Trends in Cesarean Section Rates for the United States, 1970–78

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CESAREAN SECTION DELIVERY of an infant was a relatively infrequent procedure only a decade ago. It was usually performed because the mother or infant could not physically withstand the stress of vaginal delivery, or because the fetus was in serious distress. During recent years, however, the number and rate of cesarean deliveries has increased dramatically. Because this rising trend has occurred at a time when many women are asking their physicians to make their deliveries as "natural" as possible, increased attention has been focused on this type of delivery.

Reasons for More Cesarean Sections

What explanations have been offered for the increased tendency for infants to be delivered by cesarean section? Some of the factors that have been suggested (*1–4*) are:

1. Technological monitoring of labor. The increasing use of technology in obstetrics (electronic fetal monitoring, amniocentesis, the induction of labor) may increase the chances of detecting fetal distress and lead to increased C-sections. Technological monitoring began in the early 1970s and was in fairly widespread use by the mid- and late 1970s.

2. Breech deliveries and length of labor. Obstetricians may be becoming increasingly reluctant to allow labor to continue beyond some defined period or to deliver breech babies vaginally, that is buttocks first, since that route of delivery increases the risk to the baby. Babies who were previously being delivered breech may now be delivered by C-section. There is evidence that this is an increasingly common occurrence. Although only about 3 percent of all deliveries are breech presentations, the proportion of cesarean deliveries with breech presentation rose from 6.1 percent in 1970 to 12.4 percent in 1978 (based on unpublished data from the National Hospital Discharge Survey).

3. Lesser likelihood of forceps deliveries. Forceps deliveries may be less likely to be attempted, especially the more difficult ones, because of the high risk to the fetus; these difficult deliveries may more often be by C-section now.

4. Changing childbearing patterns. Women are having fewer children later in their childbearing years, and these older primiparous mothers may be at greater risk of complications.

5. Fear of malpractice suits. Obstetricians have pointed to the increasing likelihood of malpractice suits as a factor that may dispose them toward C-section if there is any indication of fetal distress.

6. Policy of subsequent C-section deliveries. If a woman has had a C-section, the nearly universal practice in the United States is to deliver subsequent births by C-section.

Sources of Data on C-sections

Although it is difficult to empirically evaluate whether the six factors cited explain the rise in cesarean section deliveries, several studies have been able to relate cesarean section delivery to certain social and demographic characteristics and to certain maternal health characteristics, infant health characteristics, or both.

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The National Center for Health Statistics (NCHS) in 1972 conducted the National Natality Survey (NNS), a 1-in-500 sample of all legitimate live births in the United States, in which questionnaires were sent to all mothers, physicians, and hospitals named on certificates of live births. These potential respondents were "followed back" through a nationwide mail survey in order to expand the amount of information reportable through the vital registration system. The 1972 NNS revealed that 7.3 percent of the legitimate live births were C-section deliveries, 2.3 percent breech deliveries, 52.7 percent spontaneous deliveries, 36.8 percent forceps deliveries, and 0.9 percent other types of deliveries (*5*). C-sections were found to be performed more often on women with at least one of these characteristics: nonwhite, resident of a metropolitan area, high income, 35 years of age or older, the current birth being either of the first order or of the fifth order or higher. The mothers who delivered via C-section tended to have more previous fetal losses, underlying medical conditions, complications of pregnancy, prenatal visits, complications of labor, and complications during all three trimesters of pregnancy; to be administered spinal and epidural anesthetic more often; to have shorter labors and longer hospital stays, as well as more postpartum health complications, postpartum sterilization operations, and postpartum nonroutine visits. The infants delivered by C-section tended to be characterized by lower birth weight, shorter gestation periods, a greater incidence of congenital malformations or anomalies, and lower Apgar scores (an index of heart rate, respiratory effort, muscle tone, reflex irritability, and skin color); they more often required unusual resuscitative efforts and were examined sooner after leaving the delivery room. Since the National Center for Health Statistics is conducting National Natality and Fetal Mortality Surveys in 1980, the new data should provide indications of the extent to which these relationships still exist.

