Out-of-Hospital Births in Michigan, 1972–79: Trends and Implications for the Safety of Planned Home Deliveries

RUTH SIMMONS, PhD
STAN BERNSTEIN, MS

The authors are with the School of Public Health, University of Michigan, Ann Arbor, Mich. 48109. Dr. Simmons is assistant professor, Department of Health Planning and Administration, and Mr. Bernstein is research associate, Center for Population Planning.

Tearsheet requests to Dr. Simmons.

SYNOPSIS

Trends in out-of-hospital births for the State of Michigan, 1972–79, were examined by analyzing (a) location of deliveries, (b) characteristics of the mother, (c) use of health services, and (d) characteristics of the newborn. A large increase occurred in the number of births at the mother's home and other nonhospital sites for both the black and the white populations. For white women, the increase was associated with better education and greater use of prenatal care. Physician attendance for deliveries at mother's home declined. Birth weights for home-born infants increased significantly over the period, more so for whites than for blacks; mortality declined in some groups, especially for high-birth-weight babies born at the mother's home.

Assuming that the rise in home births in the 1970s was due to an increase in planned and not precipitate home deliveries, the authors concluded that these trends reflect, at least in part, the impact of planned out-of-hospital births. Toward the end of the 1970s, both the conditions under which these births occurred and some of their outcome measures were more characteristic of safety than at the beginning of the period. Disaggregation by race demonstrated, however, that the safety factor was not necessarily present for out-of-hospital births of black infants.

THE 1970s WITNESSED AN INCREASE in the number of out-of-hospital births in Michigan. Such births occur either because an emergency prevents a woman from reaching the hospital in time or because the mother or the couple elect to have the birth take place in a home, a birthing center, a clinic, or a physician's office. Michigan birth certificates do not record whether a birth occurred outside a hospital by choice or because of an emergency. Vermont is the only State that requests such information in the certificate. However, there is reason to believe that the recent rise in out-of-hospital births is due to an increased preference for such deliveries. This trend has been noted by several observers (*1–3*) and is attested to by extensively documented dissatisfaction with excessive technological management of childbirth in the hospital (*4,5*), by the increased interest in and availability of alternative birthing services, and by the growth of organizations supporting home births.

Given the rise in out-of-hospital deliveries and the recent interest in planned home births, we examined the trends in out-of-hospital births for Michigan in the 1970s. In this paper, we discuss patterns regarding (*a*) location of deliveries, (*b*) characteristics of the mother, (*c*) use of health services, and (*d*) characteristics of the newborn. We also raise the question as to what insights these trends might provide about the safety of planned out-of-hospital births.

Our primary data source was the data bank of vital records of the Office of Vital Statistics for the State of Michigan. This information was supplemented by findings from a study of women in Michigan who had had a planned home birth in 1976 (*5*).

Trends in Out-of-Hospital Births

Number of out-of-hospital births, 1972–79. Women who are unhappy with the prospect of giving birth in a hospital can choose from among a number of alternative locations. They can opt for a delivery at their own home, the residence of a relative or friend, or a physician's office, clinic, or birthing center. Official statistics for Michigan provide information separately for births that occur in the hospital and those that take place elsewhere. For

In Michigan between 1972 and 1979, the great majority of deliveries took place in hospitals. But births at the mother's home or other nonhospital sites, while relatively infrequent, more than doubled during the period.

our purpose of examining trends, this breakdown was not detailed enough. Thus, we returned to the original data set and made a further classification with three categories of out-of-hospital births: (*a*) "en route to hospital"—births indicated by the certificate as occurring in an ambulance, taxi, or car; (*b*) "mother's home"—birth certificates that showed an identical address for mother and birthplace; and (*c*)"other nonhospital sites"—births that occurred outside a hospital but not in the mother's home or en route. The last category includes a small number of births at unknown locations.

The largest proportion of intentional home births is expected to be in the "mother's home" category. Substantial numbers should also be in "other nonhospital sites." "En route to hospital" may include some planned home births; however, most of the births in this category were intended to take place in a hospital. Women who plan to be in the hospital are likely to make an effort to get there, even in emergency situations, and therefore are at considerable risk of giving birth while en route. Women who plan a home birth, on the other hand, would stay at home except when the delivery is associated with complications that require emergency care at a hospital. Moreover, given the small number of women who opt for an out-of-hospital delivery, it seems that the "en route" category consists primarily of deliveries that were intended to occur in a hospital. Since the focus of this paper is on planned home births, we exclude the en route category for much of the remainder of this analysis.

