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inadequately trained midwives. Current prosecution has by nature centered on the most competent midwives (Mills, personal communication, 1976; Bowland vs. Municipal Court of Santa Cruz, 1975; Davis, personal communication, 1977; Richwald, personal communication, 1977; Carson et al., 1977). Responsible midwives become visible and vulnerable to prosecution by the act of being responsible. In accompanying their problem patients to the hospital during labor, in consulting with physicians regarding problem cases, and in arranging hospital and physician back-up, they improve the care of their clients and become known. To be known is to be vulnerable to prosecution. The dilemma is obvious.

In previous studies, we have compared two groups of women--a planned home group and a planned hospital group -- matching them for many of the relevant factors which would be expected to affect delivery outcome (Mehl, 1977). We found significantly better outcomes in several parameters of maternal and infant outcome among the planned home group. Canonical correlation analysis strongly suggested that these differences were the result of obstetrical intervention in a low-risk population (Mehl et al., 1977). In this study, we approach the question of the outcomes of midwife-attended deliveries in a similar case-control fashion. The question we are interested in is the relative safety of midwife-attended delivery compared to a standard of physician-attended delivery.

Methods

Data Collection

Our institute has been studying delivery alternatives since 1973. Because of the difficulties with birth certificates as a source of subjects, our strategy has been to identify responsible, competent midwives, utilizing them as "index practitioners." To select an index practitioner, we assess the practitioner's knowledge and skills in obstetrics and pediatrics. We determine their practice philosophy by discussing with them their management of several different obstetrical situations. Finally we review their records for completeness and accuracy. If the criteria are met, then we collect data on every woman contacting the midwife between a beginning and an ending time point.

Data for midwives were collected from Nancy Mills, a previously mentioned midwife from Sonoma County, California, who has attended over 650 deliveries, and from midwives from the Santa Cruz Birth Center, a group of midwives whose activities and outcomes have been described elsewhere (Mehl et al., 1975; Ehrlich, 1976; Lang, 1972).[2] The data were collected for the time periods 1972 to 1975 and were obtained by retrospective chart review. For this reason it was essential that our index practitioners were capable of identifying complications and recording them. To test this hypothesis we conpared their outcomes to the outcomes of

physicians attending home deliveries and found no significant differences (Mehl, 1976).

Matching

The initial study design involved matching the data obtained from these midwives to a hospital sample consisting of planned hospital deliveries from one family practice group in western Marin County also attending home deliveries and from two private community hospitals in Madison, Wisconsin, that were also university-affiliated. While not optimal (an optimal sample would have been drawn from San Francisco Bay Area hospitals), it was felt that since the perinatal mortality of these two hospitals was lower than the Bay Area and the median income and education higher, any sampling biases would probably favor the hospital. Since the population was to be matched for socioeconomic status and since we were most concerned with the most basic indicators of perinatal outcome--mortality and morbidity indicators--subtle population effects would be small. We are currently in the process of repeating the study with a California hospital sample.

Matching was done for mother's age, parity, length of gestation, individual major risk factors, total risk factor score, education (our choice for a predictor of socioeconomic status), and presentation. The pertinent characteristics were listed on a face sheet without the

delivery details and, for each home delivery record, a match was searched for in the hospital group. If no match was found the unmatched case from the home group was eliminated and the search was resumed for the next home case. All women planning home deliveries at the time of onset of labor, experiencing the occurrence of a complication necessitating hospitalization and/or delivery, or needing the hospital after birth were included in the planned home group. There was a total of 600 planned home births and 8,000 planned hospital births for matching; 502 of the home births had matches in the hospital sample.

For the second phase of the study, computer capabilities became available, and we received data from 15% of the hospital practitioners who were rated the "least interventionist," that is, the most likely to allow labor to progress without interference and who had the most conservative criteria for intervention. Matching was done by means of a program written in PASCAL on the University of California, Berkeley, CDC6400 computer. Matches were obtained for 421 midwife-physician pairs.

Data Analysis

Statistical analysis on the files obtained were conducted with the SPSS series of statistical programs (Nie, Hull, Jenkins, Steinbrenner, & Bent, 1975), Version 6.5, as adapted by the Vogelback Computing Centern, Northwestern

University, for the CDC6000 series. The frequencies and T-test procedures were used.

Results

The initial analysis showed the same proportion of results between midwives and physicians that we found previously between planned home delivery and planned hospital delivery (Mehl, 1977). The midwife sample (which included all births transported to the hospital and cared for by physicians) had significantly less fetal distress, meconium staining, postpartum hemorrhage, birth injuries, and infants requiring resuscitation. The midwife sample also had higher mean Apgar scores. This led us to conclude that the comparison between midwives and hospital-based obstetricians was the same comparison which had been made between planned home and hospital delivery. The reasons for these differences have been indicated in other research to be related to the much greater use and indications for the use of oxytocin, forcepts, analgesia, and obstetrical procedures (Mehl et al., 1977).

For the subsequent analysis we used the midwife sample and the "low-interventionist" physician sample. Table 1 shows that there were no significant differences between the groups besides the higher incidence of planned home births among the midwife group. Table 2 shows that the only significant differences among delivery complications

were more fetal distress among the physician group and more problems with the delivery of the placenta. They also (Table 3) experienced more analgesia, first- and second-stage oxytocin, anesthesia, and obstetrical procedures. Table 4 shows that there were no significant differences in neonatal complications or maternal postpartum complications. Lastly, Table 5 shows that the only significant differences in neonatal outcomes were borderline significantly more Apgar scores at 1 minute less than 7 and 5-minute Apgar scores less than 7.

Insert Tables 1-5 about here

Discussion

From these results and from other studies (Mehl et al., 1977) it seems reasonable to suggest that the improved outcomes reported among a large group of planned home births (attended by competent practitioners) over planned hospital births relate to lesser amounts of obstetrical intervention in the planned home group. Attempted comparisons of midwives with obstetricians were confounded by this relationship.

For the second analysis presented, it would seem reasonable to suggest that the slight differences in outcome favoring the midwife group could be due to even yet

increased interventions (oxytocin, procedures, etc.) among the hospital group.

It can be concluded that, at least among a limited sample size of 421 cases, midwives did as well as physicians for low-risk cases. Larger numbers of cases are required to address questions regarding the performance of midwives in emergency situations requiring immediate intervention or rapid

Also, it must be emphasized that, while the midwives studied here were not licensed or formally trained midwives, they were, nevertheless, very knowledgeable about obstetrics and pediatrics and had acquired considerable skill and competence. Such performance attests to the ability of these women to learn outside of institutional settings. Were formal training made available, it would seem that all would stand to benefit.

From the results of this study it would seem reasonable and prudent to develop and test alternative training programs for such midwives and to establish clinical demonstration/research programs to allow for the further study of the outcomes of such midwives with reference to their possibility for legitimizing their utilization in maternal and child health care delivery. It must also be remembered that this current study is by no means definitive. Current work is underway to develop an entirely California-based hospital sample and to increase the number of midwife deliveries available for study.

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Footnotes

[1]In the remainder of this paper we will include non-certified nurse-midwives and lay midwives under the simplified heading of midwives.

[2]It should be remembered that there are many midwives from the Santa Cruz area who call themselves Santa Cruz midwives but who are not associated with the Santa Cruz Birth Center.

Table 1

Population Characteristics

	Midwife Sample N = 421	Physician Sample N = 421	Significance
Maternal education (mean)	13.4	13.4	NS
Mo. prenatal care began (mean)	3.6	3.5	NS
Primigrairdae	243	243	NS
Para 1	128	128	NS
Para 2	40	40	NS
Para 3	6	6	NS
Para 4-6	3	3	NS
Mean months of follow-up	4.1	5.4	
Vertex presentations	421	421	NS
Length of gestation (mean)	39.9	39.9	NS
Prenatal risk factor score (mean)			
Maternal age	24.4	24.4	NS
Prolonged rupture of membranes	18	18	NS
Number of female infants	223	224	NS
Number of male infants	198	197	NS
Birthweight (grams)	3,412	3,350	NS
Twins	1	1	NS

Table 2

Complications of Labor and Delivery and Procedures Used

	Midwife Sample N = 421	Physician Sample N = 421	Significance
Fetal distress	8	25	$p < 0.001$
Placenta problems	6	11	$p < 0.05$
Labor dysfunctions	18	25	NS
Hospital transfers	32	15	$p < 0.01$
Meconium staining	18	16	NS
Posterior deliveries	28	19	NS
Shoulder dystocia	2	2	NS
Partial abruptions	1	3	NS
Procedures			
Caesarean sections	2	3	NS
Mid forceps deliveries	1	5	NS
Analgesia	6	24	$p < 0.01$
Oxytocin, 1st stage	22	40	$p < 0.01$
Oxytocin, 2nd stage	38	53	$p < 0.01$
Oxytocin, 3rd stage	45	298	$p < 0.001$
Low forceps	3	10	$p < 0.01$
Number of anesthetics	4	66	$p < 0.0001$
Obstetrical procedures	16	75	$p < 0.001$

Table 3

Infant Complications

	Midwife Sample N = 421	Physician Sample N = 421	Significance
Neonatal hyperbilirubinemia	8	7	NS
Neonatal cyanosis	1	0	NS
Infection	2	2	NS
Congenital abnormalities	0	3	NS
Newborn metabolic problems	1	0	NS

Table 4

Postpartum Complications

	Midwife Sample N = 421	Physician Sample N = 421	Significance
Breast infections	3	2	NS
Postpartum D & C	1	0	NS
Maternal infection	0	2	NS
Postpartum depression	1	1	NS
Uterine atony	1	4	NS

Table 5

Neonatal Outcomes

	Midwife Sample N = 421	Physician Sample N = 421	Significance
Fetal deaths	0	0	NS
Neonatal deaths	0	0	
Perinatal deaths			
Motor cerebral palsy	1	0	NS
1-minute Apgar < 4	4	7	NS
1-minute Apgar < 7	9	21	$p < 0.05$
5-minute Apgar < 4	1	2	NS
5-minute Apgar < 7	1	7	$p < 0.05$
Infant resuscitations	4	7	NS
Respiratory distress > 12 hrs.	3	3	NS
Failure to thrive	0	1	NS
Birth injury	1	0	NS

HOME BIRTH VERSUS HOSPITAL BIRTH:

COMPARISONS OF OUTCOMES OF MATCHED POPULATIONS [1]

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Abstract

1046 matched home and hospital deliveries are compared with regard to the frequency of obstetrical procedures utilized, incidence of maternal and neonatal complications, and morbidity and mortality. Each home delivery is matched with a hospital delivery with respect to age, parity, length of gestation, major risk factors, and total risk factor score on the Nova Scotia risk factor screening criteria. Educational and socioeconomic factors are matched so that the hospital population is equally or better educated than the home birth population and of equal or higher socioeconomic class. Home deliveries were collected from six home delivery services in northern California. Hospital deliveries were collected from two community hospitals in Madison, Wisconsin. Results show no significant differences in neonatal and perinatal mortality, number of neurologically abnormal infants, incidence of low birth weight infants, and cases of neonatal infection. There were more neonatal infections and more infants requiring resuscitation in the hospital group. The general equivalence of results are discussed as indicating that pre-selected women may labor and deliver at home in the United States without significant additional risk, and at a lower cost than hospital delivery.

Key Words

Home Birth	Midwife	Obstetric anesthesia
Birth injury	Neonatal infection	Neonatal resuscitation

A continuing trend toward home delivery has been noted recently across many segments of the American population (Hazell, 1975; Ward and Ward, 1976; Arms, 1975). Much of the impetus for home delivery has been derived from consumer rather than professional initiative. Medical reaction to this trend has been largely negative and based on the contention that home deliveries presented unacceptable medical risk to mothers and infants. It has been contended that the technological advances of recent years make hospital delivery mandatory (Cox, 1976). Yet, in the Netherlands, a medically sophisticated technologically advanced country, more than two thirds of all deliveries occur at home with morbidity and mortality statistics that may be favorably compared with those of any nation in the world (Kloosterman, 1968, 1975). In Cardiff, Wales, recent data suggests that a change in the past decade from largely home to largely hospital delivered babies has had essentially no effect on materna or neonatal outcome (Chalmers, 1976a, b). Given the psycho-social advantages proposed by advocates of home delivery (Ward and Ward, 1976) and the data from the Netherlands in home delivery outcome, is it possible that under some conditions home delivery may be a reasonable alternative in the United States? Several recent report have indicated low levels of complications associated with home delivery in the United States (Mehl, et. al., 1975; Brew, 1976). These reports, however, have not included comparison populations who are delivered in hospitals. In order to more appropriately assess the relative safety of home deliveries when compared to hospital deliveries it is necessary to compare the home delivered

population to a hospital delivered population of equivalent age, parity, socioeconomic status, and prenatal medical condition.

In this study, we present a comparison study of 1046 home deliveries with 1046 hospital deliveries, matched for age, risk factors, gestational length, parity, education, and socioeconomic status. This data provides needed information for the assessment of the safety and appropriateness of home delivery for selected patients.