A second source of information on C-sections comes from the Professional Activity Study (PAS) conducted by the Commission on Professional and Hospital Activities in Ann Arbor, Mich. The Commission collects discharge information from about 2,000 of the nation's 6,000 short-stay hospitals and makes national estimates by extrapolation. It has found a tendency for C-section rates to be higher in large rather than small hospitals, in the East rather than in the West, and in teaching hospitals rather than in nonteaching hospitals; it also has found that both spinal and inhalation plus intravenous methods of anesthesia are most often used in C-section deliveries (*6–9*).

Rising rates of C-section have significant implications for fertility. First, women who deliver by C-section are much more likely to obtain postpartum sterilization. An analysis of the 1972 NNS data (*10*) showed that the proportion of mothers sterilized following delivery was 4.9 percent for forceps deliveries, 5.3 percent for breech deliveries, 7.6 percent for spontaneous deliveries, but a significant 25.3 percent for C-sections. By birth order, the postpartum sterilization rate in C-section deliveries was 7.9 percent for first order births, 22.0 percent for second order births, 59.8 percent for third order births, 55.9 percent for fourth order births, and 53.9 percent for fifth or higher order births. Thus, it is apparent that a woman's future childbearing may be terminated because of the sterilization that is so common in cesarean section deliveries. Since social, demographic,

Table 1. Number of cesarean sections and cesarean section rates for non-Federal short-stay hospitals in the United States and each region, 1970–78, by color of mother

Area	Total		White		All other races		Not stated	
	Number in thousands	Rate per 100 deliveries	Number in thousands	Rate per 100 deliveries	Number in thousands	Rate per 100 deliveries	Number in thousands	Rate per 100 deliveries
United States:								
1978	510	15.2	364	15.6	84	14.6	60	13.8
1977	455	13.7	323	14.0	71	12.6	58	12.9
1976	378	12.1	263	12.2	67	12.7	48	10.9
1975	323	10.4	227	10.4	56	10.7	40	9.5
1974	286	9.2	201	9.3	51	9.7	35	8.1
1973	246	8.0	172	8.0	46	8.7	28	6.7
1972	227	7.0	159	7.2	40	7.1	27	6.3
1971	194	5.8	134	5.7	36	6.2	24	5.9
1970	195	5.5	134	5.5	31	5.4	30	5.8
Northeast:								
1978	119	17.6	87	17.5	20	18.0	10	17.8
1977	110	15.9	82	15.8	18	16.4	10	16.3
1976	101	14.6	73	13.7	18	17.7	10	17.2
1975	80	11.9	60	11.4	13	13.6	7	13.3
1974	73	10.8	56	10.5	13	14.2	4	8.7
1973	63	9.0	48	8.7	11	11.5	4	8.6
1972	52	7.3	41	7.3	9	9.9	3	4.0
1971	60	7.4	45	7.0	11	11.6	4	5.6
1970	53	6.2	42	6.2	7	6.9	3	5.0
North Central:								
1978	130	13.9	89	14.3	14	14.4	26	12.7
1977	119	12.3	76	12.1	15	12.9	27	12.5
1976	95	10.6	63	10.5	12	12.6	19	9.7
1975	83	9.3	52	9.1	12	11.5	20	8.9
1974	78	8.4	49	8.2	10	8.9	20	8.8
1973	61	7.0	38	6.8	10	8.6	14	6.6
1972	53	5.7	32	5.5	7	5.4	14	6.3
1971	54	5.2	36	5.3	6	4.3	11	5.6
1970	52	4.7	36	4.8	5	4.3	11	4.8
South:								
1978	170	15.2	121	16.2	39	12.6	9	15.6
1977	147	13.6	105	14.5	31	10.9	10	14.9
1976	121	12.1	84	12.7	30	10.8	7	12.1
1975	110	10.5	82	11.4	25	8.8	4	7.5
1974	93	9.3	65	9.7	25	8.7	4	6.9
1973	83	8.0	61	8.8	20	7.2	2	3.5
1972	81	7.4	57	7.8	19	6.3	5	7.7
1971	51	5.2	32	4.9	15	5.2	5	7.5
1970	61	5.8	40	6.1	14	4.8	7	6.8
West:								
1978	92	14.6	66	14.4	11	19.4	15	12.8
1977	78	13.3	60	14.0	7	13.6	12	10.7
1976	61	11.3	43	11.7	6	13.7	11	9.1
1975	50	9.9	34	9.3	7	14.8	9	10.0
1974	42	8.1	31	8.4	3	8.5	7	6.7
1973	38	8.0	25	7.3	6	12.1	7	8.5
1972	41	8.3	30	8.4	6	10.9	5	6.6
1971	29	5.7	21	5.5	3	7.1	4	5.4
1970	30	5.7	17	4.7	4	8.9	9	7.2