Table 1 shows the basic trends for hospital and out-of-hospital births between 1972 and 1979. The great majority of deliveries took place in hospitals. However, births at mother's home or other nonhospital sites, while relatively infrequent, more than doubled during the period. The absolute number of deliveries at the mother's home, the larger of the two groups, remained constant during the first few years of observation and rose substantially beginning in 1975. The absolute number of births at other nonhospital sites increased also.

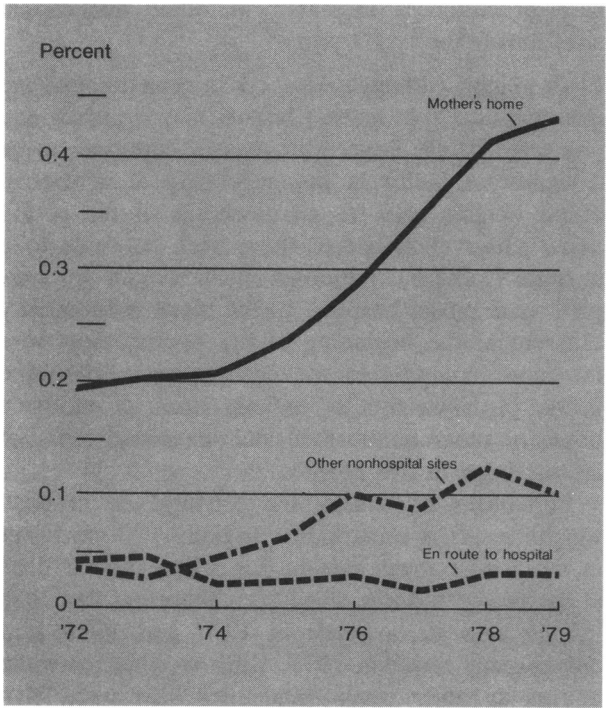
The percentage distribution of births by location was calculated to facilitate comparison among years with different base numbers of births. Changes in this percentage distribution parallel the pattern in the absolute numbers quite closely (table 1 and chart). In sum, the proportion of births at mother's home and other nonhospital sites increased considerably. The change was slow at the beginning of the period, accelerated in the intermediate years, and remained high without marked change during the last 2 years. En route to hospital deliveries, on the other hand, did not rise during the period.

Mother's age, education, and race. Maternal background is an important indicator of the trends that occurred in out-of-hospital births. Although birth certificates do not provide much information on social and economic characteristics, they do record mother's age, education, and race. There was a slight reduction of home births to women under 20 years old. In the 25–29 age group, there was a slight increase in both the home birth and the other nonhospital site categories. The overall age distribu-

Table 1. Number and percentage distribution of births, by location of birth, Michigan, 1972–79

Year	Hospital		En route to hospital		Mother's home		Other nonhospital sites	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1972	145,620	99.728	60	.041	283	.194	54	.037
1973	139,982	99.731	58	.041	282	.201	37	.026
1974	136,050	99.730	29	.021	282	.207	58	.043
1975	132,354	99.681	29	.022	313	.236	81	.061
1976	129,714	99.586	33	.025	375	.288	131	.101
1977	136,503	99.536	24	.018	489	.357	124	.090
1978	137,119	99.437	39	.028	573	.416	165	.120
1979	142,437	99.439	41	.029	619	.432	143	.100

Increase in births occurring at mother's home, en route to the hospital, and at other nonhospital sites, Michigan, 1972—79



tion, however, changed little during the period. Births at mother's home and other nonhospital sites increased for both black and white women. Home births more than doubled for whites, whereas for blacks they increased by 40 percent (table 2). Percentages of total births in the combined categories of mother's home and other nonhospital sites were remarkably similar for both racial groups. The absolute number of black women in these categories, however, was much smaller than that of white women.

For all birth sites, including the hospital, the proportion of women with at least some college education rose considerably during the period under observation. The trend was especially marked for women who delivered at home. In 1972, only 21.6 percent of home births were to mothers with at least some college education; by 1979 this figure had reached 44.7 percent (table 3). The study of planned home births in Michigan mentioned earlier also indicated that women who had a planned home birth were generally well educated. This conclusion is supported by other research on home births. However, as the race breakdown in table 3 reveals, the trend is characteristic primarily of white and not of black women. The only year showing a sharp increase in the percentage of home births to college-educated black women was 1979.

Prenatal care and attendant. Table 4 shows an increase in prenatal care during the first 3 months of pregnancy in the home birth group and a reduction in the proportion of women, in both the mother's home and other nonhospital site category, who received no care. The race breakdown reveals, however, that both of these changes apply only to whites (table 5).

The presence or absence of a trained attendant is another key variable in out-of-hospital deliveries.