Methods

The methods of data collection for the home birth series have been described elsewhere (Mehl, 1976) and consisted of chart reviews of 6 home delivery services in northern California and one in Madison, Wisconsin. We found all of the medical charts - both home and hospital - to be complete and of a similar quality of observation. Diagnostic criteria used were ours and were based on those defined by Friedman and Greenhill (1974). From reviewing the record and discussing them with all the practitioners concerned, it was our impression that practices in observing, diagnosing and recording clinical findings were not different among all the groups studied. This does not, of course, obviate the problem of retrospective chart review and the disadvantage of this technique, but indicates that the disadvantages were uniformly distributed. Statistics regarding the hospital deliveries were collected by chart review at two hospitals in Madison, Wisconsin, a largely upper middle class community with a median income of $16,000 per annum and from one of the home birth practices in northern California. Both were private

community hospitals, both University affiliated, both performing approximately 2000 deliveries yearly, one with a regional neonatal intensive care unit and the other with a regional maternal intensive care unit and a developing regional neonatal intesive care unit. Both were staffed by neonatologists and University pediatric and obstetrical faculty and residents as well as private physicians. One hospital's obstetrical services were also staffed by University family practice residents. 90% of the hospital deliveries were from Wisconsin; 10% from northern California.

Risk factors were grouped according to the Nova Scotia Risk Factor Screening Criteria, and for each home delivered patient, a hospital delivered patient was matched for age, length of gestation, parity, risk factor score, education and socioeconomic status, race, presentation, and individual major risk factors (including 1st, 2nd, and 3rd trimester bleeding, rupture of membranes exceeding 24 hours without labor, multiple gestation, hypertension, signs of pre-eclamps pre-existing maternal disease, abnormal glucose tolerance tests, and the like. The risk score for each home and hospital delivered pair were equated for the time of onset of labor.

The home delivery sample included all those women planning to deliver at home immediately prior to the initiation of labor, rupture of membranes, or emergence of a complication necessitating immediate hospitalization and delivery. All cases transferred to the hospital during or after labor or meeting the above criteria are included. For the home birth group, of all the women contacting the home delivery services, 4% were screened out for medical reasons. More

may have been screened out through telephone conversations which would not have appeared in the medical records.

The characteristics, philosophies, and methods of practice of the home delivery attendants are summarized elsewhere (Mehl, 1975, 1976; Eisenstein, 1976; Ettner, 1976; Epstein, et. al., 1976; Mills, 1976; Lang, 1972). Review of these sources will reveal that an inextricable complicating variable in this study is the mode and philosphy of practice of the attendants. The home birth practitioners were predominantly non-interventionist and had a higher threshold for intervention than did the hospital practitioners.

Educational attainment and socio-economic status were matched so that the hospital group had the same educational and/or socio-economic level as the home birth group or higher.[1] Mean maternal age was 25.2 years. 96% of the women were between the ages of 20 and 35. 22% were less than 20 and 1.8% were older than 35. 57.7% were primigravida, 24.3% were para 1, 10.4% were para 2, 2.2% were para 3, 0.9% were para 4, 0.4% were para 5, and 0.1% were para 6. The mean years of education for the home birth group was 13.5 years compared to 14.6 years for the hospital group. All were Caucasian women. Data for each group are presented up to 4 days of age, the time of hospital discharge. Follow-up data on home birth up to a mean of 11.5 months was available on all the home cases but not the hospital births. This is presented in Mehl (1976). 97.7% of the deliveries were vertex with 2.3% breech and other presentations. There were five sets of twins. 74.9% of the hospital deliveries were obstetrician attended; 25.1% were family physician attended.

1 This was matched so that each woman in the hospital group was educated as much as but not more than her counterpart in the

For the home deliveries, 66.5% were family physician attended; 30.8% lay midwife attended; and 2.7% nurse-midwife attended. The average risk factor score was 1.6% and 9.2% of each group was high risk by the Nova Scotia criteria (We felt this was artificially high.).

Results

Table 1 presents a summary of the procedure utilized during the deliveries of each of the two groups. The hospital practitioners used significantly more oxytocin, both before and after delivery. In home births buccal oxytocin was occasionally administered for uterine inertia, ~~if no results were forthcoming~~, whereas in the hospital, women were given intravenous oxytocin. Many more forceps deliveries were performed by the hospital practitioners, as well as more Cesarean sections. Despite a nine-fold greater incidence of episiotomies, hospital delivered women sustained significantly more third and fourth degree and cervical lacerations. Analgesia and anesthesia were also used much more frequently in hospitals (with the exception of caudal anesthesi (Analgesia, anesthesia, and forceps deliveries were only given or performed after transport to the hospital for the home birth group.) The incidence of manual removal of the placenta was the same in both groups. Indications for procedures were derived from review of charts.

Table 2 presents the indications for oxytocin for the two groups. The differences were seen to emerge from greater use of oxytocin in the hospital group for rupture of membranes without labor, first stage uterine inertia, and for elective induction. More oxytocin was used in the home group for second stage uterine

2 All of the women had had childbirth preparation.

inertia than in the hospital group. Typically, the home birth group waited longer, occasionally longer than 24 hours, before the initiati of oxytocin therapy.

Table 3 presents the indications for forceps deliveries for the two groups. The majority of the hospital practitioners used the criterion of a second stage of labor longer than one hour as an indication for forceps delivery. The home practitioners typically accepted any length of second stage as long as some progress was evident and there were no signs of fetal distress. This difference in approach is reflected in the greater number of forceps deliveries in the hospital for "prolonged second stage." The hospital practitioners used occiput posterior as an indication for forceps rotation and did not permit any patient to deliver OP, whereas the home birth practitioners did not intervene in the OP labor and deliveries unless signs of labor arrest or fetal distress were present. This i reflected in the higher number of mid forceps rotations in the hospital group. The two groups of practitioners also defined the sa type of forceps delivery by different terms. For the home group, a low forceps delivery was equivalent to a hospital practitioners outl forceps delivery and a mid forceps delivery was equivalent to a low forceps delivery. The home birth practitioners definitions for forceps deliveries were the same as Friedman and Greenhill (1974). There were also significantly more forceps deliveries in the hospita group. delivery for fetal distress.

Table 4 presents the indications given for Cesarean sections for by both groups. The hospital group did many more Cesarean sections

for 1st stage arrest, cephalopelvic disproportion, and/or non-progressive labor than did the home birth practitioners, and did more Cesarean sections for primi-gravida breech presentations and for fetal distress. The home birth practitioners delivered breech infants in the home if the parents continued to request home delivery after risks had been explained and if the Zatuchni-Andros score indicated vaginal delivery. From the table, it is also evident that the indications for Cesarean section were more liberal for the hospital group than for the home group.

Some significant differences in labor length emerged in that for para 0 and 1, length of first and second stages were significantly longer for women delivering at home (See Table 5).

Figure 1 presents significant differences in complications of labor and delivery for the two groups. The hospital group had significantly more intra-uterine fetal distress, elevated blood pressure during labor (from a non-elevated pre-labor baseline), meconium staining, and reported shoulder dystocia. The home group had more bleeding during labor and posterior deliveries. The hospital group had significantly more postpartum hemorrhages. There were no statistically significant differences in the incidence of face deliveries first or second stage dystocia (excluding CPD), occult cord prolapse, placenta previa, abruptio placenta, cord prolapse, posterior labor, retained placental fragments, late Dilation and Curettage after one week, hemorrhage from day 1 to day 3, hemorrhage after day 3, endometritis, vilamentous insertion of the cord, and postpartum thrombophlebitis.

Figure 2 presents statistically significant differences in the incidence of neonatal complications. The hospital group experienced significantly more birth injuries, received significantly more oxyge at 2, 3, 4, and 5 or more minutes, more respiratory distress lasting 12 hours or more among full term infants, and more total non-congeni tal neonatal complications. There were no significant differences in the incidence of total number of congenital anomalies, congenital heart disease, Down's syndrome, fetal wasting, hypoglycemia, metabolic acidosis, neonatal hypotension, neonatal hypovolemic shock, individual neonatal infections, meconium asperation, pneumonitis, amniotic fluid asperation pneumonitis, pyloric stenosis, polycythemi lung water syndrome, ITP, and cystic fibrosis with meconium ileus. From Table 5, it is evident that the hospital group neonates were gi more resuscitation, and had lower one minute and five minute Apgar scores than the home group. There was no significant difference in the incidence of fetal, intrapartum, or neonatal deaths, or in the incidence of neurologically abnoraml infants. Bith injuries includ cephalhematomas resulting in severe anemia requiring transfusion or hyperbilirubinemia requiring exchange transfusion, fractured cla ic branchial plexus injuries, facial nerve paralyses, skull fractures, and hemopneumothorax.

Discussion

Given two puerpally matched populations, outcome differences should accrue from the events occurring during labor and delivery. The data presented here indicate that for the home delivery population described, a group selected for low medical risk and attend

by midwife or physician, one may expect an outcome for baby and mother essentially as good as the resulting from a medically matched population delivery in community hospitals delivering high standards of medical care. The significant differences noted in the mangement of the women indicate that those hospital delivered are more likely to encounter oxytocin augmentation of labor, forceps delivery, analygesia, anesthesia, and Cesarean section. Recall that both grou of women were matched for identical medical risk factors prior to labor. In addition, incidence of neonatal infection was higher for hospital deliveries. The incidence of maternal infection was not significantly different for the two groups.

In this group of more than 1000 cases, it is not clear that the additional medical and obstetrical procedures rendered in hospital resulted in improved group outcome over the home delivered group. It therefore seems appropriate to conclude that for low medical risk women, home delivery is an alternative that cannot be dismissed as contraindicated because of unacceptable high risk to maternal and infant health. This data, of course, does not apply to home deliver in a medically unselected population, nor to home deliveries unattended by midwife or physician.

The results are, of course, limited by the limitations of the case-control method and the method of retrospective chart review. More definitive studies are needed, such as prospective studies by non-clinically involved individuals including practitioners doing both home and hospital deliveries and with controls for obstetrical practice philosophy, nutrition, and others, with all of the deliver

occurring in the same geographical area. Such a study should also include uniform examination and evaluation of the neonate by an independent examiner blind to the place of delivery.

From these results, it would seem reasonable and prudent to plan pilot projects in out-of-hospital deliveries or in changing hospital policy to create a more home-like environment and in evluating them as discussed above. It would also seem of importance to identify the specific aspects of the hospital environment which increase risk to mothers and infants and eliminate these aspects of hospital deliveries.

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TABLE 1

Procedures Utilized

	Home		Hospital		
	Number	Percent	Number	Percent	Stat. S
1st stage oxytocin	69	6.6	159	15.2	<0.000
2nd stage oxytocin	38	3.6	159	15.2	<0.000
Total prepartum cases	76	7.3	173	16.5	<0.000
3rd stage oxytocin	251	24.0	993	95.0	<0.000
Mid (low) forceps	10	0.9	205	19.6	<0.000
Low (outlet) forceps	3	0.3	115	11.0	<0.000
Mid forceps rotations	3	0.3	40	3.8	<0.001
Manual rotations	0	0.0	5	0.5	NS
Cesarean Sections	28	2.7	86	8.2	<0.05
Episiotomy	103	9.8	914	87.4	<0.000
1st degree lacerations	18	1.7	18	1.7	NS
2nd degree lacerations	136	13.0	56	5.4	<0.000
3rd degree lacerations	8	0.7	44	4.3	<0.001
4th degree lacerations	5	0.5	73	7.0	<0.000
Cervical lacerations	3	0.3	32	3.2	<0.000
Pudendal anesthesia	0	0.0	655	62.6	<0.000
General anesthesia	2	0.2	96	9.2	<0.000
Paracervical block	1	0.1	52	5.0	<0.000
Manual removal of placenta	15	1.4	15	1.4	NS
Analgesia	14	1.3	555	53.1	<0.000
Caudal anesthesia	32	3.0	0	0.0	<0.000

TABLE 2

Indications for Oxytocin

Indication	Home Number	Hospital Number	Stat. Sig.
Rupture of membranes without labor	6	56	$p < 0.0001$
1st stage uterine inertia	44	79	$p < 0.025$
Protracted descent, OP pres.	0	4	NS
Elective induction	0	22	$p < 0.005$
2nd stage uterine inertia	19	8	$p < 0.05$
Partial abruption	0	1	NS
Elevation blood pressure	0	1	NS
Baby died in early labor	0	1	NS

TABLE 3

Indications for Forceps

Indication	Home Number	Hospital Number	Stat. Sig.
Low Forceps			
Arrest of descent	2	0	NS
Elective		42	p <0.0001
Prolonged 2nd stage and/or protracted descent	1	54	p <0.0001
Fetal distress	0	18	p <0.005
Piper forceps to ACH	0	1	NS
Mid Forceps			
Elective	0	63	p <0.0001
Prolonged 2nd stage and/or protracted descent	4	86	p <0.0001
Fetal distress	4	53	p <0.0001
2nd stage arrest	2	0	NS
Bleeding	0	1	NS
Meconium staining	0	1	NS
Perineal dystocia	0	1	NS
Mid Forceps Rotation			
Elective, OP	0	30	p <0.0001
Elective, OT	0	3	NS
2nd stage arrest	0	1	NS
Prolonged 2nd stage and/or protracted descent	2	2	NS
Fetal distress	1	4	NS
Manual Rotation			
Elective	0	1	NS
Fetal distress	1	2	NS