NOTE: Rates are number of cesarean sections per 100 deliveries.

Table 2. Cesarean section rates for non-Federal short-stay hospitals in the United States and each region, 1970 and 1978, by age of mother

Area	Total	Age of mother					
		Under 20 years	20–24 years	25–29 years	30–34 years	35–39 years	40 years and over
United States:							
1978	15.2	11.8	13.1	16.4	19.3	21.7	19.1
1970	5.5	3.9	4.9	5.9	7.5	8.2	8.7
Northeast:							
1978	17.6	12.5	14.4	19.2	21.0	26.2	17.0
1970	6.2	3.4	5.1	6.5	9.2	7.1	12.7
North Central:							
1978	13.9	11.6	12.1	13.9	18.7	21.8	19.6
1970	4.7	3.2	4.5	5.5	5.8	4.9	5.0
South:							
1978	15.2	11.9	13.4	17.7	20.0	15.4	8.0
1970	5.8	4.6	5.3	6.5	6.1	11.4	6.0
West:							
1978	14.6	11.2	12.6	15.0	16.8	25.4	36.2
1970	5.7	4.4	4.5	4.7	10.1	11.1	13.3

NOTE: Rates are number of cesarean sections per 100 deliveries.

and health relationships found to be associated with C-section deliveries are also often related to postpartum sterilization, the rising rate of C-sections may have profound implications for the whole area of fecundity, infertility, and reproductive health.

Our third source of data on cesarean section was the National Hospital Discharge Survey (NHDS). In an unpublished study of 1970–75 trends, based on unpublished data from the NHDS, we found that 19.0 percent of the cesarean deliveries in 1975 also involved postpartum sterilization of the mother, compared with 5.6 percent of other deliveries (*11*).

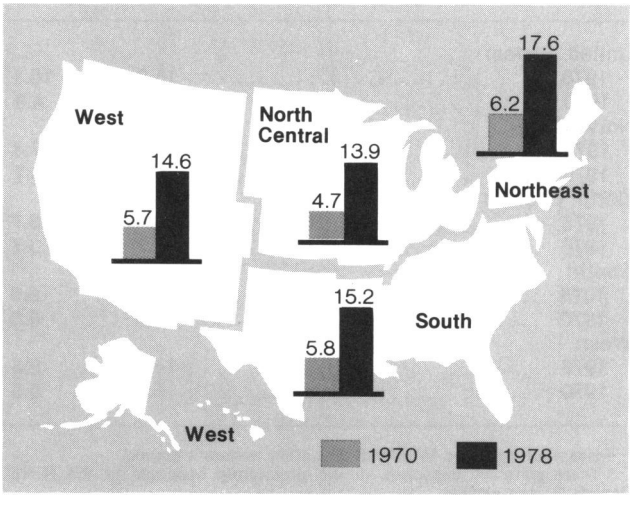
Study Methods

Data on discharges from short-stay hospitals are collected annually in the National Hospital Discharge Survey. Information for the NHDS is abstracted from the face sheets of medical records sampled for inpatients discharged from a national sample of non-Federal general and special short-stay hospitals. Roughly 200,000 medical records are sampled annually from the approximately 400 hospitals that participate in the survey, although sampling numbers and fractions vary from year to year. A more detailed report on the design of the NHDS has been published (*12*). Statistics in our report provide national estimates, but are based on NHDS sample data that are "weighted up" to reflect national estimates. Rates shown are the number of cesarean section deliveries per 100 total deliveries. Note that rates based on numbers of 5,000 or less are highly unreliable; the rates presented here are based on larger, more reliable numbers. The numbers upon which the rates are based represent an unduplicated count of mothers and compare well with the U.S. vital registration natality data.

