between 37 and 42 weeks. Whether prenatal care for these women is responsible for the better outcome of the early entrants cannot be determined. Early entry may reflect as much on the healthy behavioral characteristics of these women as it does on any effect of prenatal care.

The evaluation of prenatal care is a complex problem. The incorrect assignment of gestational age affects significantly the results of any perinatal analysis and continues to be a major problem for which no solution is readily available. As a result, there is no ideal model available to assess the association between prenatal care and pregnancy outcome. Because of the substantial problems associated with observational data, the use of randomized trials of different modes of care deserves increased consideration as the optimal method for gaining a greater understanding of the efficacy of prenatal care. □

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The Safety of Home Birth: The Farm Study

A. Mark Durand, MD, MPH

ABSTRACT

Pregnancy outcomes of 1707 women, who enrolled for care between 1971 and 1989 with a home birth service run by lay midwives in rural Tennessee, were compared with outcomes from 14 033 physician-attended hospital deliveries derived from the 1980 US National Natality/National Fetal Mortality Survey. Based on rates of perinatal death, of low 5-minute Apgar scores, of a composite index of labor complications, and of use of assisted delivery, the results suggest that, under certain circumstances, home births attended by lay midwives can be accomplished as safely as, and with less intervention than, physician-attended hospital deliveries. (*Am J Public Health.* 1992;82:450–452)

Introduction

Despite a sizable body of literature on the subject, the authors of two recent reviews have concluded that a final judgment regarding the relative safety of home birth still cannot be made.[1,2]

This study compares the outcomes of a cohort of 1707 planned lay midwife–attended home births from the Farm midwifery service in rural Tennessee with the outcomes of a sample of physician-attended hospital births derived from the 1980 US National Natality/National Fetal Mortality Survey (NNS/NFMS). This is the largest comparative study of a cohort of home births yet published.

Previous studies of home birth safety underscore the importance of having explicit comparison groups (rather than of being strictly descriptive),[1] of considering planned and unplanned home births separately,[2–4] of tracking intrapartum hospital transfers of intended home births (and attributing the outcome to the home birth group),[5] and of controlling for the effects of birth weight, type of delivery attendant, and demographic characteristics of the mother.[6,7] All these issues have been addressed in this study.

Standards of prenatal care at the Farm are modeled to the recommendations of the American College of Obstetricians and Gynecologists. Deliveries are conducted without analgesia, however, and great emphasis is placed on meeting the emotional needs of the family. Several family members and friends are commonly in attendance and are encouraged to take an active role in the birth.[8] In addition, the laboring woman is encouraged to stay off her back and remain physically mobile through labor and delivery. In the absence of signs of fetal distress, women are permitted to labor beyond 24 hours, occasionally for 2 to 3 days. They are also encouraged to eat and drink during labor in the belief that this allays maternal exhaustion and the need for operative delivery.

A. Mark Durand is with the Department of Health, Commonwealth of the Northern Marianas Islands.

Requests for reprints should be sent to A. Mark Durand, MD, MPH, Department of Health, Commonwealth of the Northern Marianas Islands, Rota Health Center, Rota, MP 96951.

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A hospital with surgical facilities is located about a 20-minute drive from the community.

Methods

A retrospective cohort of 1707 births derived from all pregnancies accepted for care at the Farm between January 1971 and June 1989, except those that aborted spontaneously prior to 28 weeks gestational age and 54 who were lost to follow-up, was studied. The outcomes of all these births were attributed to the Farm group, whether or not delivery was ultimately accomplished at home (Table 1).

Women with preexisting diabetes or hypertension, Rh negative blood with positive antibody screen, weight greater than 135 kg, and hematocrit on intake lower than 28 were considered ineligible for care at the Farm. In addition, before 1985, women with prior cesarean section were also considered ineligible.

The NNS/NFMS is a probability sample of births in the United States in 1980 for which a birth or fetal death certificate was filed. Low birth weights (less than 2500 g) and fetal deaths were deliberately oversampled to allow more detailed study of them.[9] Stillborn infants of less than 28 weeks gestational age (or weight of 1000 g) were not included.