Table 2. Number and percentage distribution of births by race[1] and location of birth, Michigan, 1972–79

Year	White		Black	
	Number	Percent	Number	Percent
	Hospital			
1972	119,063	99.75	25,632	99.61
1973	113,922	99.74	25,144	99.69
1974	112,366	99.73	22,746	99.71
1975	108,740	99.68	22,663	99.68
1976	106,857	99.59	21,765	99.55
1977	112,861	99.54	22,592	99.51
1978	113,352	99.44	22,274	99.42
1979	117,638	99.45	23,190	99.36
	Mother's home			
1972	208	0.17	74	0.29
1973	218	0.19	60	0.24
1974	226	0.20	53	0.23
1975	250	0.23	63	0.28
1976	294	0.27	78	0.36
1977	399	0.35	83	0.36
1978	483	0.42	87	0.39
1979	501	0.42	109	0.47
	Other nonhospital sites			
1972	37	0.03	16	0.06
1973	29	0.02	8	0.03
1974	50	0.04	8	0.03
1975	75	0.07	5	0.02
1976	118	0.11	12	0.05
1977	109	0.10	15	0.07
1978	131	0.11	32	0.14
1979	124	0.10	17	0.07
	Mother's home and other nonhospital sites			
1972	245	0.20	90	0.35
1973	247	0.22	68	0.27
1974	276	0.24	61	0.27
1975	325	0.30	68	0.30
1976	412	0.38	90	0.41
1977	508	0.45	48	0.43
1978	614	0.54	119	0.53
1979	625	0.53	126	0.54

[1] In this table and subsequent tables where race breakdowns are given, a small number of cases in "other racial groups" has been omitted.

NOTE: The percentages in this table are based on the total number of black and white births, including the small number of births occurring en route.

The decline in physician-attended births at mother's home (table 6) may reflect physicians' reticence about attending planned home deliveries, parents' unwillingness to request their attendance, or merely more accurate recording patterns. There was also a slight increase in the recorded role of other health care practitioners. A further breakdown by race shows that physician-attended deliveries declined, especially for births of whites at mother's home (table 7). Deliveries attended by other health practitioners, on the other hand, increased for whites. For births of blacks, the presence of other health care practitioners increased at other nonhospital sites during the last 3 years.

Table 3. Percentage of mothers with college education[1] by location of infants' birth and race, Michigan, 1972–79

Year	Mother's home			Other nonhospital sites		
	Black	White	Total	Black	White	Total
1972	11.0	25.5	21.6	0.0	16.7	19.3
1973	13.3	27.1	24.3	28.6	11.5	15.2
1974	9.4	33.5	28.5	75.0	14.6	23.2
1975	13.1	36.1	31.4	0.0	23.3	21.5
1976	17.1	36.9	32.3	25.0	23.3	23.3
1977	13.4	45.6	38.7	13.3	19.4	18.7
1978	13.6	44.7	40.1	25.0	35.7	33.7
1979	21.3	50.6	44.7	23.5	36.6	34.5

[1]This category includes women who have had at least some college education.

Table 4. Percentage distribution of prenatal care by location of birth, Michigan, 1972–79

Year	Mother's home			Other nonhospital sites		
	Early	Late	None	Early	Late	None
1972	42.4	33.0	24.6	62.0	28.0	10.0
1973	48.5	27.3	24.2	50.0	36.1	13.9
1974	48.1	33.3	18.5	50.0	36.5	13.5
1975	50.0	30.6	19.4	54.4	38.0	7.6
1976	52.0	27.3	20.7	61.7	32.8	5.5
1977	55.3	30.4	14.3	75.6	20.2	4.2
1978	62.1	27.4	10.5	60.9	33.3	5.8
1979	60.5	25.0	14.5	53.6	38.4	8.4

NOTE: "Early" is within first 3 months of pregnancy; "late" is after first 3 months of pregnancy.

Birth weight. Although advances in neonatology have demonstrated that mature infants may be small and immature babies large, birth weight continues to be a significant factor in the well-being of newborns. Mean weights rose for all newborns in the period under observation except those born en route to a hospital (table 8). Although mean weights for hospital and out-of-hospital births were substantially different at the beginning of the period, they were far more comparable in recent years. For some years, birth weights of infants born at mother's home or other nonhospital sites exceeded those of infants born in the hospital.

For births of whites, the convergence in birth weight trends is remarkable. Initially 170 gm lower in 1972, the mean weight for white infants born at the mother's home was higher than that for white infants born in hospitals in 1977 and 1978, and only slightly lower in 1979. Birth weights for white infants at other nonhospital sites also were high (table 9). The disproportionate increase in mean weight for infants born at mother's home and other nonhospital sites is likely to be associated with the rising number of planned home births, especially among the white population. This conclusion is underscored by findings from the previously mentioned Michigan study, in which weights were compared for a representative sample of out-of-hospital births for 1976. In that study, 26.3 percent of weights for unplanned home deliveries fell below 2,500 gm, compared with only 1.3 percent for planned ones. The mean birth weight difference between the 2 groups was 658.9 gm (mean planned = 3616.6; mean unplanned = 2957.7; Mann-Whitney U statistic = 1628, $P < .0001$).

