepsis	2	0.2	Well at 1 mo
First postpartum month			
Evaluation for possible endometritis	2		Discharged after evaluation
Cholecystitis/Cholecystectomy	4		All well
Other (colitis, hemorrhoidectomy)	2		All well
First newborn month			
Neonatal death	1		At 24 h of age; no cause of death established by medical examiner
Evaluation of possible anomaly	9		All stable for condition at 1 mo
Respiratory problems	8		All well at 1 mo
Infection or jaundice	8		All well at 1 mo
Other [†]	10		All well at 1 mo

* *n* = 1221.[†] Circumcision, dehydration, failure to thrive, hernia repair.

during labor for hospital birth, compared with 7.5% of women at less than 42 weeks' gestation. Both intrapartum fetal deaths occurred in pregnancies of 42 weeks' or more gestation with meconium-stained amniotic fluid.

As previously noted, full birth information was obtained from hospital records or managing clinicians for 80% of these intrapartum transfers; substantial birth information was received for all others. Five-minute Apgar scores were 7 or higher for 95% (of those for whom the Apgar was reported); all liveborn infants were well at a postpartum evaluation. Thirty-two percent of these transfers had a cesarean delivery, and 16% had an assisted vaginal delivery.

Among those with a previous cesarean delivery who began labor with the intention of delivering at home (*n* = 57), 14% were transported to the hospital during labor for care (as compared with 7.7% transported

among those with no history of cesarean delivery [not statistically significant]). The cesarean delivery rate was 5.3% in women with a previous cesarean; there was one vacuum assisted delivery in this group (1.8%). The overall cesarean rate was 2.3%.

Among the 1221 women beginning labor with the intention of delivering at home, there were five perinatal deaths. Thus the total intrapartum and neonatal mortality was 4.1 per 1000 (see Table 5). Excluding two fetal demises diagnosed at the first labor status evaluation by the attending midwife and referred immediately for hospital birth, there were three fetal or infant deaths among women whose labor was managed in whole or in part at home. This results in a total intrapartum and neonatal mortality for planned labor and birth at home of 2.5 per 1000. Both fetal deaths were in pregnancies of 42 weeks or more gestation with

Table 5. Summary Outcomes of Transfers to Hospital-Based Care or Management

Timing of transfer	<i>n</i>	% of relevant sample	Adverse outcomes
Antepartum referral (includes preterm labor or rupture of membranes if no longer eligible for home birth)	97	7.4 (of 1318)	10 IUFD, 4 NND, information unknown for 19%
Intrapartum transfer	102	8.3 (of 1221)	2 IUFD prior to first assessment, 1 IUFD in labor (stillborn in hospital)
Postpartum maternal transfer	10	0.8 (of 1221)	No maternal mortality
Postpartum infant transfer	14	1.1 (of 1221)	1 IUFD in labor (stillborn at home)
Total	126	10.3 (of 1221)	
Later postpartum	8	0.7 (of 1221)	No maternal mortality
Later newborn	36	2.9 (of 1221)	1 NND at home at 24 h of age

IUFD = intrauterine fetal demise; NND = neonatal death (within first week of life).

evidence of meconium passage. One stillbirth occurred in the hospital; the mother was transferred during labor for slow progress and meconium-stained fluid. The fetal heart rate was reported as normal on arrival in the hospital, and the mother labored for several hours more before delivering the stillborn infant. Meconium aspiration was reported as the cause of death. The second stillborn was born at home; there was no autopsy, but the reporting midwife indicated the presence of meco-

nium as well. A third infant died at 24 hours of age; postmortem studies were unable to establish a cause of death. For labors managed entirely at home, mortality was 1.8 per 1000. There were no maternal deaths.