Of the 16 327 births that ultimately constituted the NNS/NFMS, an additional 2294 were deleted from this study to eliminate those that were attended by nonphysicians, those who delivered out-of-hospital, those with no prenatal care, and those in which the mother had prenatal risk factors that were used as exclusion criteria at the Farm (Table 1).

The design effect created by differential sampling and losses due to lack of data across the strata (fetal deaths, live births of low birth weight, other live births) in the NNS/NFMS was compensated for by assigning weighting coefficients (0.0131, 0.4227, and 1.8844, respectively) to the observations in each of the three strata. The coefficients are normalized such that the average coefficient of a single observation is 1.0, which is the coefficient assigned to observations in the Farm group. These coefficients were applied in the analyses described below.

Data for both groups were obtained by retrospective review of medical records.

The principal independent variable of this study is the intended site of delivery. The dependent variables are measures of pregnancy outcome defined as (1) death of the fetus at birth weight greater than 1000 g or at 28 weeks gestational age, or death of a live born infant aged less than 28 days; (2) a 5-minute Apgar score of less than 7; (3) use of forceps, vacuum, or cesarean delivery; and (4) occurrence of excessive bleeding during labor, labor of greater than 24 hours duration, neonatal birth injury, or neonatal respiratory distress. The effect of intended site of delivery on each outcome was examined via multiple logistic regression equations, which also contained terms for potential confounders.

Of these potential confounders, maternal education and number of prenatal visits were treated as continuous variables. Birth order (1, 2 to 4, greater than 4), maternal age (younger than 18, 18 to 34, older than 34), birth weight (less than 2500 g, 2500 to 4000 g, greater than 4000 g), and smoking during pregnancy (yes, no) were categorized.

The power to detect odds ratios of 1.5 or greater for the delivery type and labor complications outcomes exceeds 0.99. For low 5-minute Apgar scores, the corresponding power is 0.75 (0.99 for odds ratio of 2 or greater). For perinatal mortality, this study has a power of 0.62 to detect an odds ratio of 1.5 (0.98 for odds ratio of 2 or greater). All power calculations presume two-sided comparisons.

Results

Demographic characteristics of women in the two groups and transfers to hospital care from the Farm group are summarized in Tables 2 and 3.

No significant differences between the two groups regarding fetal and neonatal death, labor-related complications, or low 5-minute Apgar scores were detected, regardless of whether the comparisons were crude or adjusted for confounders (Table 4). Rates of assisted deliveries were very low in the Farm group (2.11%) compared with the NNS/NFMS sample (26.60%), a difference that is statistically significant at the P = .01 level. The casarean section rate was 1.46% at the Farm vs 16.46% in the NNS/NFMS sample (Table 4).

The causes of death for the 17 deceased neonates and stillbirths in the Farm group are listed in Table 5. There were no maternal deaths in the Farm group.

Discussion

In this study, lay midwife–attended home births appear to have been accomplished with safety comparable to that of conventional births. Furthermore, the proportion of deliveries in which opera-

TABLE 1—Selection of Records for Analysis

Farm group	
Accepted for care	1761
Lost to follow-up	54
Number analyzed	1707
NNS/NFMS	
Number originally sampled	18 006
Insufficient data	1679
Included in NNS/NFMS	16 327
Criteria for present study not met[a]	2294
Number analyzed	14 033

Note. NNS/NFMS = US National Natality/National Fetal Mortality Survey.
[a]Exclusion criteria include no prenatal care, out-of-hospital birth, nonphysician attendant, prepregnancy diabetes or hypertension, anemia (hematocrit lower than 28), weight greater than 135 kg, and Rh negative blood with positive antibody screen.