Table 5. Percentage distribution of prenatal care by location of birth and race, Michigan, 1972–79

Year	Mother's home						Other nonhospital sites					
	Early		Late		None		Early		Late		None	
	White	Black	White	Black	White	Black	White	Black	White	Black	White	Black
1972	42.9	40.3	33.0	33.3	24.1	26.4	63.9	57.1	25.0	35.7	11.1	7.1
1973	52.0	37.5	25.0	35.7	23.0	26.8	57.1	25.0	32.1	50.0	10.7	25.0
1974	53.0	28.8	29.3	50.0	17.7	21.2	53.3	28.6	37.8	28.6	8.9	42.9
1975	54.7	32.2	28.6	39.0	16.7	28.8	56.2	40.0	37.0	40.0	6.8	20.0
1976	55.6	40.0	25.8	30.7	18.5	29.3	64.3	41.7	30.4	50.0	5.2	8.3
1977	60.5	30.7	29.6	32.0	9.9	37.3	76.4	69.2	19.8	23.1	3.8	7.7
1978	65.6	39.4	26.4	35.2	8.0	25.4	62.6	54.8	34.1	29.0	3.3	16.1
1979	63.3	45.6	25.6	23.3	11.1	31.1	52.1	58.8	38.7	41.2	9.2	0.0

Table 6. Attendant at birth, by location of birth, Michigan, 1972–79 (percentages)

Year	Mother's home				Other nonhospital sites			
	Physician	Other[1] health practitioner	Other and unknown health practitioner	None	Physician	Other[1] health practitioner	Other and unknown health practitioner	None
1972[2]	67.4	0.7	31.8	...	65.0	5.0	30.0	...
1973	64.2	1.1	24.8	9.9	83.8	0.0	13.5	2.7
1974	67.7	2.1	26.2	3.9	72.4	1.7	19.0	6.9
1975	56.5	5.1	31.6	6.7	81.5	3.7	12.3	2.5
1976	57.3	5.3	30.7	6.7	81.7	0.8	14.5	3.1
1977	45.6	5.7	42.9	5.7	78.2	2.4	16.9	2.4
1978[3]	38.7	6.1	55.1	...	61.8	7.3	30.9	...
1979	31.0	7.4	61.6	0.0	62.2	6.3	31.5	0.0

[1] Included in this category are midwives, nurse-widwives, nurses, and physician assistants.
[2] Different coding schemes used in 1972 make it impossible to determine births with no attendant.
[3] For 1978 it is impossible to distinguish no attendant from other or unknown attendant.

Table 7. Attendant at birth by location of birth and race of mother, Michigan, 1972–79 (percentages)

Year	Physician		Other[1] health practitioner		Other and unknown health practitioner		None	
	White	Black	White	Black	White	Black	White	Black
	Mother's home							
1972[2]	64.2	76.9	0.5	1.5	35.3	21.5	...	...
1973	59.2	83.3	1.4	0.0	28.9	8.3	10.6	8.3
1974	65.0	81.1	1.8	1.9	30.1	9.4	3.1	7.5
1975	51.2	77.8	6.4	0.0	35.2	17.5	7.2	4.8
1976	53.1	75.6	6.5	1.3	34.4	15.4	6.1	7.7
1977	41.1	67.5	6.8	0.0	48.6	15.7	3.5	16.9
1978[3]	34.2	64.4	7.0	1.1	58.8	34.5	...	...
1979	27.9	47.7	8.0	4.6	64.1	47.7	0.0	0.0
	Other nonhospital sites							
1972[2]	62.1	72.7	6.9	0.0	31.0	27.3	...	...
1973	89.7	62.5	0.0	0.0	10.3	25.0	0.0	12.5
1974	74.0	62.5	2.0	0.0	18.0	25.0	6.0	12.5
1975	82.7	60.0	4.0	0.0	12.0	20.0	1.3	20.0
1976	81.4	83.3	0.8	0.0	15.3	8.3	2.5	8.3
1977	78.9	73.3	1.8	6.7	18.3	6.7	0.9	13.3
1978[3]	67.9	37.5	4.6	18.8	27.5	43.8	...	...
1979	62.9	58.8	4.0	23.5	33.1	17.6	0.0	0.0

[1] Included in this category are midwives, nurse-widwives, nurses, and physician assistants.
[2] Different coding schemes used in 1972 make it impossible to determine births with no attendant.
[3] For 1978 it is impossible to distinguish no attendant from other or unknown attendant.