Discussion

This report is one of the few studies of home birth conducted in the United States and is unique in its multisite prospective nature. Although the sample has limited ability to reflect stable rates of perinatal problems in home birth settings due to its relatively small size, the antepartum and perinatal transfer rates reported are similar to a larger retrospective study that addressed nurse-midwifery home birth practice outcomes.³⁰ Intrapartum and neonatal mortality rates in this study also compare favorably to rates reported in that study (two per 1000) and in a prospective study of outcomes of planned birth center births (1.3 per 1000).³¹ The latter study cited comparisons to two studies of uncomplicated hospital births. A study of electronic fetal monitoring published in 1986 identified 14,618 births as low risk and reported the associated intrapartum and neonatal mortality as one per 1000.³² A 1987 report identified 11,592 uncomplicated term and post-term pregnancies for an evaluation of perinatal characteristics of postdates pregnancies; of these, 8135 were uncomplicated term hospital births with an intrapartum and neonatal mortality of 2.1 per 1000.³³ A number of studies of home birth also report low rates of intrapartum or neonatal mortality, although it is recognized that international reporting criteria for perinatal mortality may vary. When possible, raw data available in these published reports were recalculated to reflect a sample similar to that reported here (Table 7). A recent meta-analysis of six European and US home birth studies³⁴ revealed no significant difference in perinatal mortality between home and hospital birth. This meta-analysis included data only from developed countries

Table 6. Actual or Potential Obstetric Problems Reported by Midwives as Occurring During Labor and Birth at Home

Event	<i>n</i> (%) [*]	Relative risk for transfer to hospital-based care (95% CI)
Maternal inability to cope with labor/need for analgesia	45 (3.7)	2.7 (1.4, 5.2)
Fetal heart abnormalities in the first stage of labor	29 (2.4)	8.7 (4.8, 15.4)
Fetal heart abnormalities in the second stage of labor	56 (4.7)	5.0 (3.0, 8.4)
Prolonged latent phase of labor	137 (11.3)	3.5 (2.5, 4.8)
Lack of progress in the first stage of labor	133 (11.0)	6.5 (4.9, 8.6)
Lack of progress in the second stage of labor	27 (2.2)	23 (10.3, 51.4)
Prolonged rupture of membranes	76 (6.3)	4.2 (2.7, 6.6)
Meconium-stained amniotic fluid (any)	202 (16.8)	2.2 (1.6, 2.9)
Moderate to thick meconium	57 (4.7)	3.7 (2.1, 6.3)
Shoulder dystocia or difficulty delivering shoulders	38 (3.2)	0.8 (0.3, 2.7)
Postpartum hemorrhage or excess bleeding in the third stage of labor	123 (10.2)	1.2 (0.7, 2.1)

CI = confidence interval.

^{*}Percentages have been corrected for missing data. In some cases transfer to hospital management early in labor created missing data for some variables.

Table 7. Perinatal Deaths in Other Studies of Home Birth*†

Author	Site	<i>n</i>	Perinatal or neonatal mortality	Comment
Van Alten et al ¹²	Wormerveer, 1969–1983	7980	2.3 per 1000	Those remaining eligible for home birth at labor
Burnett et al ²²	North Carolina, 1974–1976	934	3 per 1000	Neonatal mortality only
Mehl et al ²¹	US, 1977	1146	3.5 per 1000	Excludes deaths due to prematurity and anomalies
Schramm et al ²⁶	Missouri, 1978–1984	1770	2.8 per 1000	Neonatal mortality among physician, nurse-midwife, and MMA midwife-attended births only
Campbell et al ¹⁰	Britain, 1979	5933	4.1 per 1000	Those booked for home birth
Woodcock et al ¹⁴	Australia, 1981–1987	976 home birth	5.1 per 1000	Uncorrected for birth weight and gestational age
Sullivan and Beeman ²⁴	Arizona, 1983	1243	2.4 per 1000	Excludes anomalies
Tyson ¹⁶	Canada, 1983–1988	1001	2 per 1000	Neonatal mortality only
Hinds et al ²⁵	Kentucky, 1985	575	3.5 per 1000	Neonatal mortality only
Durand ²⁸	The Farm, 1992	1707	2.3 per 1000	Excludes deaths due to anomalies and premature births
NRPMS Group ¹⁹	Britain, 1996	2888	2.1 per 1000	Planned home birth

MMA = Missouri Midwife Association; NRPMS = Northern Region Perinatal Mortality Survey Coordinating Group.