TABLE 4

Indications for Cesarean Sections

Indication	Home Number	Hospital Number	Stat. Si
Hypertonic labor (after oxytocin)	0	3	NS
Hypotonic labor, no response to oxytocin	0	1	NS
Vaginal obstruction by paraovarian cyst	0	1	NS
History of previous difficult forceps	0	1	NS
2nd stage arrest, CPD	6	4	NS
Rupture of membranes, no response to oxytocin	1	1	NS
Labor longer than 24 hours total	0	1	NS
Placenta previa	0	1	NS
Fetal distress	5	8	NS
Repeat Cesarean	0	1	NS
1st stage arrest, CPD	12	45	p <0.005
Multigravida breech (with or w/o CPD)	1	2	NS
Primigravida breech (as above)	0	7	p <0.05
Severe toxemia	1	0	NS
Meconium at 42 weeks	0	1	NS
Face presentation	0	2	NS
Transverse lie	0	2	NS
Suspected postmaturity	0	1	NS
Positive stress test	0	1	NS
Prolapsed cord	1	0	NS
Fetal arrhythmia on monitor	0	1	NS
Amnionitis, no labor, no rupture of membranes	1	0	NS

TABLE 5

	Home	Hospital	Stat. Sig.
Birthweight, mean	3518	3439	NS
Labor length			
para 0, 1st stage	14.5 hrs	10.4 hrs	<0.01
para 0, 2nd stage	94.7 min	63.9 min	<0.05
para 1, 1st stage	8.5 hrs	5.9 hrs	<0.01
para 1, 2nd stage	48.7 min	19.0 min	<0.005
para 2, 1st stage	7.7 hrs	6.6 hrs	NS
para 2, 2nd stage	21.7 min	15.9 min	NS
3rd stage	21.0 min	4.6 min	<0.005

TABLE 6

Neonatal Outcomes

	Home	Hospital	Stat. Sig
Intrapartum death	1	1	NS
Fetal death	2	0	NS
Neonatal death	0	1	NS
Perinatal mortality/1000	2.9	1.9	NS
Neonatal mortality/1000	0	0.9	NS
Neonatal asphyxia	3	7	NS
Neonatal resuscitations required	14	52	$p < 0.0001$
Birth injuries	0	30	$p < 0.0001$
Neurological abnormal infants	1	6	NS
1 min Apgar score 4	20	36	$p < 0.05$
1 min Apgar score 7	56	116	$p < 0.0005$
5 min Apgar score 4	3	8	NS
5 min Apgar score 7	11	23	$p < 0.05$

Figure 1

STATISTICALLY SIGNIFICANT DIFFERENCES IN COMPLICATIONS OF LABOR AND DELIVERY

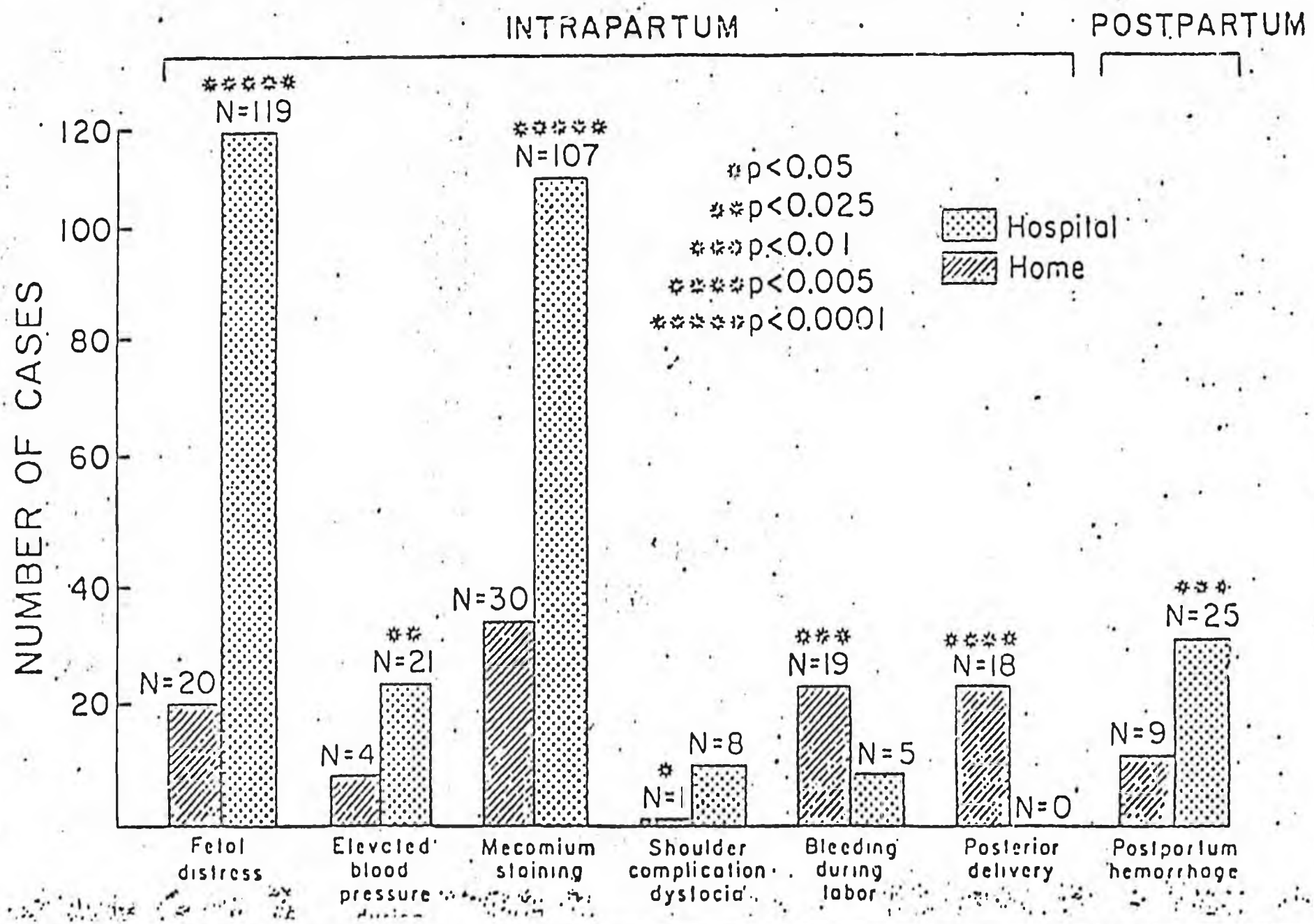
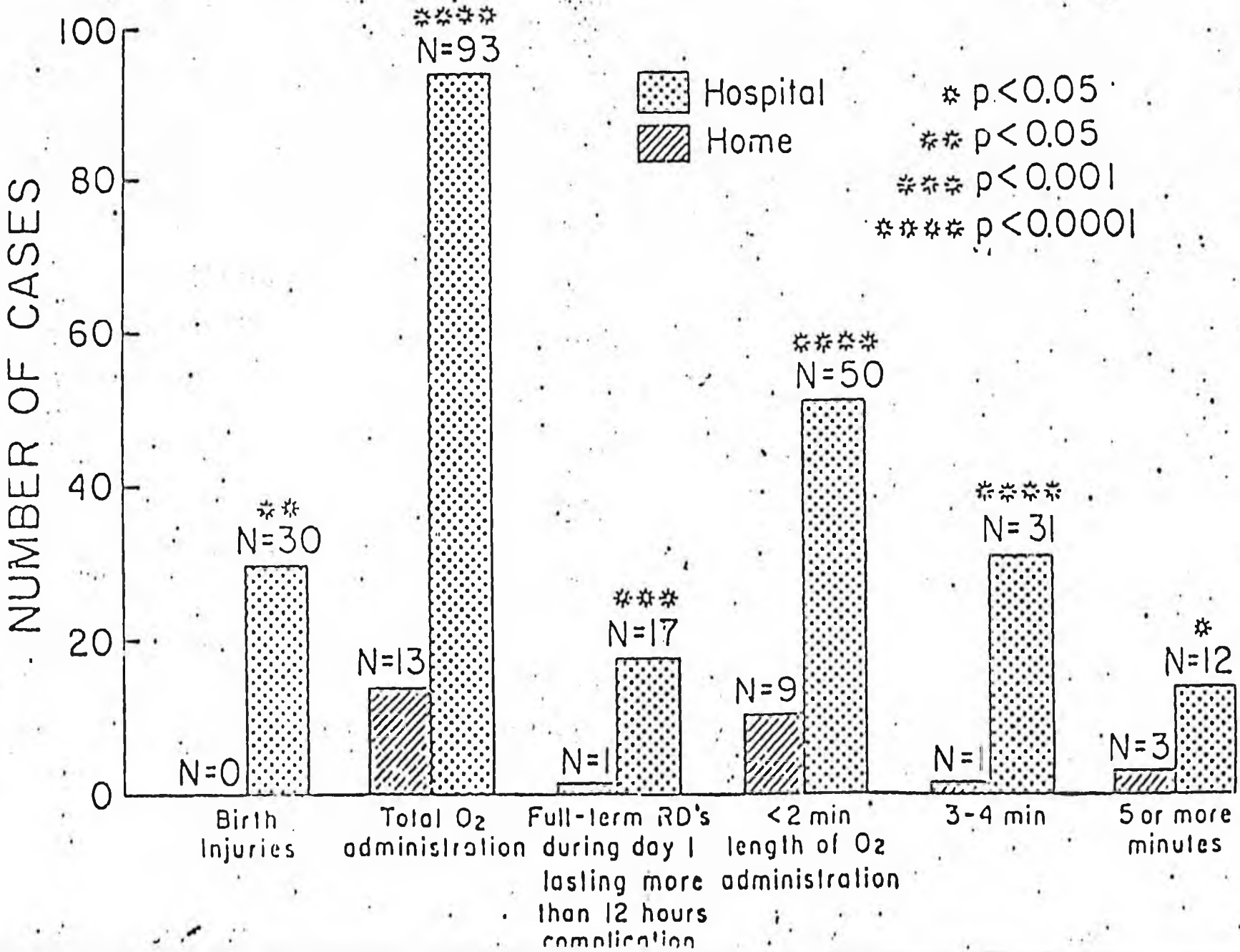


Figure 2

STATISTICALLY SIGNIFICANT DIFFERENCES IN COMPLICATIONS OF THE NEWBORN



Statistical Outcomes of Home Delivery
I. Comparison to similarly selected Hospital Deliveries [1,2]

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2 Presented at the first annual meeting of the National Association of Parents and Professionals for Safe Alternatives in Childbirth, Washington, D.C., May 15, 1976.

ABSTRACT

Medical records of 1,146 elective home births from 5 home delivery services in northern California were compared with medical records of 180 planned hospital deliveries conducted by one of the same services, and consisting of women who met their criteria for home delivery. Three of the services consisted of family physicians and nurse-midwives, while two consisted of lay midwives without immediate physician supervision. Rates of medical complications in both groups were low. Significantly more analgesia and anesthesia (although low) was used in the planned hospital group; the incidence of low Apgar scores in this group was higher than for the planned home group. Results of both groups were better than those of the general population. Possible reasons for this are discussed. Most other measures of perinatal outcome and complications were not significantly different between the two groups or between physicians and midwives. The neonatal mortality rate was 5.0/1000; the perinatal mortality rate was 9.5/1000. There were no maternal deaths. These figures support the conclusion that in a self-selected, medically screened population, home delivery can be a safe alternative. Possible reasons for this are cited.

Key Words

Home Birth Midwife Perinatal

Neonatal Mortality Infant Morbidity

Acknowledgments

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Introduction

We began our studies on the statistical outcomes of home deliveries because of the tremendous rise in the number of home deliveries across the country and the lack of available data on their outcomes. We had hoped to provide data which parents and professionals could use on their individual scales of relative value along with the already available experiential data on emotional outcomes as they weighed risks and benefits to determine what kind of delivery they would choose to have or to attend. The purpose of this study was to compare the outcomes of 1146 elective home deliveries with 180 similarly selected hospital deliveries performed by one of the same groups of physicians involved in the home deliveries.

Methods

Our sources of data for the 1146 elective home deliveries and our methods of analysis have been described elsewhere (Mehl, et al.,1976). In summary these deliveries were collected from the medical charts of five San Francisco Bay Area services consisting of three physician-midwife groups: a rural-based family practice in Western Marin County, an urban-based family practice in Mill Valley, and an urban-based group consisting of one physician (trained in pediatrics/neonatology) and two midwives; and two midwife groups consisting of 10 lay midwives in Santa Cruz County and 1 lay midwife in Sonoma County. 59.2% of the deliveries were performed by physicians and 40.8% by lay midwives. The methods of operation of these services, their screening procedures, obstetrical philosophies and practices, and the sociodemographic characteristics of their population have all been described elsewhere (Mehl, et al.,1976).

The planned hospital comparison group was drawn from the records of the Point Reyes family practice and consisted of 180 deliveries. These women came from the same population pool as those women planning home deliveries and had many of the same attitudinal sets. They would have been attended at home had they chosen to deliver there. Women with complications of prenatal care obviating a home delivery were excluded from this sample. For the hospital comparison group 81.2% were followed at least six months. 110 of the infants and mothers were discharged at the end of two hours post-delivery. The hospital comparison group tended to be less from the counter-culture and were characterized by a more uniform middle-class socioeconomic backgroupd with usually one or both parents a college graduate.

DISCUSSION

Each group was a self-selected health group of women screened for complicating medical problems. Comparisons between the home birth group and the planned hospital group suggests that for women delivering in the home with the particular philosophies and practices of this particular group of practitioners, there was no significant increase in risk with a home delivery versus a hospital delivery.