Neonatal mortality. The Michigan Vital Statistics Department routinely links death certificate files with those of birth records, allowing analysis of neonatal mortality. However, given the small number of cases, analysis of mortality trends requires caution. As might be expected, neonatal mortality was higher for out-of-hospital than for hospital births (table 10). Moreover, while hospital births exhibited a steady decline in neonatal mortality, the pattern for out-of-hospital deliveries was marked by considerable year-to-year variation, in large measure due to the small number of births. These considerable small-population fluctuations obscure its exact dimension, but there may have been a mild downward trend in the two categories where planned home births were concentrated: mother's home and other nonhospital sites.

To measure the statistical strength of the change in neonatal mortality, we divided the data into two periods: the first 3 years, when the number of births at mother's home or other nonhospital sites was relatively stable and low, and the last years,

when they had increased. The chi-square test of the difference in mortality rates between 1972–74 and 1977–79 was significant at the $P < .01$ level for both the mother's home group and the combined group of mother's home and other nonhospital sites. For other nonhospital sites it was significant at the $P < .05$ level.

Although a more detailed comparison is more difficult, especially for blacks because of the small numbers involved, the neonatal mortality rate for whites was lower than that for blacks and displayed greater stability (table 11). Except for 1979, the rate for whites showed a downward trend over the last years. The provisional data for 1979 show that mortality for blacks was lower than for whites. Since our experience has been that proportionally greater numbers of deaths of blacks are added when the data base is completed, we expect the completed rate for blacks to be higher. Chi-square tests of the difference in mortality rates by race for the early and the late periods show a statistically significant decline for blacks at the $P < .05$ level.

Table 8. Mean birth weights (in grams) by location of birth, Michigan, 1972–79

Year	Hospital	En route to hospital	Mother's home	Other nonhospital sites
1972	3,305.0	3,138.7	3,029.8	3,023.3
1973	3,310.2	3,001.2	3,098.1	3,378.4
1974	3,322.2	2,812.5	3,194.0	3,005.7
1975	3,320.1	3,268.1	3,149.8	3,328.7
1976	3,331.2	3,072.1	3,164.0	3,333.9
1977	3,339.3	2,747.9	3,345.8	3,452.0
1978	3,339.6	2,994.3	3,314.4	3,269.6
1979	3,351.4	2,817.0	3,301.4	3,387.5

Neonatal mortality, birth weight, and race. Table 12 shows neonatal mortality trends broken down by birth weight. Birth weights were divided into two categories: those less than and those more than 2,500 gm, thus differentiating babies with very low weights from all others. Until recently, the 2,500 gm limit was a major criterion in the diagnosis of prematurity. Gestational age is increasingly used in newborn assessment, but the 2,500 gm cutoff point remains an important factor.

During the period of observation a considerable drop occurred in neonatal mortality of hospital newborns weighing less than 2,500 gm, reflecting the

Table 9. Mean birth weights (in grams), by location of birth and race, Michigan, 1972–79

Year	Hospital		Mother's home		Other nonhospital sites	
	White	Black	White	Black	White	Black
1972	3,358.9	3,056.5	3,188.4	2,598.3	3,175.2	2,540.7
1973	3,366.3	3,058.2	3,167.1	2,872.9	3,518.5	2,888.1
1974	3,373.9	3,069.1	3,256.5	2,912.0	3,004.6	3,012.3
1975	3,371.2	3,072.8	3,230.3	2,844.5	3,334.2	3,232.0
1976	3,382.2	3,077.4	3,281.2	2,737.8	3,363.4	3,028.8
1977	3,391.8	3,077.8	3,428.3	2,945.6	3,512.5	3,020.2
1978	3,391.1	3,082.0	3,404.8	2,791.0	3,353.1	2,910.5
1979	3,403.2	3,093.6	3,394.2	2,916.3	3,395.5	3,321.4

Table 10. Neonatal mortality rate[1], by place of birth, Michigan, 1972–79

Year	Hospital	En route to hospital	Mother's home	Other nonhospital sites	Mother's home and other nonhospital sites
1972	13.75 (2,003)	50.00 (3)	77.70 (22)	37.00 (2)	71.22 (24)
1973	12.70 (1,779)	68.96 (4)	28.30 (8)	0.00	25.08 (8)
1974	12.19 (1,659)	0.00	39.00 (11)	34.40 (2)	38.24 (13)
1975	11.35 (1,503)	0.00	28.75 (9)	12.30 (1)	25.38 (10)
1976	10.63 (1,379)	60.60 (6)	48.00 (18)	45.80 (6)	47.43 (24)
1977	9.60 (1,311)	0.00	18.40 (9)	0.00	14.68 (9)
1978	8.98 (1,232)	76.92 (3)	34.90 (20)	6.06 (1)	28.46 (21)
1979[2]	8.73 (1,243)	121.95 (5)	32.31 (20)	0.00	26.25 (20)

[1] For the base numbers of these rates, see table 1.
[2] Provisional figures.
NOTE: Number of deaths in parentheses.