* Recalculated from original data where possible to remove twin births, congenital anomalies, and premature births (by standard study participants referred these complications for hospital birth).

† Only studies with at least 500 births are recorded.

that use similar perinatal reporting criteria and definitions.

There are several limitations to note in this report. The results reported here reflect a sample of nurse-midwifery practices willing to participate in data collection and to permit the resulting scrutiny of their practices. We cannot draw comparisons to nonparticipating nurse-midwifery practices or to the home birth practices of physician and other midwife providers. During 1994 and 1995, an average of 2600 certified nurse-midwives-attended home births per year were reported in vital statistics data.^{7,8} Thus, these data reflect more than 40% of those births.

This study presents only the outcomes of home birth practice; it makes no comment on the process of care. There was no attempt to require adherence to standardized guidelines for practice because the intent was to examine home birth practice as it occurs in the community. However, it may be reasonable to infer that many participating practices developed their individual protocols in accord with the professional practice guidelines for home birth practice developed by the American College of Nurse-Midwives (ACNM Home Birth Committee. Guidelines for home birth. Washington DC: American College of Nurse-Midwives, 1991). The equivalency of clinical protocols in the individual practices was not examined, but participating midwives were asked brief questions about their determination of ineligibility for home birth. For example, 95% of the midwives considered twin pregnancy a contraindication for home birth, and 90% considered a breech presentation a contraindication. Preterm labor was a

contraindication as well; for 90% of practices, labor before 36 weeks' gestation conferred ineligibility for home birth; two practices held 35 weeks as a minimum gestational age (data on file). Seventy-three percent of the midwives accepted women for home birth if they had a previous cesarean delivery; in most cases a previous successful vaginal birth after the cesarean delivery also was required to confer eligibility for home birth.

Antenatal screening practices were not evaluated per se. However, the observation that referrals to hospital-based care were made upon diagnosis of obstetric complications such as gestational diabetes, multiple gestation, or congenital anomalies suggests that standard obstetric evaluation protocols were followed.

Variations in skill and experience of participating midwives could affect findings, but these aspects of practice were not evaluated directly. Participants averaged more than 9 years of experience as midwives and more than 7 in home birth practice, with a range from a few months to 20 years. Practices also varied in the number of intended home births enrolled in the study over the course of 1 year. This number ranged from two to 150. No attempt was made to analyze outcomes according to the experience of the clinician or practice. As noted above, the purpose was to examine home birth outcomes as they occur, given the mix of practice experience and protocol.

The absence of a comparison group may be seen as a limitation of this study, creating difficulty in determining whether the intrapartum and neonatal morbidity and mortality seen here are higher than what would be

expected in a similar group of planned hospital births. However the series of risk screening filters through which women interested in home birth passed in these participating practices (at first inquiry, at first visit, and throughout the antepartal and perinatal period) makes it difficult to choose an equivalent comparison population from other data sources. In addition, bias due to self-selection would remain a threat despite careful matching of risk status. In consideration of these factors, the prospective data are presented without a direct comparison; the low incidence of mortality allows individual examination of each case.

Only a randomized clinical trial would remove the issue of selection bias; however, this would be extremely difficult to carry out. Researchers in Great Britain assessed the feasibility of doing a randomized trial comparing home to hospital birth. They found that of 500 women booking for obstetric care, 71 were deemed of low enough risk for a home birth, and of these only 11 (2.2% of the original sample) agreed to be randomized.³⁵ In addition, the authors noted that four of six women randomized to hospital birth were "disappointed," although all randomized to home birth were pleased; those who declined to participate had strong preferences about the place of birth. Wieggers et al²⁰ further suggest that choice in childbirth may have a positive influence on levels of anxiety and apprehension, which in turn could influence outcomes. Elimination of choice, as would be necessary with randomization, could theoretically have a negative impact on the course of childbirth and thus on outcomes. Thus the debate over home birth is not likely to be settled with a randomized trial.