Several points may be made -- that the perineal massage technigue

(next page)

There was no association among either group between length of labor and length of second stage with the incidence of low Apgar scores at birth or with other complications. The mean length of first stage labor among the planned hospital group was 12.5 hours for primigravidae and 5.4 hours for multigravidae. For the home group it was 10.2 hours and 4.6 hours, respectively. This difference was significant at $p < 0.05$. The mean length of second stage labor for the planned hospital primigravidae was 106.8 min ± 31.0 min and for multigravidae was 50.1 min ± 28.3 min. For the home series the mean length of second stage was 118.2 min ± 40.5 min. for primigravidae and 44.6 min ± 23.7 min for multigravidae. The primigravidae differences were significant at $p < 0.05$.

There were 14 cases of prolonged rupture of membranes in the home birth series and 11 in the planned hospital series ($p < 0.01$). There were no infections in the infants except for one low birth weight infant whose mother developed signs of amnionitis prior to delivery and had had multiple vaginal exams. She was in the planned hospital series. Table 9 presents some additional data on the reasons for which home deliveries were transported to the hospital for the home birth series.

utilized by the midwives in preventing vaginal lacerations during delivery did indeed function and that as the physicians adopted this technique, their laceration rate decreased. The higher utilization of oxytocin after delivery by the physicians may have reflected its availability to them and their training to use it frequently. The equivalence of hemorrhage and blood loss results between the physician and midwife group suggests that it was not needed as frequently as used. The lay midwives took women to the hospital more frequently than the physicians, presumably reflecting their decreased capabilities to handle specific complications at home and their lower threshold level for going to the hospital possibly related to a lower level of knowledge. The reasons for transport which were most significantly different between the groups were for prolonged rupture of membranes, uterine inertia, decreasing fetal heart rate, manual removal of a retained placenta, and treatment of postpartum hemorrhage. The physicians were able to treat some of their cases of uterine inertia with buccal oxytocin at home, and removed several retained placenta at home, as well as carrying oxytocin and methergine to treat third stage bleeding at home. The greater number of FHT problems brought to the hospital by the midwives may reflect their greater level of anxiety in dealing with and desire for transporting abnormal situations to the hospital early.

The planned hospital population, while having equivalent training for childbirth, used more analgesia during labor than the home birth series, and this may have contributed to their higher incidence of low one minute Apgar scores, second stage dystocia, and greater incidence of fetal heart rate drops. The much lower incidence of "excessive bleeding" in the planned hospital group may be indicative of the attendents lesser anxiety for equivalent blood loss in the hospital than in the home. The

incidence of postpartum hemorrhage was greater in the planned hospital group and may represent the greater tendency to pull on the umbilical cord to aid in the delivery of the placenta. At home, the umbilical cord was rarely pulled to aid placental delivery, but rather, the natural expulsive forces of the uterus were relied on. This is substantiated by the longer third stages seen in the home group.

The failure of prolonged second stage to be associated with infant problems in this series may relate to the slower descent with less intense pushing placing less of a stress on the infant, or may relate to other factors. This has been found to hold, as well, in the British Perinatal Study (1973) and by Friedman (1974). Clearly many of these findings may need to be substantiated by further study in such populations as these. It may be that much current obstetrical thinking is influenced by many of the studies having been completed on welfare populations, while different results may hold in different populations. More work needs to be done in this area.

The 0.3% incidence of neurologically abnormal infants at one year follow-up contrasts favorably with the 1.7% incidence of neurologically abnormal infants at 1 year of age found by the National Institute of Neurological Diseases and Stroke (1972). The Apgar scores in this series were scored by an attendent not involved in the actual delivery, and may be inflated here, as in the hospital, where often the physician delivering the infant assesses the Apgar score. They are useful however in assessing the accoucheur's perception of the infant's immediate difficulties, which in this series, seem minimal. The total percent of 1 minute Apgar scores less than 7 was 4.1% compared to a 21% incidence of such scores in a non-welfare population in the hospital found by Drage and Berendes (1966). The contribution of other factors such as lower stress in the home e.-

in a study such as this. Incidences of meconium staining in this group was less than that of the general population (Klaus and Farnaroff, 1973). This was true as well for labor dystocia (Friedman, 1974) and (Eastman and Hellman, 1968), as well as for other complications (Eastman and Hellman, 1968).

Neonatal mortality rate for the home delivery population was 5.2 per 1000, and perinatal mortality was 9.5 per 1000. Intrapartum asphyxia deaths occurred at a rate of 0.95 per 1000. Unfortunately few studies are available for comparison. Behrman, et al[9] report a neonatal mortality rate of 5.0 per 1000 in 39,896 non-premature, white middle-class pregnancies receiving private prenatal care. The non-premature perinatal rate for this group was 7.6 per 1000, and the overall neonatal and perinatal mortality rates were 13.8 and 17.6 per 1000, respectively. Chan, et al[10] report an intrapartum stillbirth rate due to asphyxia of 1.7 per 1000 in 1162 patients receiving random assignment fetal monitoring at Loma Linda University Hospital, and Shenker, et al[11] report a 0.5 per 1000 intrapartum asphyxial death rate in fetal monitored patients. The prematurity rate of the Behrman, et al study was 4.8%; in the home delivery series it was 3.0%. The planned hospital population had a neonatal mortality rate of 5.5 per 1000 and a perinatal mortality rate 11.0 per 1000.

T

This compares favorably to the work of Halverkamp (1976) showing superior results of nurse monitorring labors compared to fetal monitor machines. Table 10 is included to show the equivalence of physician midwife observations for the home delivery series. Since these same physicians were making observations in the hospital, this suggests that the quality of observations between the two populations was equivalent.

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portion and had more low forceps deliveries, significantly more because of a drop in fetal heart rate.

Table 4 presents the comparison complication figures for the home delivery population (4A) and the planned hospital group (4B). The planned hospital group showed significantly more second stage labor dystocia ($p < 0.025$), more drops of the fetal heart rate ($p < 0.005$), more postpartum hemorrhage ($p < 0.001$), more forceps deliveries ($p < 0.001$), episiotomies ($p < 0.001$), Cesarean sections ($p < 0.025$), analgesia ($p < 0.001$), and significantly less total unmedicated deliveries ($p < 0.001$).

Table 5 compares the perinatal outcome data. The neonatal and perinatal mortality results were not significantly different between the planned hospital group and the home delivery group, nor was the rate of low birthweight infants, or the mean length of infant follow-up. The hospital neonatal death rate was 5.5 per 1000 live births with 11.1 perinatal deaths per 1000 total births. Table 6 compares infant morbidity obtained and outcome, and Table 7 compares neonatal complications. The planned hospital group had significantly more fetal hypoxia ($p < 0.025$) and significantly more 1 minute Apgar scores less than 4 ($p < 0.025$). Among the home birth series, the midwives had more infants who received phototherapy for jaundice than did the physicians ($p < 0.025$). Causes of fetal deaths are compared in Table 8.

The prematurity rate for the population initially seeking assistance from one of the services studied was 3.0%. For the planned hospital group it was 2.8%. There was no significant difference between one minute Apgar scores ranging from 4-6 between the home birth group and the planned hospital group with 40 and 7 such ratings, respectively. Average Apgar scores for the planned hospital group were 8.6 at one minute and 9.7 at five minutes, and were not statistically significantly different from the home birth group.

Results

Table I compares the statistics on the selection of the planned hospital group with the elected home delivery group. There were more primigravidae in the hospital group and fewer secundipara. The other differences were not significant. The maternal age was not statistically different between groups. Virtually all the women in the planned hospital group were trained in childbi: classes (as were the home group) such as Bradley or LaMaze. A high incidence of breast feeding also characterized the planned hospital group. All women in the planned hospital group attempted breast feeding except one, and, for a variety of reasons, two of these were not successful.

Statistics on the presentations and deliveries are compared in Table 2. The planned hospital group contained more breech infants, had more Cesarean sections, had more analgesia, received more oxytocin during first stage, second stage, and after third stage labor, had more low and mid forceps deliveries, and more episiotomies. The breech infants did not contribute to these differences with the exception of one Cesarean section. It is important to note that the labor attendents for these planned hospital deliveries had the same philosophies as the home birth attendents so that these differences presumably come as a result of the effect of being in the hospital and may relate to a lower motivation for the women to carry through with an unmedicated delivery or to more readily available analgesia or an atmosphere more encouraging of analgesia, or to a feeling of pressure transmitted to the birth attendents to intervene sooner or more aggressively in the hospital than at home. These may be related to the subtle effects of atmosphere which are as yet difficult to measure. The indications given for forceps and Cesarean deliveries are compared in Table 3. The planned hospital group had more Cesarean sections, primarily related to cephalopelvic dispro-

	Home		Hospital		California	Stat.
	Number	Percent	Number	Percent	1973	Sign.
Mother's Age	1146	100.0	180	100.0	100.0	
<20	60	5.2	12	6.7	17.3	NS
20-34	1068	93.2	160	89.9	77.6	NS
≥35	18	1.6	6	3.4	5.1	NS
Mean Age	24.9					
Range	16-44					
Variance	16.8					
S.D.	4.1					
Parity	1146	100.0	180	100.0	100.0	
para 0	729	63.6	133	73.9	43.3	p<.005
para 1	237	20.7	33	18.3	31.0	NS
para 2	128	11.2	9	5.0	13.3	p<.025
para 3	34	3.0	2	1.1	6.0	NS
para 4	18	1.6	1	0.6	6.3	NS
Prenatal Care Began	1146	100.0	180	100.0	100.0	
1st Trimester	707	61.7	114	64.0	72.8	NS
2nd Trimester	362	31.6	63	35.4	20.2	NS
3rd Trimester	74	6.5	1	0.6	4.5	**
None	3	0.3	0	-	2.4	NS

*includes prenatal care unknown

Indications for C-Sections and Forceps Deliveries
in Women Beginning Labor at Home

	Home Number	Hospital Number
Low Forceps Delivery		
Protracted descent	6	0
Arrest of descent	2	3
Dysfunctional labor	1	0
Brow presentation with arrest of descent	1	0
Fetal heart drop	1	3
Bleeding during 2nd stage	0	1
	11	7
Mid Forceps Delivery		
Protracted descent	3	0
Arrest of descent	1	1
Dysfunctional labor	1	0
Fetal heart drop, occiput posterior presentation	1	0
Fetal heart rate drop, amnionitis, maternal hypertension	0	1
	6	2
C-Sections		
Cephalopelvic disproportion	16	7
Failure to descend, occiput posterior presentation, relative CPD	6	
Arrest of active phase dilation, fetal heart drop, cord 4x neck	1	
Prolapsed cord	1	(1)
Breech with amnionitis	1	
Psychotic reaction to labor	1	
Acutely dropping fetal heart tones	1	
Toxemia	1	
Breech with low breech score, poor labor progression	0	1
Transverse lie with one prolapsed cord	(1)	2
	28	10

Perinatal Outcome

	Home Number	Home Rate	California St. 1973	Sign.	Hospital Number	Hospital Rate
Total Births	1152*				180**	
Live Births	1147*				180**	
Fetal Deaths	5	4.3[1]	8.2[1,3]	NS	1	5.5[1]
Neonatal Deaths	6	5.2[2]	10.3[2]	NS	1	5.5[2]
Total Perinatal Deaths	11	9.5[1]	20.3[1]	NS	2	11.1[1]
Low Birthweight (2501g)	15	1.3[2]	5.3[2,3]	NS	3	1.7[2]
Mean Length of Infant Follow-Up	11.5 mos.			NS	11.6 mos.	
S.D. Length of Follow-Up	±10.3 mos.			NS	±10.4 mos.	
% Infants Followed to 6 mos.	83.4%			NS	81.2%	

*includes 6 sets of twins
** includes 2 sets of twins

1 per 1000 total births
2 per 1000 live births
3 for white, non-Spanish surname, age 20-29

Complications	Primigravidae N=729 M.D.'s N=464 Home	To Hosp	Midwives N=265 Home	To Hosp	SS[1]	Multigravidae N=417 M.D.'s N=221 Home	To Hosp	Midwives N=196 Home	To Hosp	SS[1]	Total M.D.'s N=685 Home	To Hosp
Jaundice req. Rx	1	5	2	9	p<0.025	2	1	0	1	NS	3	6
Fecal hypoxia	2	0	0	0	NS	0	1	0	0	NS	2	1
Neurological Abnormalities[2,4]	2	1	0	1	NS	0	0	0	1	NS	2	1
Cerebral palsy	1	0	0	1	NS	0	0	0	0	NS	1	0
Neonatal FTT	1	1	0	1	NS	0	0	0	0	NS	1	1
Apgar (1 min.) score												
score less than 4	3	0	1	1	NS	0	1	0	1	NS	3	1
score 4 - 6	12	7	5	3	NS	2	4	2	5	NS	14	11

1 calculated on the basis of home & hospital
2 include cerebral palsied infants
4 development at 1 year follow-up