Table 11. Neonatal mortality rate[1] of births, by location of birth and race, Michigan, 1972–79

Year	Mother's home		Other nonhospital sites	
	White	Black	White	Black
1972	48.08 (10)	162.60 (12)	54.05 (2)	0.00 (0)
1973	32.11 (7)	16.67 (1)	0.00 (0)	0.00 (0)
1974	22.12 (5)	131.32 (6)	40.00 (2)	0.00 (0)
1975	32.00 (8)	15.87 (1)	13.30 (1)	0.00 (0)
1976	37.41 (11)	89.74 (7)	33.90 (4)	166.67 (2)
1977	20.05 (8)	12.05 (1)	9.17 (1)	0.00 (0)
1978	18.63 (9)	126.44 (11)	7.63 (1)	0.00 (0)
1979[2]	33.93 (17)	27.52 (3)	0.00 (0)	0.00 (0)

[1] For the base numbers of these rates, see table 2.
[2] Provisional figures.
NOTE: Number of deaths in parentheses.

Table 12. Number of neonatal deaths per 1,000 live births, by location of birth and birth weight, Michigan, 1972–79

Year	Hospital		Mother's home		Mother's home and other nonhospital sites	
	Less than 2,500 grams	More than 2,500 grams	Less than 2,500 grams	More than 2,500 grams	Less than 2,500 grams	More than 2,500 grams
1972	135.43 (1,527)	3.17 (425)	400.00 (20)	8.89 (2)	360.66 (22)	7.52 (2)
1973	123.68 (1,336)	3.04 (392)	117.64 (6)	8.88 (2)	115.38 (6)	7.78 (2)
1974	119.70 (1,202)	3.19 (399)	195.65 (9)	8.81 (2)	203.70 (11)	7.33 (2)
1975	112.24 (1,104)	2.92 (357)	155.56 (7)	3.89 (1)	166.67 (7)	3.04 (1)
1976	107.46 (1,034)	2.72 (326)	246.15 (16)	3.31 (1)	222.22 (18)	12.08 (5)
1977	101.48 (993)	2.41 (305)	166.66 (7)	0.00 (0)	142.86 (7)	0.00 (0)
1978	86.10 (936)	2.05 (262)	237.29 (14)	7.89 (4)	181.82 (14)	6.20 (4)
1979[1]	91.44 (915)	2.01 (266)	346.67 (26)	3.77 (2)	313.25 (26)	3.07 (2)
1975–1979	...	2.41	...	3.94	...	...

[1] Provisional figures.
NOTE: Number of deaths in parentheses.

increased technical and medical capability of hospitals for dealing with the problems of premature infants. The most noteworthy pattern in the context of this paper is the reduction of neonatal mortality of babies weighing more than 2,500 gm who were born at mother's home. The rate declined by 5 points after the first 5 years, then fluctuated year by year, but averaged 3.94 for 1975–79. The comparable rate for hospital births was 2.41. In comparing these two rates, it has to be remembered that the category "mother's home" includes many unplanned home deliveries and their greater likelihood of mortality. The chi-square test of the difference in mortality rates for normal-weight births at mother's home for the early and later years was not statistically significant.

The reduction in neonatal mortality was greater for white than for black infants (table 13). Neonatal mortality for 1975–79 for white infants more than 2,500 gm born at the mother's home was 2.94; for those born at the hospital it was 2.24. Thus, for the white group the difference in mortality between hospital and nonhospital sites diminished during the period. The chi-square test of the difference between the early and the later years is not significant.

For the black population, the contrast in neonatal mortality between home and hospital continued to remain strong; for deliveries at mother's home it was 9.62 per 1,000 live births, for the hospital 3.46.

'Although the proportion of both white and black out-of-hospital births increased over the period, the favorable changes in birth weight and mortality for white infants were impressive; for blacks, this was not so clearly the case.'