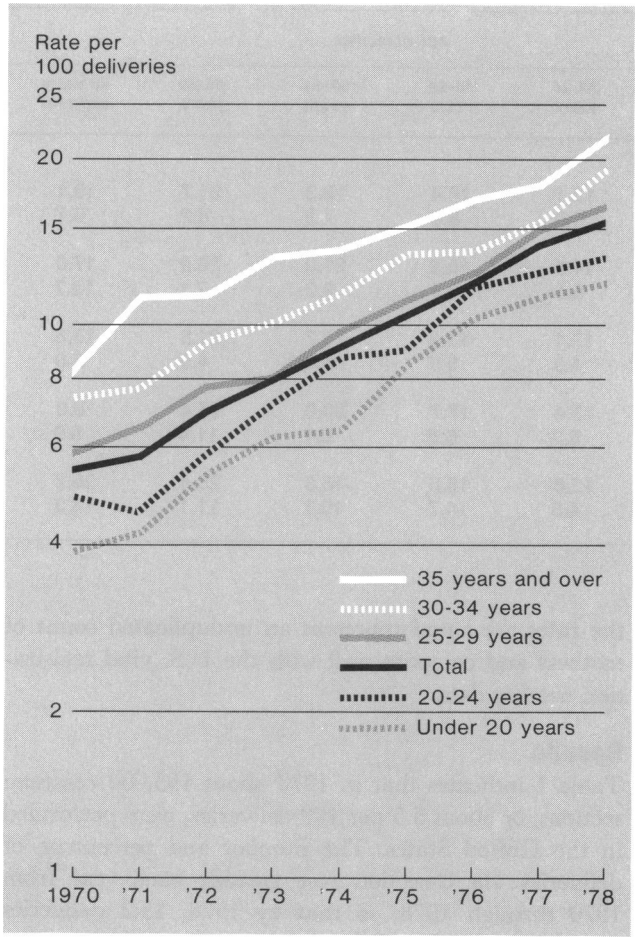
Results

Table 1 indicates that in 1970 about 195,000 cesarean sections, or about 5.5 per 100 deliveries, were performed in the United States. The number and percentage of deliveries via C-section rose steadily each year from 1970 through 1978, so that by 1978, 15.2 deliveries per 100, or 510,000 deliveries, were via C-section. The color of the mother did not cause substantial variation in C-section rates for each year examined. However,

Cesarean section rate (per 100 deliveries) for U.S. geographic regions, 1970 and 1978



Cesarean section rate (per 100 deliveries) for 5-year age groups and total for all age groups, 1970–78



since a limitation of NHDS data is that the "not stated" color category comprises a large proportion of the total, comparisons by color may not be valid.

Within each region, the same rising trend in C-rates was apparent. In 1970 the regional C-section rates were all in the 5 to 6 range, but within each region, C-section rates rose steadily, so that by 1978 all regions had C-section rates of 14 or more. The rate was highest

Table 3. Cesarean section rates for non-Federal short-stay hospitals in the United States and each region, 1970 and 1978, by marital status of mother

Area	Total	Marital status		
		Married [1]	Unmarried [2]	Not stated
United States:				
1978	15.2	15.5	13.3	18.1
1970	5.5	5.7	4.5	3.2
Northeast:				
1978	17.6	17.8	16.4	20.6
1970	6.2	6.3	5.1	3.1
North Central:				
1978	13.9	13.8	14.0	17.5
1970	4.7	4.9	3.7	3.4
South:				
1978	15.2	16.2	11.0	16.0
1970	5.8	6.1	4.5	2.2
West:				
1978	14.6	14.7	13.4	19.0
1970	5.7	5.7	5.7	6.4

[1] Includes separated women.
[2] Includes widowed and divorced women.
NOTE: Rates are number of cesarean sections per 100 deliveries.