TABLE 2—Characteristics of 1707 Women Intending Home Birth and of 14 033 Women from the 1980 US NNS/NFMS

Characteristic	Farm Group	NNS/NFMS
Age (%)		
< 18 years	1.3	1.7
18–34 years	94.9	93.6
> 34 years	3.8	4.7
Education (%)		
< 9 years	6.3	3.7
9–12 years	41.7	58.8
> 12 years	52.0	37.5
Unmarried (%)	15.0	18.2
Race (%)[a]		
White	—	82.5
non-White	—	17.5
Birth order (%)		
1	44.7	37.3
2–4	50.7	56.1
> 4	4.6	6.6
Smoking (%)	1.1	12.1
Number of prenatal visits	8.9	10.3
Gestational age of infants (%)		
< 36 weeks	1.5	5.7
36–42 weeks	97.2	89.6
> 42 weeks	1.3	4.7
Birth weight of infants (%)		
< 2500 g	3.8	5.8
2500–4000 g	87.9	83.4
> 4000 g	8.3	10.8

Note. NNS/NFMS = US National Natality/National Fetal Mortality Survey.
[a]An estimated 98% of Farm group mothers are White.

TABLE 3—Transfers to Inpatient Care from the Farm Group

Time of transfer	(n)	(%)
Before start of labor	28	(1.6)
Intrapartum	126	(7.4)
Postpartum[a]	76	(4.5)
Total Referred	230	(13.5)
To hospital during labor without being referred	3	
Delivered at home	1551	(90.1)

[a]Includes infants and mothers.

tive assistance was required was much smaller in the Farm group (though a fraction of this discrepancy may have been due to the fact that, prior to 1985, women who had had previous cesarean deliveries had been excluded from care by Farm midwives).

Stratifying both groups by birth weight or parity, comparing the entire Farm set to the NNS/NFMS subset of births from nonmetropolitan southern US areas or of White mothers only, and breaking the Farm set into groups by year of delivery did not appreciably alter the results (data not shown). Thus, differences in demographic characteristics or changes in technology over time do not appear to explain the findings. Of course, other factors such as diet (many mothers in the Farm group were vegetarians), occupational profile, and psychological differences among those electing home birth could help explain the observed results.

Observer bias could also have distorted the results. (The likelihood of a complication or outcome being noticed and recorded may be different for midwives than for physicians.) However, the results regarding perinatal deaths, in particular, are hard to ascribe to observer bias.

The possibility that some outcomes that were not examined in this study may be worse among those delivering at home and that other groups of attendants may not perform as well as the Farm midwives should also be noted.

Hospital births have a safety advantage in cases in which life-saving technology is immediately required. There is some evidence, however, that elective interventions, which are used more frequently in-hospital, may increase the risk of various adverse outcomes in low-risk women.[10–17]

In addition, it is possible that the unfamiliar setting and the presence of unfamiliar personnel, the limited presence and role of family members, and the restricted freedom of movement of the laboring woman may all create an atmosphere at a hospital birth that undermines self-confidence and encourages passivity on the part of the laboring woman, diminishing her ability to deliver spontaneously. Recent work demonstrating the beneficial effect of supportive female attendants (doulas) during labor, highlights the importance of such intangibles.[18]

The results of this study suggest that, for relatively low-risk pregnancies, home birth with attendance by lay midwives is not necessarily less safe than conventional (hospital-physician) delivery. Support by the medical and legal communities for those electing, and those attending, home birth should not be withheld on the grounds that this option is inherently unsafe. □

TABLE 4—Association between Intended Site of Delivery and Selected Pregnancy Outcomes

Outcome	% Farm group	% NNS/NFMS[a]	Crude RR	Adjusted OR[b]	(95% CI)	P value
Perinatal death	1.00	1.33	0.75	0.69	(0.38–1.26)	.23
Labor-related complications	6.27	7.29	0.86	0.81	(0.63–1.04)	.09
Bleeding	1.93	1.02	—	—	—	—
labor >24 hours	2.87	2.76	—	—	—	—
Birth injury	0.23	3.34	—	—	—	—
RDS	1.41	3.65	—	—	—	—
Assisted delivery[c]	2.11	26.60	0.08	0.04	(0.03–0.05)	.00
Cesarean section	1.46	16.46	0.09	0.09	(0.08–0.10)	.00
5-minute Apgar<7	1.62	2.40	0.68	0.69	(0.40–1.19)	.18

Note. NNS/NFMS = US National Natality/National Fetal Mortality Survey; RR and OR denote risk and odds ratios; CI = confidence interval; RDS = respiratory distress syndrome.
[a]NNS/NFMS is the reference group.
[b]Adjusted odds ratios were obtained by logistic regression and controlled for maternal age, parity, education, marital status, birth weight, smoking, and number of prenatal visits.
[c]Assisted delivery is use of any of the following: cesarean section, forceps, or vacuum extractor.