Table 13. Number of neonatal deaths per 1,000 live births for infants weighing more than 2,500 grams, by location of birth and race, 1972–79

Year	Hospital		Mother's home		Mother's home and other nonhospital sites	
	White	Black	White	Black	White	Black
1972	2.96 (330)	4.29 (94)	10.99 (2)	0.00 (0)	9.35 (2)	0.00 (0)
1973	2.92 (312)	3.58 (77)	11.30 (2)	0.00 (0)	9.76 (2)	0.00 (0)
1974	2.99 (313)	4.18 (82)	5.38 (1)	26.32 (1)	4.41 (1)	21.74 (1)
1975	2.67 (273)	4.25 (83)	0.00 (0)	22.22 (1)	0.00 (0)	20.00 (1)
1976	2.53 (255)	3.74 (70)	0.00 (0)	20.00 (1)	5.63 (2)	50.85 (3)
1977	2.22 (237)	3.79 (74)	0.00 (0)	0.00 (0)	0.00 (0)	0.00 (0)
1978	1.90 (202)	2.86 (55)	6.77 (3)	16.39 (1)	5.39 (3)	11.36 (1)
1979	1.92 (213)	2.66 (53)	4.61 (2)	0.00 (0)	3.65 (2)	0.00 (0)
1975–1979	2.24	3.46	2.94	9.62	3.18	13.09

NOTE: Number of deaths in parentheses.

These differences underline the importance of distinguishing between the rates for blacks and whites. The results are similar when births at mother's home are lumped together with deliveries at other nonhospital sites. For blacks, a wide gap exists between births at hospital and nonhospital sites; for whites the differences are small. The chi-square test of the difference between early and late years is not significant.

Implications for Safety

In presenting information on trends for out-of-hospital births in the 1970s, we distinguished among categories of birth sites with high and low likelihood of being planned. We observed that the number of births at mother's home and other nonhospital sites had increased, that this increase was large for both the black and the white populations, and that it was associated with higher levels of education and greater use of prenatal care for white women. Physician attendance for deliveries at mother's home declined. Birth weights for home births increased significantly over the period, more so for white than for black infants; mortality declined in some groups, especially mortality for high-birthweight babies born at mother's home. In this section, we discuss what inferences might be drawn from these trends about the safety of planned home births. Before doing so, however, it is important to place this discussion in a larger perspective.

Women who had a planned home birth in Michigan in 1976 believed that no major risks were involved, provided there had been proper medical screening, good prenatal care, and adequate preparation. Although some of the professional literature lends support to this point of view (*1,7,8*), the medical community generally has argued that childbirth outside the hospital is unsafe (*9,10*).

Using mortality data from vital records for several States, the Executive Board of the American College of Obstetricians and Gynecologists stated that home births are several times more dangerous than hospital births. Since birth certificates do not generally distinguish between planned and unplanned home deliveries, such mortality statistics reflect the dangers of both emergency and deliberate home births. Therefore, it is inappropriate to use such statistics as evidence about the risks of planning. If vital records are to be useful in the determination of risks, additional analysis is required. In some States the use of birth attendants in planned home deliveries may allow the retrospective determination of planning status. In such an analysis for North Carolina, it was found that planned home births by lay-midwives resulted in 3 neonatal deaths per 1,000 live births, planned home deliveries without a lay-midwife were associated with 30, and unplanned home deliveries with 120 neonatal deaths per 1,000 live births (*1*). The approach used in the North Carolina study required fieldwork to establish the planning status for ambiguous cases; this approach could not be used to ascertain the deaths that occurred in the hospital as a consequence of complicated planned home deliveries that ended in the hospital.

Precise measurement of the risks of hospital and home births calls for experimental studies that submit a randomly selected sample of women with a wide range of characteristics to either the home or the hospital confinement. Such studies have not been and most likely will not be undertaken. The

complex variations in the setting and context of home deliveries, as well as the ethical issues associated with the random assignment of women to a particular birthing situation, make such research infeasible. Prospective studies using birth-site intentions of newly pregnant women are more manageable but also have limitations. Publicly declaring an intention to use a particular birth setting may alter the subsequent behavior of participating women and therefore may not adequately reflect the true dimension of risk. Sample selection procedures are complex and likely to allow study of only women who are under the supervision of a health care professional. Conklin and Simmons found in the 1976 Michigan study that approximately one-third of the planned home births that were sampled took place without attendance by a health care practitioner. Information from special home delivery services, while useful, may not be generalizable. Mehl (*7*), and more recently Richwald and Stuart (*8*), for example, used data from home birth services in California in an attempt to assess the risks of planned home births. Yet such services do not exist everywhere and do not cover the total population of women who opt for a home confinement. Nor can this approach ascertain the risks of hospital confinements for comparable groups of women, which would be necessary for a definitive answer to the question of risk.

We have analyzed information from vital records for several years and disaggregated information by the location of birth, characteristics of the mother and infant, and use of health care services. Although it is impossible to establish the planning status of any given out-of-hospital delivery with this approach and equally impossible to make definitive statements about safety, useful inferences can nonetheless be drawn. Such an approach can serve as a complement to the more expensive and elaborate field-based research designs.