Table 4. Cesarean section rates for non-Federal short-stay hospitals in the United States and each region, 1970 and 1978, by hospital size and ownership

Area and year	Total	Hospital size			Hospital ownership		
		Less than 100 beds	100–499 beds	500 beds or more	Proprietary	Government	Voluntary nonprofit [1]
United States:							
1978	15.2	10.1	15.7	17.0	16.4	13.1	15.8
1970	15.5	4.9	5.4	6.6	6.2	5.4	5.6
Northeast:							
1978	17.6	17.4	16.9	19.5	15.8	19.7	17.4
1970	6.2	3.7	6.2	7.1	5.5	6.4	6.2
North Central:							
1978	13.9	8.7	14.3	14.8	[2]	14.6	13.7
1970	4.7	3.7	4.8	5.1	[2]	4.8	4.7
South:							
1978	15.2	9.6	16.0	17.4	19.8	11.8	16.9
1970	5.8	5.3	5.1	7.4	5.9	5.7	5.9
West:							
1978	14.6	9.3	16.0	18.0	13.1	12.6	15.6
1970	5.7	5.5	5.7	6.4	6.8	5.0	5.9

[1] Hospitals operated by church and other nonprofit groups.
[2] There were no deliveries in the proprietary hospitals in the North Central Region sample.

NOTE: Rates are number of cesarean sections per 100 deliveries.

Table 5. Mean days in non-Federal short-stay hospitals in the United States and each region for cesarean section and other types of deliveries, 1970–78

Area and type of delivery	1978	1977	1976	1975	1974	1973	1972	1971	1970
United States:									
Cesarean sections	6.7	6.7	7.3	7.2	7.2	7.2	7.6	7.8	7.8
Other deliveries	3.2	3.4	3.6	3.6	3.7	3.7	3.7	3.8	3.9
Northeast:									
Cesarean sections	7.5	7.8	8.1	7.7	8.0	8.0	8.3	8.5	8.4
Other deliveries	3.8	3.9	4.3	4.0	4.1	4.3	4.4	4.3	4.5
North Central:									
Cesarean sections	7.0	7.3	7.6	8.2	7.8	7.8	8.0	7.8	8.4
Other deliveries	3.6	3.8	4.0	4.0	4.1	4.2	4.2	4.2	4.3
South:									
Cesarean sections	6.3	6.1	7.2	6.6	6.7	6.7	7.7	8.0	7.2
Other deliveries	3.0	3.1	3.5	3.4	3.4	3.3	3.4	3.4	3.5
West:									
Cesarean sections	5.9	5.6	5.8	5.8	6.0	6.1	6.2	5.8	6.7
Other deliveries	2.4	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.2

in the Northeast at 17.6 and lowest in the North Central Region at 13.9, as the map indicates.

Table 2 and the chart indicate cesarean section rates by age of the mother. The chart shows that the increase in rates was substantial for mothers under age 20. These teenage mothers experienced a C-section rate of 11.8 in 1978, and very little regional variation in C-section rates was observed among them. Mothers aged 20 to 24 had a C-section rate of 13.1, mothers aged 25–29 a rate of 16.4, mothers aged 30–34 a rate of 19.3, mothers aged 35–39 a rate of 21.7, and finally, mothers aged 40 and older a rate of 19.1, slightly less than the C-section rate for mothers in the next lower age group. Thus, in 1978, mothers aged 30 and older had about a 1-in-5 chance of delivering their infants via a C-section delivery. The fact that more than 1 in 10 mothers under age 20 had C-section deliveries forebodes rising cesarean section rates in the future, since these younger women are in the early childbearing period, and many will experience subsequent deliveries, most of which will be by C-section.

The mean age for mothers having cesarean sections in 1978 was 25.9 years and 24.7 years for mothers having other kinds of deliveries. Thus, mothers having C-sections were just about a year older than mothers having other kinds of deliveries, and this difference was consistent within all regions except the West, where the mothers having C-sections were 1½ years older.

Table 3 shows C-section rates by marital status of the mother. A married woman was at a slightly higher risk than an unmarried woman of having a C-section both in 1970 and 1978. Nationally, the rate in 1978 for married women was 15.5 compared with 13.3 for unmarried women. In the South, the rate for married women was also higher than for unmarried women (16.2 compared with 11.0); in the North Central Region, the rates were nearly identical for both groups (13.8 for married women compared with 14.0 for the unmarried).