Condition	Number	Rate per 1000 LB	Delivery	Complications	Outcome
Congenital Defects	6	5.2			
PDA			Home	None	repaired surgically at 1 year
Coarctation of aorta			Home	None	repaired surgically at 2 years
Omphalocele			Home	None	repaired surgically at 15 hours
Myelomeningocele, thoracic			Home	None	mental & motor retardation at 18 months
Multiple minor anomolies			Hosp	FHT↓, C-S	no mental or motor retardation at 1 ye
Down's syndrome			Home	Meconium	mental retardation
Cerebral palsy	2	1.7	Home	FHT↓, precip. del.	motor retardation
			Home	None	mild spastic with slow verbal develop
Surgical Conditions	2	1.7	Home	None	pyloric stenosis repaired at 5 and 8 d
Low Birthweight	15	13.1	Hosp	2nd Tri Bleed	1332 grams, in hospital 1 month, severe
			Home	None	1729 grams, in hospital 2 weeks, mild
			Home	Breech	2154 grams, in hospital 12 days, mild
		Others:	Home	None	No problems
Low Birthweight	3	16.6	Hosp	FHT prior to del.	neonatal sepsis and amnionitis
			Hosp		2 cases mild RDS
Hyperviscosity syndrome	1	5.5	Hosp	None	resolved

Age at Death	Number	Delivery	Complications	Cause of Death
5 months est. gest. age	1	Home	None	Rh incompatability, insisted on home delivery
35 weeks est. gest. age	2	Home	None	Intrauterine death, unknown cause
During labor	1	Hosp	Amnionitis IUD in place	Overwhelming intrauterine sepsis
During labor	1	Home	None	Unknown cause
2 days	1	Home	None	Macrosomia, single umbilical artery, bilateral adr hemorrhage, numerous congenital anomalies
7 days	1	Home	None	Cystic fibrosis, meconium ilius, postoperative perc tinitis and sepsis
7 days	1	Home	None	Coarctation of aorta
10 days	1	Home	None	Cor biloculare
2 weeks	1	Home	None	Sudden infant death syndrome
3 weeks	1	Home	None	Post surgery for tetralogy of Fallot
During labor	1	Hosp	Rapidly ↓ FHT	Meningoencephalitis, etiology unknown
8 days	1	Hosp	None	Aplastic left ventricle

Neonatal Outcomes

Primigravidae N=729				Multigravidae N=417				Total N=1146				Planned
Midwives N=265		M.D.'s N=221		Midwives N=196		M.D.'s N=685		Midwives N=461				N=178
Home	To Hosp	Home	To Hosp	SS^1	Home	To Hosp	Home	To Hosp	SS^1	Home	To Hosp	Home	To Hosp	SS^1	
5	2	9		$p<0.025$	2	1	0	1	NS	3	6	2	10	$p<0.025$	3
0	0	0		NS	0	1	0	0	NS	2	1	0	0	NS	3
1	0	1		NS	0	0	0	1	NS	2	1	0	2	NS	0
												0	1	NS	0
0	0	1		NS	0	0	0	0	NS	1	0				
1	0	1		NS	0	0	0	0	NS	1	1	0	1	NS	1
												1	2	NS	6
												7	8	NS	7
0	1	1		NS	0	1	0	1	NS	3	1				
7	5	3		NS	2	4	2	5	NS	14	11				

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Complication	Primigravidae (N=52/133=39.1%) Hospital	Percent	Stat. Sign.**[1]
Intrapartum			
Dystocia 1st Stage[2]	15	11.3	NS
Dystocia 2nd Stage	10	7.5	p 0.025
CPD	7	5.3	NS
Meconium stain only	4	3.0	NS
FHT↓ (c̄, s̄ meconium)	10	7.5	p 0.005
Hypertension	2	1.5	NS
Precipitous labor	2	1.5	NS
Other*	6	4.5	
TOTAL	56		
Postpartum			
Hemorrhage[3]	5	3.8	p 0.001
Excessive PP bleed[3]	2	1.5	p 0.001
Retained placenta	2	1.5	NS
Endometritis	3	2.3	NS
PP Depression	1	0.8	NS
TOTAL	13		

Complication	Multigravidae (N=10/45=22.2%) Hospital	Percent	Stat. Sign.**[1]
Intrapartum			
Dystocia 1st Stage	2	4.4	NS
Dystocia 2nd Stage	1	2.2	NS
CPD with breech	1	2.2	--
Precipitous labor	2	4.4	NS
FHT↓	1	2.2	NS
Hypertension	1	2.2	--
Transverse lie	1	2.2	--
TOTAL	9		
Postpartum			
Hemorrhage	0	--	NS
Excessive PP bleed	1	2.2	NS
Retained placenta	1	2.2	NS
Endometritis	1	2.2	NS
TOTAL	3		

*single cases of amnionitis, shoulder presentation, cord prolapse, cord knot, recurrent pyelonephritis, transverse lie.

**compared with Table 5A

[1]Percent complications per 133 primigravidae, 45 multigravidae.

[2]Dystocia as used in this table is defined as: prolonged or arrested first stage, failure to dilate; prolonged or arrested 2nd stage, failure to descend, according to Friedman and Greenbill (1974).

[3]Hemorrhage is defined as more than 650 ml; excessive bleeding as "more than normal", and includes late bleeding after the third postpartum day.

Neonatal Outcomes

Nulligravidae	N=729			Multigravidae	N=417			Total	N=1146			
	M.D.'s N=464	Midwives N=265		M.D.'s N=221	Midwives N=196			M.D.'s N=685	Midwives N=461			Planned N=178
	Home	To Hosp	SS^1	Home	To Hosp	Home	To Hosp	SS^1	Home	To Hosp	SS^1	
	5	2	9	$p<0.025$	2	1	0	1	NS	3	6	2	10	$p<0.025$	3
	0	0	0	NS	0	1	0	0	NS	2	1	0	0	NS	3
	1	0	1	NS	0	0	0	1	NS	2	1	0	2	NS	0
	0	0	1	NS	0	0	0	0	NS	1	0	0	1	NS	0
	1	0	1	NS	0	0	0	0	NS	1	1	0	1	NS	1
												1	2	NS	6
	0	1	1	NS	0	1	0	1	NS	3	1	7	8	NS	7
	7	5	3	NS	2	4	2	5	NS	14	11				

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Reasons for Transportation to the Hospital and Therapy Applied

Complication	M.D.'s N=58	Midwives N=78	Stat. Sign.
1st Stage Complications			
No prenatal care			
Dehydration→IV Hydration	1	0	NS
severe toxemia→Cesarean	0	1	NS
Prolonged rupture of membranes→induction	0	4	p 0.01
Dystocia 1st stage (excluding CPD)			
Uterine Inertia→Oxytocin	7	19	p 0.002
Labor Prolongation with↓ FHT→ internal monitor & oxytocin	1	0	NS
Arrest of Dilation.			
Involving↓ FHT and uterine inertia→int. monitor & oxytocin	1	0	NS
Brow presentation→oxytocin & low forceps	1	0	NS
Arrest & Uterine Inertia→oxytocin, low forceps	0	2	NS
Arrest→CPD, Cesarean	10	7	NS
Arrest→FHT nuchal cord x4 Cesarean	1	0	NS
Hypertension, Rx'ed with mag. sulfate	1	0	NS
untreated	5	0	NS
Bleeding during labor→no treatment	1	0	NS
Amnionitis→antibiotics	1	0	NS
Fear, desire for hospital	2	6	p 0.05
Desire for anesthesia			
Anesthesia given	3	0	NS
Analgesia only	1	0	NS
Hyperemesis→IV's and compazine	1	0	NS
Dropping FHT's			
No therapy, monitor applied	0	4	p 0.001
Cesarean section	0	1	NS
Cord prolapse→Cesarean	0	1	NS
with meconium→intubation	0	3	p 0.025
Psychotic Reaction to Labor Cesarean	0	1	NS

Midwife Services Functioning Independently of Physicians

Complication	Primigravidae N=729				Multigravidae N=417				Totals N=1146			
	MD's N=464		Midwives N=265		MD's N=221		Midwives N=196		MD's N=685		Midwives N=461	
	Home[2]	Hosp[3]	Home	Hosp	Home	Hosp	Home	Hosp	Home	Hosp	Home	Hosp
Intrapartum												
Hypertension	1	6	2	0	0	0	0	0	1	6	2	0
Dystocia 1st stage	25	16	2	18	2	4	0	8	27	20	2	26
Dystocia 2nd stage[7]	9	8	1	6	4	3	0	6	13	11	1	12
3rd stage oxytocin	115	43a	1	7a[x]	38	35a	2	4a[x]	153	78a	3	11a[x]
Meconium staining totals	19	2	4	2a	7	0	4	1a	26	1	8	3a
Meconium $\bar{c}$↑ BP	0	2a	0	0	0	0	0	0	0	2	0	0
Meconium stain with FHT irreg. or↓	2a	3a	0	0	2	0	0	1	5	3	0	1
Precipitous labor	1	0	0	0	7	0	0	0[y]	8	0	0	0[y]
CPD	0	4	0	9	0	1	0	0	0	14	0	9
Poly/oligohydramnios	0	2	0	1	0	1	0	0	0	3	0	1
Brow presentation	1	1	0	1	0	0	0	0	1	1	0	1
Placenta previa	0	1	0	0	0	0	0	0	0	1	0	0
Partial abruption	0	1	0	0	0	0	0	0	0	1	0	0
Shoulder dystocia	1	0	0	1	0	0	1	0	1	0	1	1
FHT irreg/↓ $\bar{s}$ mec.	2	5	1	6	1	1	0	2	3	5	1	3
Postpartum												
Excessive PP bleed[4]	9	1a	2	1a	10	2a	4	2a	16	3a	6	3a
PP Hemorrhage[4]	1	0	0	3	3	0	0	2	3	1	0	1
Retained Placenta	8	2	2	2	4	2	0	2	12	2	2	2
PP Depression	0	2a	0	2a	0	1	0	0	0	0	0	2a
Endometritis	6	1a	3	1	2	1a	1	0	8	2a	4	1
Thrombophlebitis	0	0	0	1	0	0	0	0	0	0	0	1

[1]calculated on home + to hospital totals [2] complication managed at home [3] complication managed at hospital [4]see Table 5A for definition [5] 24-48 hours after delivery [6] after third postpartum day [7] excluding abnormal presentation a already at hospital for another reason

STATISTICAL SIGNIFICANCE[1]: x=$p < 0.001$ y=$p < 0.025$ all others = not significant

	M.D.'s N=58	Midwives N=78	Stat. Sign.[b]
2nd Stage Complications			
Protracted descent			
Rx'ed with low forceps (1 FHT↓)	4	2	NS
Rx'ed with mid forceps with FHT↓	2	1	NS
Rx'ed with oxytocin	5	9	NS
Arrest			
CPD, Cesarean Section	4	2	NS
Abnormal Presentation, mid forceps	1	1	NS
Brow presentation, low forceps	0	1	NS
Deopping FHT's			
Low forceps	1	0	NS
With meconium→oxytocin, intubation	0	2	NS
mid forceps	1	0	NS
Bleeding→oxytocin	0	1	NS
3rd Stage Complications			
Retained placenta→manual removal	2	5	$p<0.05$
Hemorrhage→oxytocin, meth., blood	1	4	$p<0.025$
Cervical laceration→suturing	0	1	NS

a sums of complications
b based on total N's (685 and 461, respectively)

Senator Charlie Parr
HESS Committee
Pouch V
Juneau, Alaska
99811

March 22, 1982

Senator Charlie Parr and all other Legislators

Sir:

I am in support of SB 747 "An Act Related to Midwifery". I feel that pregnancy and childbirth is a natural physiological process and, in as much, a state of wellness rather than disease. For that reason, I feel that safe birthing alternatives such as midwifery within birthing center and home deliveries be offered as options as well as the hospital settings.

I urge you and other legislators to support passage of this bill, so families might exercise their freedom of choice in matters relating to safe, healthy childbirth.

Sincerely,

Leo + Carolyn Evans

Note:

Gentlemen:

I, Carolyn Evans, am a Childbirth Educator in Sitka + feel very strongly that HB 747 must + should be passed legalizing midwives in Alaska. We are a rural + isolated area, + we need choices + alternatives for our

(over)

mothers + couples when it comes to their childbirth!

Please vote in favor of this bill!!

Thank you,

C Evans

Box 902

Sitka, AK

99835

March 16, 1982

747

Charles Parr
HESS
And all State Legislators
Juneau, Alaska.

Dear Sir,

I am writing you concerning Senate Bill 747, concerning Home Birth. I have had a home birth myself and support Sen Frasers Bill. Homebirth needs control but also it needs to be a viable alternative for those parents that want it. We need to make Home birth safer not stop it. In reality, Parents will choose home birth whether this bill is passed or not, but this bill does attempt

to make this Alternative safer for everyone.

Thankyou for your time, and hopefully your support.

Sincerely,

Marylynne C. Maryanna
SRA Box 23961
Anchorage, Alaska 99507.

747

Dear Senator Parr.

Please support senate Bill 747 an act relating to midwifery.

it should be within the Parents constitutional Rights to be able to have birthing with whome and where they want.

USA is a Free-country.

We are going to have a baby this fall and will not have it in the hospital with sick people.

Professionals are not interested to come and birth at our home,

and we are comfortable with an certain Lay midwife and are going to have birthing with her.

Do not make us criminals because of that. it is Our Right as a parents to have our children with whome we are comfortable and we wish you would vote yes on Bill 747 for Our sake and for the sake of so many others.

Thank You for your support.