TABLE 5—Perinatal Deaths among 1707 Infants of Women Enrolled for Care at the Farm

Category of Death	Number
Lethal congenital anomalies	6
Complications related to prematurity	4
Death in utero before onset of labor	2
Neonatal sepsis	1
Abruption (during labor)	1
Respiratory distress, unknown cause	1
Prolapsed cord	1
Suspected child abuse	1
Total	17

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Skilled Nursing Facility Care for Persons with AIDS: Comparison with Other Patients

James H. Swan, PhD, A. E. Benjamin, PhD, and Andrew Brown, MD

ABSTRACT

We compared average daily hours of care for patients with and without acquired immunodeficiency syndrome (AIDS) in a hospital-based skilled nursing facility. Patients with AIDS averaged over an hour more direct nursing care per patient day (6.5 vs 5.4 hours). These findings support other reports of greater nursing time and higher costs of caring for nursing home patients with AIDS. (*Am J Public Health.* 1992;82:453–455)

Introduction

Skilled nursing facility (SNF) care for persons with acquired immunodeficiency syndrome (AIDS) (PWAs) is limited but will likely grow.[1] As the postdiagnosis life expectancy of PWAs increases[2] and greater numbers of PWAs find no other locus of care,[3–5] SNFs should become accepted parts of an AIDS continuum of care.[6–8] AIDS poses major challenges to providers that are inexperienced with PWAs[9,10] and the populations from which they derive,[11] and that are not equipped to deal with special care needs[9] or special precautions and infection controls.[10]

PWAs are generally thought to be costlier than traditional nursing home patients[12,13] because they need different, more complex, and higher volumes of care.[10] Kerschner reports that PWAs in the final months of life require, on the average, 7 hours of nursing home care daily.[14] Adams[15] reports that PWAs require an average of over 5 hours' direct intermediate care facility–level nursing care daily. Swan and Benjamin report an average daily total nursing time of 6.5 hours (5.4 hours direct time) for PWAs in a freestanding AIDS-dedicated SNF[1]; this time approaches the 6.5 to 7.5 hours of care required daily for functionally dependent nursing home patients with complex needs.[16]

Some industry observers have argued that PWAs' need for heavy care has been overstated,[17] but no research has directly examined the relative costs of SNF care for PWAs versus "traditional" nursing home populations. This study begins to fill the gap, using comparative data on AIDS and non-AIDS care in a single hospital-based SNF in California.

Methods

In our study of care for PWAs in two Northern California SNFs with dedicated AIDS beds, a random sample of 29 non-AIDS patients was drawn from a hospital-based SNF between August 18 and December 31, 1987. (The other SNF served PWAs only.) The sample was drawn from two wards that also cared for AIDS patients—an oncology ward and a general ward. These 29 patients averaged 51 days of care per patient, compared with 41 days per patient for the 20 PWAs receiving care in the SNF in the same period.

A major issue was whether nursing hours were greater for PWAs than for others. Nursing hours were measured in two ways: (1) monthly nursing personnel time divided by days of care provided that month, and (2) daily direct plus indirect nursing time per patient attributed to nursing procedures recorded using GRASP,[18]

At the time of this study, all authors were with the Institute for Health Policy Studies, University of California, San Francisco. James H. Swan is now with the Health Care Administration Program, California State University, Long Beach, Calif.

Requests for reprints should be sent to James H. Swan, PhD, Health Care Administration Program, California State University, Long Beach, CA 90840.

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