The assumption we make here is that the rise in home births in the 1970s was due to an increase in planned (and not precipitate) home deliveries. As we noted at the beginning of this paper, there is evidence supporting such an assumption. There is, furthermore, no evidence supporting the alternative hypothesis that the increase is due to more emergency home births. We have no indication of a shift in medical policy for prenatal care, for example, that would have induced women to contact the hospital or their physician later than previously, thereby increasing the risk of an emergency home birth. Nor have there been substantial changes in the availability of hospital or ambulance services. If we assume that emergency home births have remained roughly constant, the trends we observed should reflect, at least partly, the impact of planned out-of-hospital births. With this assumption in mind, we conclude that toward the end of the 1970s both the conditions under which these births occurred and some of their outcome measures are more characteristic of safety than at the beginning of the period. Disaggregation by race has demonstrated, however, that this is not necessarily true for out-of-hospital births for blacks.

Specific conclusions suggested by our findings are:

1. Better-educated women are likely to make informed choices about the circumstances of their delivery and to be aware of necessary preparations. Increased levels and earlier initiation of prenatal care allow the type of health screening that, it has been argued, leads to greater safety (*1*).

2. The substantial increase in birth weight for out-of-hospital births suggests that women who decided to have their babies at home tended to deliver infants with birth weights characteristic of normal, healthy infants. To the extent that birth weight is indicative of infants' health, we conclude that choosing a home birth is not necessarily associated with high risk.

3. The small number of cases in this study makes it difficult to draw inferences about the safety of planned out-of-hospital births from neonatal mortality trends. However, the statistically significant decrease in overall neonatal mortality and in neonatal mortality of high-birth-weight infants also points in the direction of greater safety.

4. Disaggregating information by race indicates that the decision to deliver outside the hospital could have different consequences for poor black and white women. Although the proportion of both white and black out-of-hospital births increased over the period, the favorable changes in birth weight and mortality for white infants were impressive; for blacks, this was not so clearly the case. Since race in these data is likely to reflect socioeconomic status, which is not recorded on the birth certificate, a key question raised by our analysis is: Are planned out-of-hospital births for poor women based on different motivations than for middle-class women? It may be that poor women plan to deliver at home because they cannot afford, or have inadequate access to, hospital care. It would not be surprising if such nonhospital births were less safe than those

based on a rejection of the hospital-based, medical model of delivery.

The breakdown of out-of-hospital births by location, characteristics of mother, use of health services, and characteristics of the infant has revealed differences between black and white groups as well as considerable change for each group over time. While the implications for the safety of planned home births must, given the approach used here, remain tentative, the group differentials in themselves and the patterns of change warrant careful attention.

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Where Cancer Patients Die: An Epidemiologic Study

JANE McCUSKER, MD, DrPH

Dr. McCusker is associate professor of public health at the University of Massachusetts, Amherst, Mass. 01003.

Sharon Fleck Campbell, information analyst, University of Rochester Cancer Center, obtained data for this study from the Rochester Regional Tumor Registry, and Charles L. Odoroff, PhD, associate professor, Department of Biostatistics, University of Rochester, assisted with the statistical analysis. This work was supported in part by Public Health Service grant CA-11198 from the National Cancer Institute.

Tearsheet requests to Dr. McCusker.

SYNOPSIS

In a sample of deaths among cancer patients, the relationship of place of death to age, sex, length of time between diagnosis and death, cancer site, and patients' socioeconomic status was investigated. The Rochester (N.Y.) Regional Tumor Registry provided these data for all cancer patients who died in Monroe County, N.Y., during 1976, 1977, and 1978. Patients who had not been residents of the county were excluded from the sample, as were patients under 15 years of age at death and those whose cancers had been diagnosed only at autopsy.

Analysis with a logit model was used to estimate odds ratios that compared the probabilities of death in an acute care hospital and in a chronic care facility with the probability of death at home. Patients whose cancers had been diagnosed less than 1 month before their deaths were significantly more likely to die in a hospital than were patients whose cancers had been diagnosed earlier. Cancer sites, too, were significantly related to place of death: persons with leukemia or lymphoma were most likely to die in a hospital, followed by patients with lung, breast, and upper gastrointestinal tract cancers; persons with colorectal, genitourinary, and miscellaneous cancers were most likely to die at home.

The patients whose deaths were studied were classified by socioeconomic area (SEA) ranking. Patients who had resided in higher level SEAs were more likely to die at home than those from lower level SEAs; however, this trend was reversed among patients from the lowest level SEAs, who had a relatively high rate of death at home and a low rate of death in chronic care facilities.