Mrs J. Weis. 976 Homer Ak 99603

Dear Senator Charlie Parr, Legislator Brian Rogers and all other Legislators,

I am writing this letter in support of Senate Bill 747. Having the choice of where I have my children is very important to me, actually two of the most important decisions of my life came down to the fact I didn't want to give birth in a hospital. Both of my babies were born at home. My first was born at the midwives home, and my second was born in my own bed. Both times I felt very secure and safe. It is also very important who women give birth with and deserve the choice. Women needs lots of love, encourgment and understanding during birth, lay midwives have the time to be continuously with the woman doing her job.

Please don't misunderstand me I am not against doctors and hospitals we all know we have to have them but birth is not a sickeness and need not be done in the hospital every time. Statics show that there is less mortality and morbitity with home births than with hospital births

Please support this Bill as it is a very good one and I would like to see the day when midwives will be accepted as true and gifted people dedicated to their work.

Thank You very much,

Nanette Woodman
SR BOX 505B
FBX AK 99712

STATISTICAL OUTCOMES OF HOMEBIRTHS IN THE U.S.: CURRENT STATUS

Lewis E. Mehl, MD*

We began our studies on the statistical outcomes of home deliveries because of the tremendous rise in the number of home deliveris occurring across the country and the lack of any available data on their outcomes. We had hoped to provide data which parents and professionals could use on their individual scales of relative value along with the experiential data on emotional outcomes as they weighed the risks and benefits to determine what kind of delivery they would choose.

First, I will report the statistical outcomes of 1146 planned homebirths in the San Francisco Bay Area and then I will compare this to 180 similiarly selected hospital deliveries performed by one of the same groups of physicians. This is part of some ongoing work in which we are attempting to accumulate a matched hospital series with which to compare the home delivery statistics.

Our sources of data (Mehl, et al.,1976)[1] were the medical charts from five home delivery services in northern California. The five services included 3 physician groups and 2 lay midwife groups as follows:

(1) A rural-based family practice in Western Marin County (Point Reyes) composed of 3 family physicians and 3 registered nurses, performing both home and hospital deliveries since 1970 as part of a comprehensive family practice.
(2) An urban-based family practice in Mill Valley composed of 2 physicians and 2 registered nurses--one a maternity nurse practitioner--in practice since 1973.
(3) An urban-based group in Berkeley consisting of 1 physician (whose training had been in pediatrics/neonatology) and 2 registered nurses, affiliated with a women's health cooperative in Berkeley. This group did not have hospital privileges and performed only home deliveries, referring women requiring hospital care to local obstetricians. They had been functioning since early 1974.
(4) 10 lay midwives from Santa Cruz County, functioning in both urban and rural settings without immediate medical supervision, and with limited medical backup, performing births since 1971.
(5) A rural lay midwife (Nancy Mills) from Sonoma County with good physician backup, performing births since 1970.

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* *LEWIS E. MEHL is on the faculty of the University of Wisconsin, Center for Health Sciences, Department of Family Practice and Psychiatry, and is Coauthor of "The Homebirth Trend," "Management of Complications of Home Delivery," and other works.*

In the latter service, records had been kept only for the last 1/1 of her estimated 500 deliveries during a five year time span. All records until April 1975 were reviewed by one of us (LEM). They were adequately detailed regarding prenatal care, intrapartum and post partum events, and infant and maternal follow-up. The groups represented the following percentages of the total sample:

(1) The Point Reyes physician group:	40.4%
(2) The Hill Valley physician group:	11.2%
(3) The Berkeley physician group:	7.6%
(4) The Santa Cruz County midwives group:	30.8%
(5) The Sonoma County midwife:	10.0%

The lay midwife from Sonoma County (Nancy Hills) began her midwifery activities accidentally, visiting a friend in labor. Others learned she had attended a birth and asked her to their deliveries, until she eventually developed a reputation as a midwife (See the Chapter by Nancy Hills later in this book for more details on her midwifery experience). Her training was self-acquired through reading and experience. The Santa Cruz midwives began functioning in much the same fashion, becoming midwives to meet an experienced need in the community, and educating themselves through discussion groups, experience, and reading. Their average fee per birth was $35.00, so that their motivation was clearly not monetary. Typically, they were women who had had an unattended homebirth and had decided to help other women avoid their predicament. The Sonoma County midwife had good medical backup through physicians (mainly family practice residents) at the Community Hospital of Santa Rosa, who, while unwilling to attend home deliveries, were willing to discuss problems over the telephone and handle complicated deliveries in the hospital. The Santa Cruz group had poor medical backup, and were not able to obtain telephone consultation. They were often heavily criticized and condemned when bringing women to the hospital who needed hospital care, and had few supportive physicians to whom they could refer women with complications. Labors in the Sonoma area were occasionally as far as one hour from a hospital, although the usual distance was approximately 15 minutes. Labors in the Santa Cruz area were occasionally as far as 45 minutes from a hospital, but usually ranged from 5 to 15 minutes. Transport facilities for both lay midwife groups consisted of the midwife's car without any specialized support equipment. Equipment present at deliveries with the lay midwives was also minimal and typically consisted of a bulb syringe, sterile gauze, sterile gloves, a fetoscope, blood pressure cuff, urine dipsticks for testing acetones, glucose, and protein, a portable scale, and little else. Their mode of operation has been described by Larg.[10]

The physician services brought a home delivery kit with them to births. Typically the nurse would attend the labor from its inception and the physician would arrive during the second stage for primigravidae and late first stage for multigravidae. The physician kit included IV equipment, oxytocin and methergine for use after delivery, other emergency drugs, forceps to use if necessary, as well as suture supplies. (However, there was no intravenous oxytocin or forceps used at home in this series.) The only equipment or drugs not present in their kit and usually present in the hospital was whole blood. A

complete list of supplies is available on request (see addresses of authors tabulated at end of book). The transport vehicle for the physician groups was also the car belonging to the birth attendant. For the Point Reyes group, the closest hospital was 20 miles. For the Berkeley and Hill Valley groups the distance from a hospital was usually 5-10 minutes.

Prenatal care was essentially the same for all groups and did not deviate from the standards recommended by the American College of Obstetrics and Gynecology with regard to visit frequency, laboratory tests, and clinical assessment. The lay midwife groups required a minimum of two visits to a physician at which time clinical pelvimetry, Rh status, blood type, rubella titre, hemoglobin, hematocrit, VDRL and gonorrhea culture were determined. Nutrition, the avoidance of prenatal medication, and the psycho-social aspects of pregnancy were stressed more than is typically done in prenatal care, and visits usually lasted 20-30 minutes for the physician groups involving discussions with the nurse and then the doctor. For the lay midwife group, the visits were typically 30-60 minutes. Three women had no prenatal care, and first presented themselves in labor.

There was no limiting of weight gain. It was felt that every woman should gain at least 20-30 lbs. during pregnancy and the average weight gain was in the 30-35 lb range. Women with chronic medical disease were encouraged to seek a hospital, as were women who remained anemic. The threat of a hospital birth usually increased patient compliance with iron-containing preparations and, as a result, the number of women delivering at home with hemoglobins of less than 11.0 gm% was minimal (less than 12).

Intrapartum care was essentially similar among the groups as well. The lay midwife groups did not perform breech or twin deliveries at home. The physician groups did, on occasion, although only after explaining the problems inherent in such deliveries. After 1973 the usual policy was to recommend Cesarean section to women with low breech scores (Zatuchni-Andros breech score) and to attend women with breech scores indicating safe vaginal delivery at home if the woman so desired and requested. (Since the completion of this study, the lay midwives have begun attending some breech deliveries at home because of parents' dissatisfaction with the rising incidence of Cesarean section in the breech presentation.)

Labor prolongation, of itself, was not treated as a complication requiring hospitalization. Uterine inertia was initially often treated with buccal oxytocin by the physician group at home, and if results were not forthcoming, the woman was transported to the hospital for IV oxytocin. Prolongation of the second stage of labor was also not treated as a complication; indeed, most of the practitioners felt that a slower second stage with little pushing by the mother (often 2-3 hours) was *preferable* to a shorter second stage (less than 2 hours) characterized by an intense pushing effort by the mother. Cases of second stage arrest, however, if not responsive to buccal oxytocin over a 1-2 hour period, were transported to the hospital for forceps delivery. The midwives were unable to administer oxytocin and, consequently, sent more of their patients to the hospital for dystocia.

LAY MIDWIVES HAVE BEGUN ATTENDING SOME BREECH DELIVERIES AT HOME BECAUSE OF PARENTS' DISSATISFACTION WITH THE RISING INCIDENCE OF CESAREAN SECTION IN THE BREECH PRESENTATION.

Both groups monitored the fetal heart rate closely throughout the first and second stage, using a fetal stethoscope or Doppler ultrasound fetoscope, and felt that any significant drop in heart rate requiring intervention would be noticed. Blood pressures were checked approximately every 1-2 hours during labor. Fetal heart tones were checked as often as after every contraction during second stage if some variability had been noted or if the mother were pushing particularly hard, but usually were taken every 15 minutes during second stage and every 25-40 minutes during first stage, depending on the character of the labor and the fetal heart rate pattern. The fetal heart was occasionally listened to through a contraction and for some time afterwards to determine the presence of any abnormal pattern.

Meconium staining without fetal heart rate irregularities was not treated. (Meconium staining with fetal heart rate irregularities was cause for hospitalization, and the infants, with one exception, were treated with intubation and lavage.) Prolonged rupture of membranes in a term sized infant was followed, but not treated unless necessary. It was felt that if the mother did not show signs of amnionitis and had a good socioeconomic/nutrition background, that intervention was not necessary within 24 hours. If labor had not begun by 24 hours, induction in the hospital was usually undertaken.

The midwives practiced perineal massage to prevent tearing, while the physicians typically did not. This was optimally done by the mother and father for the month prior to delivery and was done by the midwife during the last half of the second stage. This was not done consistently by all parents or all midwives, but it was felt by the midwives that it helped prevent lacerations during delivery.

Forceps deliveries were not conducted at home, and no analgesia or anesthesia was administered at home. If the latter was desired, hospital transport was necessary for the woman to receive it.

The room in which the delivery occurred was kept warm and the baby was given to the mother immediately after delivery to hold and nurse, with blankets being placed around the infant to prevent heat loss. The umbilical cord was not clamped until it ceased pulsating except in Rh negative mothers, in whom it was clamped immediately after delivery. RhoGam was given to the Rh negative mothers within 48 hours. Silver nitrate was not applied routinely to the infants' eyes unless there had been a past history of gonorrhea, or one or both parents were unsure of the other. Most of the infants were fed only by breast without glucose or formula supplementation, and were fed ad lib.

Home visits were usually made each day for the first three postpartum days, and telephone contact was maintained with the couple. The infants were seen by the physicians at one week in their offices and again at four weeks. After that point, the recommendations for well

child care of the American Academy of Pediatrics were observed. Midwives referred infants for newborn care after the first week to pediatricians or family physicians, and continued to follow the infants themselves for varying periods of time. All mothers had a postpartum examination from 4-6 weeks by a physician, and for the lay midwives, results of this examination were recorded in their records.

STUDY POPULATION

Hazell[8] has described the demographic characteristics of the homebirth population in the San Francisco Bay Area in a study of 300 home deliveries from the socioanthropological standpoint. Her subjects overlapped to some extent with our sample and were derived from the same subject pool--San Francisco Bay Area couples planning homebirth.

TABLE 1
'HOME DELIVERY STUDY POPULATION

Contacted Home Delivery Service	1,348	100.0%
Screened Out, Medical Dx	55	4.1%
Decided Against	147	10.9%
Attempted Home Delivery	1,146	85.0%
Physicians	685	59.8%
Midwives	461	40.2%
Taken to Hospital	136	11.9%
Physicians	58*	5.1%
Midwives	78*	6.8%
Completed Home Delivery	1,010	74.9%

* Patients hospitalized represented 8.5% of physicians' cases, 16.9% of midwives' cases.

In Hazell's study, 90% lived in typical American fashion, with the father gainfully employed, in a single family dwelling with one or two cars, were not members of an ethnic minority, not on welfare, and without household servants. A general characteristic of the group was described as a self awareness shown in a concern for nutrition, health foods, ecology, humanistic psychology, and a strong feeling for a natural birth process. Typically, the mother and father had both attended college, but neither had graduated. The fathers' occupations were noted to vary through the range of occupations present in the Bay Area, from auto mechanic to physician to homesteader. Only one tenth were classified as "hip," in rebellion to "normal American Values," living in a variety of alternative styles.

In our study, patients of the lay midwives tended to belong more to the counter-culture than Hazell's population. In the physician groups, more professional couples were included. A detailed socioeconomic study on one of the lay midwife groups (the Sonoma County sample) is currently being coordinated by one of us (VEH), and a psychological/developmental outcome study on a subsample of the Santa Cruz group is being analyzed by two of us (LEM and CHP).

Table 1 (p. 77) presents statistics on the selection of the study population. Only 4% of those women who requested a home delivery were screened out for medical reasons (including premature labor, toxemia, and underlying systemic disease). This low percentage would seem to indicate that women seeking home deliveries are a self-selected healthy group, probably knowledgeable about childbirth, and the importance of nutrition in pregnancy. Nine women with previous fetal deaths were included in the homebirth sample. Previous obstetrical complications (with the exception of Cesarean section) were not used as screening criteria, since it was felt that these were, to some extent, iatrogenic.