Questions about the relative safety of different birth settings are legitimate but often are answered in terms of ideologies rather than systematic research.³⁶ The debate usually is framed as one of hospital compared with home. In most situations, and certainly in the practices described here, however, the circumstances are more planned hospital birth compared with intended home birth within a system that facilitates transfer to hospital birth when problems arise. Thus, issues related to appropriate risk screening and prediction of perinatal problems are important when considering out-of-hospital birth settings. The two factors most strongly associated with perinatal mortality and morbidity are congenital anomalies and low birth weight.³⁷ Neither condition is preventable by choice of birth site, although adverse sequelae may be modulated by the availability of emergency medical care. However, in these practices, premature birth and pregnancies known to be complicated by fetal anomalies were referred routinely for planned hospital birth. The ability to identify other perinatal problems then becomes more

important in out-of-hospital birth. Recognizing that risk screening always will be an imperfect science and that some perinatal events cannot be predicted in any event, this report nonetheless underscores the ability of home birth practicing nurse-midwives to select an initial eligible sample at low risk of adverse perinatal outcomes. Subsequently developing problems associated with increased perinatal risk, such as multiple gestation, abnormal fetal lie, or concurrent medical illnesses also are referred appropriately for perinatal management or hospital delivery. Although the outcomes of women referred for hospital birth prior to the onset of labor do not reflect on managed home birth, it is of interest to note the concentration of perinatal morbidity and cesarean delivery among women referred for hospital birth during the antepartum period. The apparent success of certified nurse-midwives in identifying higher risk pregnancies and appropriately referring these to perinatal care prior to labor is consistent with other reports.^{38,39} During labor, events associated with increased need for interventions best delivered in hospital settings also are identified by nurse-midwives during home birth management, and the mothers or infants are transferred appropriately. One area that might require reassessment is the postdates pregnancy, especially if accompanied by meconium passage. These data and those from another recently published study⁴⁰ suggest that eligibility for home birth should be considered carefully in this circumstance; although hospital birth is no guarantee of a good outcome, specialty care is available more readily in that setting for infants with meconium aspiration.

When intrapartum, postpartum, and neonatal emergencies occur, prompt transport and intervention is critical. Perinatal emergencies were rare in this sample. Participating midwives were asked at the beginning of this study about routine preparations for emergencies. All carry oxygen, oral suction equipment, intravenous setups, oxytocin, and methylergonovine to the home. All but one midwife carry a Doppler device for monitoring the fetal heart; the remaining midwife uses a fetoscope. All but one carry an Ambu bag for resuscitation and reported having formal certification in neonatal resuscitation. Sixty-eight percent bring a laryngoscope and endotracheal tubes to home births; twenty percent also bring mechanical suction (data on file). In addition, most home birth practices in this study had eligibility requirements that the birth site be within 30 minutes of a hospital providing obstetric services. Examination of hospital transfer records indicated that in the vast majority of cases, the mother arrived in the hospital with ample time prior to delivery to evaluate maternal-fetal status and make perinatal management decisions. In those cases in which birth occurred imme-

diately upon arrival, infants were born in good condition with pediatricians in attendance. Obviously, successful management of such transfers is also contingent on a close collaborating relationship between the midwife, the consulting obstetrician, and the hospital staff, especially given that only 12% of these participating midwives had hospital privileges.

This evaluation of planned home birth points to the possibility that home birth can be accomplished, with good outcomes, within a structured system that allows for collaboration with physicians and referral to hospital-based care where necessary. Presentation of these data is not intended to posit home birth as a solution for all or most women. Demand for home birth is admittedly minimal in the contemporary American health care system, but it has been a stable demand, resulting in 25,000 births a year. The outcomes, risks, and benefits of home care for childbirth should be assessed to make appropriate decisions regarding the circumstances in which home birth could occur, for those women who are determined to pursue this choice in childbirth. This report is intended to be a step in this direction.

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