11% of the women who considered home delivery decided against it for non-medical reasons. This was highest in the lay midwife groups and may have been related to a hesitation to deliver without physician backup. In the physician-directed services, a common reason cited for switching to a hospital birth was that Medicaid would cover only hospital deliveries.

TABLE 2
CHARACTERISTICS OF MOTHERS

	Number	Percent	Calif 1973
Mother's Age:	1,146	100.0%	100.0%
< 20	60	5.2	17.3
20-34	1,068	93.2	77.6
≥ 35	18	1.6	5.1
Parity:	1,146	100.0%	100.0%
para 0	729	63.6	43.3
para 1	237	20.7	31.0
para 2	128	11.2	13.3
para 3	34	3.0	6.0
para ≥ 4	18	1.6	6.3
Prenatal Care Began*	1,146	100.0%	100.0%
1st trimester	707	61.7	72.8
2nd trimester	362	31.6	20.2
3rd trimester	74	6.5	4.5
none	3	0.3	2.4

*Includes prenatal care unknown

Of the 1,146 women beginning labor at home with the intention of delivering there, 136 (11.9%) were sent to the hospital to complete their delivery for treatment of intrapartum (11%) or postpartum (0.9%) problems. 88% of the deliveries begun at home were completed there. Thus, of the initial set of women contacting the home delivery services, 75% successfully delivered at home.

Four surviving infants required hospitalization for other than phototherapy within 3 days of delivery; a fifth was born very prematurely in the hospital, and remained there for one month.

Table 2 (p. 78) presents characteristics of the mothers and compares them to California statistics for 1973.[14] Over 90% were in the optimal childbearing age of 20-34 years, the average being 24.9 years. There was a high number (64%) of primigravidae in this series, and a incidence of grand multiparity of less than 1%. Virtually all of the women were trained in childbirth classes such as Bradley or Lamaze. 1145 women attempted breastfeeding (i.e., all but 1 of the series of 1146 total) and at 6 months of age 1138 were successful (i.e., 99.4%). These women tended to begin prenatal care later than the California 1973 sample, perhaps because they felt more knowledgeable and therefore, less of a need.

TABLE 3
CHARACTERISTICS OF PRESENTATION & DELIVERY

Presentation:	1,146	100.0%
Vertex	1,125	98.2%
Brow	(3)	(0.3%)
Shoulder	(3)	(0.3%)
Breech	21	1.8%
Delivery:	1,146	100.0%
Cesarean	28	2.4%
Vaginal	1,118	97.6%
Analgesia only	(14)	(1.2%)
Anesthesia only	(3)	(0.3%)
Both	(6)	(0.5%)
None	(1,095)	(95.5%)
Oxytocin:		
1st & 2nd Stage Labor	85	7.4%
3rd Stage Labor	235	20.5%
Forceps:		
Low Forceps	11	1.0%
Mid Forceps	6	0.5%
Perineal lesions:		
Lacerations Requiring Repair	148	12.9%
Episiotomies	89	7.8%

Table 3 (above) presents statistics on the presentations and deliveries. Most of the deliveries were vertex presentations (98. Of the 21 breech presentations (1.8%) 10 delivered successfully, b choice, at home, while 11 were taken to the hospital. The latter were all unexpected and with lay midwives.

1% of the women studied had low forceps deliveries, 0.5% had mid forceps deliveries, and 2.4% were delivered by primary Cesare section. The California Cesarean section rate was 9.9% in 1973. as the Mayo Clinic[1] found, half of the Cesarean sections are repe then California's primary section rate would approximate 5% (or a bia) the rate of this study.

OF THE 1,146 HOMEBIRTHS OF THIS STUDY, ONLY 8% HAD EPISIOTOMIES AND ONLY ANOTHER 13% HAD TEARS IN NEED OF REPAIR; THE LOWEST INCIDENCE OF TEARING WAS AMONG LAY MIDWIVES, ONLY 5%, WHILE IT WAS 40% AMONG THE HOMEBIRTHS ATTENDED BY PHYSICIANS.

Lacerations requiring repair were lowest (4.4% and 5.7%) in the lay midwife groups and highest (40.2%) in the physician group with the shortest experience in performing home deliveries without episiotomies. Similarly, episiotomies were much lower for the lay midwife groups than for the physician groups.

TABLE 4
INDICATIONS FOR THE 45 C-SECTIONS & FORCEPS DELIVERIES IN THE 1,146 WOMEN BEGINNING LABOR AT HOME

LOW FORCEPS DELIVERY	
Protracted descent	5
Arrest of descent	2
Dysfunctional labor	—
Brow presentation with arrest of descent	—
Fetal heart drop	—
	7
MID FORCEPS DELIVERY	
Protracted descent	3
Arrest of descent	—
Dysfunctional labor	1
Fetal heart drop, occiput posterior (OP) presentation	—
	4
C-SECTIONS	
Cephalopelvic disproportion (CPD)	16
Failure to descend, OP presentation, relative CPD	6
Arrest of active dilation, fetal heart drop, cord 4x neck	—
Prolapsed cord	—
Breech with amnionitis	—
Psychotic reaction to labor	—
Acutely dropping fetal heart tones	—
Toxemia	—
	28

Analgesia and/or anesthesia were used in only 2% of the vaginal deliveries. During the first and second stage of labor, 38 women (or 3.3%) received buccal oxytocin at home, while 47 women (or 4.1%) received IV oxytocin in the hospital. Following completion of the third stage of labor, 146 mothers received oxytocics at home (given entirely by the physician group), 89 in the hospital. The mean length of first stage was 10.2 hours for primigravidae and 4.6 hours for multigravidae; second stage means were 118 and 45 minutes respectively. Table 4 (above) presents the indications for forceps deliveries and Cesarean sections in the women beginning labor at home. There were 23 C-sections for cephalopelvic disproportion, 1 for fetal distress, 1 for toxemia, 1 for amnionitis, and 1 for psychotic reaction to labor.

TABLE 5
COMPLICATIONS OF LABOR & DELIVERY
(INDIVIDUAL WOMEN MAY BE LISTED UNDER MORE THAN 1 COMPLICATION)

Complication	PRIMIGRAVIDAE (N=135/729-18.5%) Home	Hosp	Total	Percent[1]	MULTIGRAVIDAE (N=78/417-18.7%) Home	Hosp	Total	Percent[1]
Intrapartum								
Dystocia[2] 1st stage	27	34	61	8.4%	2	12	14	3.4%
Dystocia 2nd stage	10	14	24	3.3	4	9	13	3.1
CPD	0	23	23	3.2	11	1	12	2.9
Meconium stain, only	24	3	27	3.7	3	4	7	1.7
FHTs (2,3 meconium)	6	13	19	2.6	7	0	7	1.7
Hypertension	3	6	9	1.2	1	2	3	0.7
Brow presentation	1	2	3	0.4				
Shoulder dystocia	1	1	2	0.3				
Polyhydramnios	0	2	2	0.3				
Other[4]	1	10	11	1.5				
TOTALS	73	108	181		28	28	56	
Postpartum								
Hemorrhage[3]	1	3	4	0.5%	4	1	5	1.2%
Excessive PP Bleeding[3]	11	7	18	2.5	5	4	13	3.1
Retained Placenta	10	4	14	1.9	4	4	8	1.9
Endometritis	9	2	11	1.5	3	1	4	1.0
PP Depression	0	4	4	0.5	0	1	1	0.2
TOTALS	31	20	51		20	11	31	

4 single cases of oligohydramnios, amnionitis, toxemia, prolapsed cord, thrombophlebitis, placenta previa, placenta abruptio, dehydration, urinary tract infection, 2nd trimester bleeding, and precipitous labor.

4 single cases of cephalopelvic disproportion (CPD), shoulder dystocia, oligohydramnios.

1 Percent complications per 723 primigravidae, 417 multigravidae.
2 Dystocia is defined here as: prolonged or arrested 1st stage, failure to dilate, prolonged or arrested 2nd stage, failure to descend. (As per Greenhill & Friedman)

TABLE 7
REASONS FOR TRANSPORTATION TO THE HOSPITAL & THERAPY APPLIED

COMPLICATION & THERAPY	M.D.'s N=58*	Midwives N=78*	Stat. Sign.†
1st Stage Complications			
No prenatal care			
Dehydration→IV Hydration	1	0	NS
Severe Toxemia→Cesarean	0	1	NS
Prolonged rupture of membranes→Induction	0	4	p 0.01
Dystocia 1st stage (excluding CPD)			
Uterine inertia Oxytocin	7	19	p 0.001
Labor prolongation with FHT→ Internal monitor & Oxytocin	1	0	NS
Arrest of Dilation involving FHT & uterine inertia→ Internal monitor & oxytocin	1	0	NS
Brow presentation→Oxytocin & low forceps	1	0	NS
Arrest & Uterine Inertia→Oxytocin & low forceps	0	2	NS
Arrest→CPD, Cesarean	10	7	NS
Arrest→FHT, nuchal cord x4, C-sec	1	0	NS
Hypertension→			
Rx'ed with magnesium sulfate	1	0	NS
Untreated	5	0	NS
Bleeding during labor→No treatment	1	0	NS
Amnionitis→Antibiotics	1	0	NS
Fear, Desire for hospital	2	6	p 0.05
Desire for anesthesia→			
Anesthesia given	3	0	NS
Analgesia only	1	0	NS
Hyperemesis→IV's and compazine	1	0	NS
Dropping FHT's			
No therapy, monitor applied	0	4	p 0.001
Cesarean section	0	1	NS
Cord prolapse→Cesarean	0	1	NS
With meconium→Intubation	0	3	p 0.025
Psychotic reaction to labor→Cesarean	0	1	NS

* sums of complications
† based on total N's (685 & 461 respectively)

TABLE 7 CONT'D
REASONS FOR TRANSPORTATION TO THE HOSPITAL & THERAPY APPLIED

COMPLICATION & THERAPY	M.D.'s N=58*	Midwives N=78*	Stat. Sign.†
2nd Stage Complications			
Protracted descent→			
Rx'ed with low forceps (1 FHT↓)	4	2	NS
Rx'ed with mid forceps with FHT↓	2	1	NS
Rx'ed with oxytocin	5	9	NS
Arrest			
CPD→Cesarean section	4	2	NS
Abnormal presentation→Mid forceps	1	1	NS
Brow presentation→Low forceps	0	1	NS
Dropping FHT's			
Low forceps	1	0	NS
With meconium→Oxytocin, intubation	0	2	NS
Mid forceps	1	0	NS
Bleeding→Oxytocin	0	1	NS
3rd Stage Complications			
Retained placenta→Manual removal	2	5	p<0.05
Hemorrhage→Oxytocin, methergine, blood	1	4	p<0.025
Cervical laceration→Suturing	0	1	NS

* sums of complications
† based on total N's (685 & 461 respectively)

PERINATAL OUTCOME

Six sets of twins were successfully delivered at home, bringing the total number of births to 1,152. There was no maternal mortality or residual morbidity. Infant morbidity is summarized in Table 8 (p. 86).

Fifteen infants, including two sets of twins, weighed less than 2501 grams at birth. Eleven of these were over 2250 grams. Fourteen of the low birthweight infants were born at home.

One 1332 gram infant was born in the hospital following second trimester bleeding and remained there for a month. Two of the smaller babies weighing 1700 and 2200 grams were admitted to the hospital with mild respiratory distress syndrome. All the low birth weight babies survived without other postnatal complications than those mentioned above.

TABLE 11
CHARACTERISTICS OF MOTHERS

	Home Number	Home Percent	Hosp Number	Hosp Percent	Calif. 1973	Stat. Sign.
Mother's Age	1146*	100.0%	180	100.0%	100.0%	NS
<20	60	5.2	12	6.7	17.3	NS
20-34	1068	93.2	160	89.9	77.6	NS
>35	18	1.6	6	3.4	5.1	NS
Parity	1146	100.0%	180	100.0%	100.0%	
para 0	729	63.6	133	73.9	43.3	p<.005
para 1	237	20.7	33	18.3	31.0	NS
para 2	129	11.2	9	5.0	13.3	p<.025
para 3	34	3.0	2	1.1	6.0	NS
para 4	18	1.6	1	0.6	6.3	NS
Prenti Care Began	1146	100.0%	180	100.0%	100.0%	
1st Trimester	707	61.7	114	64.0	72.8	NS
2nd Trimester	362	31.6	63	35.4	20.2	NS
3rd Trimester	74	6.5	1	0.6	4.5	**
None	3	0.3	0	0.0	2.4†	NS

* For home group: Mean age=24.9, Range=16-44, Variance=16.8, SD=4.1
† Includes prenatal care unknown.

Virtually all of the women in the planned hospital group were trained in childbirth classes (as were the home group) such as Bradley or Lamaze. A high incidence of breastfeeding also characterized the planned hospital group. All women in the planned hospital group attempted breastfeeding except for one. For a variety of reasons, two of these women were not successful.

RESULTS

Statistics on the presentations and deliveries are compared in Table 12 (p. 91). The planned hospital group contained more breech infants, had more Cesarean deliveries, had more analgesia, received more oxytocin during first, second, and after third stage labor, and had more low and mid forceps deliveries and episiotomies. It is important to note that their attendants had the same philosophies as the home delivery attendants, so that these differences come as a result of being in the hospital and may relate to a lower motivation for the women to have natural childbirth or to a more readily available analgesia or to a feeling of pressure transmitted to the birth attendents to intervene sooner and more aggressively in the hospital than in the home. These may all be related to the subtle effects of "atmosphere" which are, as yet, difficult to measure. The indications given for forceps and Cesarean deliveries are compared in Table 13 (p. 92). The planned hospital group had more Cesarean sections, primarily related to CPD and have more low forceps deliveries, significantly more because of a falling fetal heart rate.

TABLE 12
CHARACTERISTICS OF PRESENTATION & DELIVERY

	Home Number	Home Percent	Hosp Number	Hosp Percent	Statis. Signif.
Presentation	1146	100.0%	178	100.0%	
Vertex	1125	98.2	167	93.8	p<0.009
Brow	3	(0.3)	0	0.0	**
Shoulder	3	(0.3)	1	0.6	**
Breech	21	1.8	9	5.1	p<0.010
Delivery	1146	100.0%	178	100.0%	
Cesarean	28	2.4	10	5.6	p<0.025
Vaginal	1118	97.6	168	94.4	p<0.025
Analgesia only	14	(1.2)	9	(5.0)	p<0.025
Anesthesia only	3	(0.3)	3	(1.7)	**
Both	6	(0.5)	1	(0.6)	**
None	1095	(95.5)	154	(86.5)	p<0.001
Oxytocin					
1st & 2nd stage	85	7.4	29	15.3	p<0.001
3rd stage labor	235	20.5	54	30.3	p<0.005
Forceps					
Low forceps	11	1.0	7	3.9	p<0.001
Mid forceps	6	0.5	2	1.1	p<0.001
Perineal Lesions					
Lacerations req. repair	148	12.9	26	15.6	NS
Episiotomies	89	7.8	42	25.1	p<0.001

Table 14 (p. 93) presents the comparison complication figures for the planned hospital population, and compares these results with those obtained by the population delivering at home. The planned hospital group showed significantly more second stage labor dystocia ($p<0.025$), more drops of the fetal heart rate ($p<0.005$), more postpartum hemorrhage ($p<0.001$) and less "excessive bleeding" (defined as less than 650 cc's but more than the attendant is comfortable with) postpartum ($p<0.001$). The planned hospital population had significantly more forceps deliveries ($p<0.001$), episiotomies ($p<0.001$), Cesarean sections ($p<0.025$), and analgesia ($p<0.001$), and significantly less total unmedicated deliveries ($p<0.001$)

RELATIVE PERINATAL OUTCOME

Table 15 (p. 94) compares the perinatal outcome data. The neonatal mortality and perinatal mortality results were not significantly different between the planned hospital group and the home delivery group, nor was the rate of low birthweight infants, or the mean length of infant follow-up. The hospital neonatal death rate was 5.5 per 1000 with 11.1 perinatal deaths per 1000.

TABLE 13
INDICATIONS FOR C-SECTIONS AND FORCEPS DELIVERIES
IN WOMEN BEGINNING LABOR AT HOME

	Home Number	Hosp Number
Low Forceps Delivery		
Protracted descent	6	0
Arrest of descent	2	3
Dysfunctional labor	1	0
Brow presentation with arrest of descent	1	0
Fetal heart drop	1	3
Bleeding during 2nd stage	0	1
	11	7
Mid Forceps Delivery		
Protracted descent	3	0
Arrest of descent	1	1
Dysfunctional labor	1	0
Fetal heart drop, occiput posterior (OP) pres.	1	0
FHT+, amnionitis, maternal hypertension	0	1
	6	2
C-Sections		
Cephalopelvic disproportion (CPD)	16	7
Failure to descent, OP presentation, rel. CPD	6	0
Arrest of active dilation, FHT+, cord 4x neck	1	0
Prolapsed cord	1	(1)
Breech with amnionitis	1	0
Psychotic reaction to labor	1	0
Acutely dropping fetal heart tones	1	0
Toxemia	1	0
Breech with low breech score, poor labor progress	0	1
Transverse lie with one prolapsed cord	(1)	1
	28	10

TABLE 14
COMPLICATIONS OF LABOR & DELIVERY (HOSPITAL GROUP)
(INDIVIDUAL WOMEN MAY BE LISTED UNDER MORE THAN 1 COMPLICATION)

Complication	PRIMIGRAVIDAE (N=522/133=39.1%) Hosp	Percent	Statis. Sign.1*	Complication	MULTIGRAVIDAE (N=1045/422=22.2%) Hosp	Percent	Statis. Sign.1*
Intrapartum				**Intrapartum**			
Dystocia[2] 1st stage	15	11.3	NS	Dystocia[2] 1st stage	2	14.4	NS
Dystocia 2nd stage	10	7.5	p<0.025	Dystocia 2nd stage	1	2.2	NS
CPD	7	5.3	NS --	CPD with breech	1	2.2	--
Meconium stain only	4	3.0	NS	Precipitous labor	2	4.4	NS
FHT+(c.s. meconium)	10	7.5	p<0.005	FHT+	1	2.2	--
Hypertension	2	1.5	NS	Hypertension	1	2.2	NS
Precipitour labor	2	1.5	NS	Transverse lie	1	2.2	--
Other[3]	6	4.5	--	TOTAL	9		
TOTAL	56						
Postpartum				**Postpartum**			
Hemorrhage[3]	5	3.8	p<0.001	Hemorrhage[3]	0		NS
Excessive PP bleeding[3]	2	1.5	p<0.001	Excessive PP bleeding[3]	1	2.2	NS
Retained placenta	2	1.5	NS	Retained placenta	1	2.2	NS
Endometritis	3	2.3	NS	Endometritis	1	2.2	NS
PP Depression	1	0.8	NS	TOTAL	3		
TOTAL	13						

* Single cases of amnionitis, shoulder presentation, cord prolapse, cord knots, recurrent pyelonephritis, transverse lie.

Compared with Table 5 on page 81.

1 Rate of complications in 133 primigravidae, 42 multigravidae.

2 Dystocia as used in this table is defined as prolonged labor associated with [illegible]

TABLE 15
COMPARATIVE PERINATAL OUTCOME

	Home Number	Home Rate	Hosp Number	Hosp Rate	Calif. 1973	Stat. Sign.
Total Births	1152^		180†			
Live Births	1147^		180†			
Fetal Deaths	5	4.3α	1	5.5α	8.2α,Y	NS
Neonatal Deaths	6	5.2β	1	5.5β	10.3β	NS
Total Perinatal Deaths	11	9.5Y	2	11.1α	20.3α	NS
Low Birthweight (<2501 g)	15	1.3β	3	1.7β	5.3β,Y	NS
Mean Length of Infant Follow-up	11.5 mos.		11.6 mos.			NS
S.D. Length of Follow-up	10.3 mos.		10.4 mos			NS
% Infants Followd to 6 mos.	83.4%		81.2%			NS

^ Includes 6 sets of twins.
† Includes 2 sets of twins.

α 1 per 1000 total births
β 1 per 1000 live births
Y for white, non-Spanish surname, age 20-29

Table 16 (p. 95) presents infant morbidity for the hospital group. Table 17 (pp. 96-97) compares neonatal complications. The planned hospital group had significantly more fetal hypoxia ($p<0.025$) and significantly more 1 minute Apgar scores less than 4 ($p<0.025$). Among the homebirth series, the midwives had more infants who received phototherapy for jaundice than did the physicians ($p<0.025$). Causes of fetal deaths are compared in Table 18 (p. 98).

The prematurity rate for the population initially seeking assistance from one of the services studied was 3.0%. For the planned hospital population it was 2.8%. There was no significant differences between 1 minute Apgar scores ranging from 4-6 between the homebirth group and the planned hospital group with 40 & 7 such ratings, resoectively. Average Apgar scores for the planned hospital group were 8.6 a at 1 minute and 9.7 which were not significantly different from the homebirth group.

There was no association among the hospital group either between length of labor and length of second stage of incidence of low Apgar scores at birth or other complications.

TABLE 16
INFANT MORBIDITY OF PLANNED HOSPITAL GROUP*

Complication	Number	Rate per 1,000 LB	Delivery	Complications	Outcome
Low Birthweight	3	16.6	Hosp		
Case one	1		Hosp	FHTs prior to del.	neonatal sepsis and enterolitis
Case two	1		Hosp	None	mild RDS
Case three	1		Hosp	None	mild RDS
Hyperviscosity syndrome	1	5.5	Hosp	None	resolved

* To compare these data with the homebirth group, see Table 8, p. 86.

The mean length of 1st stage labor among the group planning hospital birth was 12.5 hrs for primigravidae and 5.4 hrs for multigravidae. For the home group it was 10.2 hrs and 4.6 hrs respectively. The standard deviations were 2.6 and 1.3 hrs, respectively, for planned hospital group and 1.9 and 1.2 hrs, respectively, for planned home group. This difference was significant at $p<0.05$.

The mean length of 2nd stage labor for the planned hospital primigravidae was 106.8 min ± 31.0 min and for multigravidae was 50.1 min ± 28.3 min. For the home series, the mean length of 2nd stage was 118.2 min ± 40.5 min for primigravidae and 44.6 min ± 23.7 min for multigravidae. The primigravidae differences were significant at $p<0.05$. Multigravidae were not comparable for parity and could not be compared.

There were 14 cases of prolonged rupture of membranes in the homebirth series and 11 in the planned hospital series ($p<0.01$). There were no infections of the infants except for one low birthweight infant whose mother developed amnionitis. She was in the planned hospital series.

TABLE 17
COMPARATIVE NEONATAL OUTCOMES

COMPLICATIONS	HOME PRIMIGRAVIDAE N=729				STATIS. SIGNIF.
	M.D.'s N=484		Midwives N=245		
	Home	To Hosp	Home	To Hosp	
Jaundice Req. Rx	1	5	2	9	p<0.025
Fetal Hypoxia	2	0	0	0	NS
Neurological Abnormalities[2,3]	2	1	0	1	NS
Cerebral Palsy	1	0	0	1	NS
Neonatal FTT	1	1	0	1	NS
Apgar (1 min.)					
Score < 4	3	0	1	1	NS
Score = 4-6	12	7	5	3	NS

COMPLICATIONS	HOME MULTIGRAVIDAE N=417				STATIS. SIGNIF.[1]
	M.D.'s N=221		Midwives N=196		
	Home	To Hosp	Home	To Hosp	
Jaundice Req. Rx	2	1	0	1	NS
Fetal Hypoxia	0	1	0	0	NS
Neurological Abnormalities[2,3]	0	0	0	1	NS
Cerebral Palsey	0	0	0	0	NS
Neonatal FTT	0	0	0	0	NS
Apgar (1 min.)					
Score < 4	0	1	0	1	NS
Score = 4-6	2	4	2	5	NS

COMPLICATIONS	HOME TOTAL N=1146				STATIS. SIGNIF.[1]
	M.D.'s N=685		Midwives N=461		
	Home	To Hosp	Home	To Hosp	
Jaundice Req. Rx	3	6	2	10	p<0.025
Fetal Hypoxia	2	1	0	0	NS
Neurological Abnormalities[2,3]	2	1	0	2	NS
Cerebral Palsey	1	0	0	1	NS
Neonatal FTT	1	1	0	1	NS
Apgar (1 min.)					
Score < 4	3	1	1	2	NS
Score = 4-6	14	11	7	8	NS

Cont'd on next page

TABLE 17 CONT'D
COMPARATIVE NEONATAL OUTCOMES

COMPLICATIONS	PLANNED	STATIS. SIGNIF.[1]
Jaundice Req. Rx	3	NS
Fetal Hypoxia	3	p<0.025
Neurological Abnormalities[2,3]	0	NS
Cerebral Palsy	0	NS
Neonatal FTT	1	NS
Apgar (1 min.)		
Score < 4	6	p<0.025
Score = 4-6	7	NS

[1] Calculated on the basis of home & hospital
[2] Includes cerebral palsied infants
[3] Development at 1 year follow-up

CONCLUSION

In conclusion, the home delivery group of women were a self-selected group screened for obvious problems and complications occurring during pregnancy, while the hospital group is a similarly selected group who would have been eligible for a home delivery had they decided to have one. While the home delivery outcomes are not directly comparable to State statistics, their outcomes are better than average and lower than might have been expected. Behrman et al.[2] have studied 39,000 white middle-class women in Oregon receiving prenatal care from private physicians and found a neonatal mortality rate of 12 per 1000 live births and a perinatal mortality rate of 17 per 1000 total births. Interestingly enough, if one eliminates premature infants from Behrman's series, the neonatal death rate was 3.5 per 1000 and the perinatal death rate was 7.5 per 1000 which is not statistically significantly different from the home delivery series of this report (cf. Table 15, p. 94).

Another often asked question is that of the need for routine fetal monitoring. Chan et al.[4] have studied the role of fetal monitoring in reducing intrapartum deaths and in a study in which patients were randomly assigned to fetal monitoring, there was no statistically significant difference between the monitored group and the non-monitored group. Also important is that Chan's study revealed an intrapartum death rate of 1.7 per 1000 in his 1162 monitored patients. This is not statistically significantly different from the intrapartum death rate of 0.95 per 1000 in our series of 1145 home deliveries. In another study, Shenker et al.[13] reported a 0.5 per 1000 intrapartum death rate in monitored patients. This is not statistically significantly different from our series either.