Table 4 indicates C-section rates for 1970 and 1978 by hospital size and hospital ownership within each region. Notable increases in C-section rates occurred in hospitals of all sizes from 1970 to 1978 within all four regions. Similarly, significant increases in C-section rates occurred in hospitals with all types of ownership from 1970 to 1978 within all four regions. Hospitals of 500 beds or more had the highest C-section rates in all four regions both in 1970 and in 1978. For the United States as a whole, smaller hospitals of fewer than 100 beds had a C-section rate of 10.1, significantly lower than the rate of 17.0 for larger hospitals. In 1978, proprietary hospitals had the highest C-section rate (16.4), slightly higher than the rate for voluntary nonprofit hospitals (15.8) and the rate for city, county, and State government hospitals (13.1).

In table 5 the average length of hospital stay for mothers with C-section and other types of deliveries in the period 1970–78 is compared by region. In 1978, the average C-section stay was 6.7 days, as compared with only 3.2 days for other types of deliveries. A C-section therefore requires, on the average, an additional 3.5 days in the hospital, thus obviously increasing the cost of delivery. Within each region, shorter average hospital stays were observed for 1978 than for 1970 for both C-sections and other types of deliveries. From 1970 to 1978, the average length of stay for C-section in the United States declined from 7.8 days to 6.7 days, or a reduction of about 1 day. For other kinds of deliveries, the decline was from 3.9 days in 1970 to 3.2 days in 1978, or a decline of a little more than half a day.

Table 6. Percentage distribution of cesarean sections in non-Federal short-stay hospitals in the United States and each region, 1970 and 1978, by length of mother's hospital stay

Area	Number in thousands	Length of stay: 7 days or less	8–14 days	15 days or more
United States:				
1978	510	79.4	18.6	2.0
1970	195	57.3	39.1	3.7
Northeast:				
1978	119	67.8	29.8	2.4
1970	53	41.6	53.9	4.5
North Central:				
1978	130	75.7	22.5	1.8
1970	52	55.1	39.6	5.3
South:				
1978	170	84.8	13.0	2.2
1970	61	62.0	36.0	2.0
West:				
1978	92	89.6	9.0	1.4
1970	30	78.8	18.4	2.8

It is curious that the longest stay for C-sections is in the Northeast (7.5 days), where the C-section rates are highest. The length of stay for other types of deliveries is also the longest in the Northeast, at 3.8 days; mothers in the West had a much lower average stay, only 2.4 days for non-C-section deliveries and 5.9 days for C-sections.

Table 6 shows the percentage distribution of C-sections by length of hospital stay. Within all four regions, a far higher proportion of mothers with C-sections stayed a week or less in the hospital in 1978 than in 1970. For the United States as a whole, about four of five mothers (79.4 percent) with cesarean section deliveries left the hospital within a week in 1978, compared with less than three of five (57.3 percent) in 1970. Stays of 15 days or more were less common in 1978 than they were in 1970, except in the South. As one might expect, the percentage of mothers with stays of 7 days or less was greatest in the West (89.6 percent), where the average of length of stay was shortest; conversely, the percentage of mothers who stayed 7 days or less was lowest in the Northeast (67.8 percent), where the average length of stay was the longest.

Discussion

Based on 1970–78 National Hospital Discharge Survey data, a significant rise in the rate of cesarean sections was observed during this period. The uniformity of the increase within all regions, for all racial groups, for all ages, for women of all marital statuses, for all hospital sizes, and for all types of hospital ownership suggests that a fundamental and widespread change in obstetrical practice has taken place.

One suspect variable that has been associated with the rising C-section rate is fetal monitoring. In testimony before a recent Senate subcommittee (*13*), a study entitled "Fetal Heart Rate Monitoring and Scalp Sampling in High Risk Pregnancies" was cited. In this study, 690 high-risk obstetrical patients were randomly assigned to 1 of 3 types of fetal monitoring groups—auscultation, electronic monitoring alone, or electronic monitoring with an option to obtain the hydrogen ion concentration of the fetal scalp. The C-section rate for the auscultated patients was 5.6 percent; for the electronically monitored alone, it was 17.6 percent. This study, however, had a flaw that may invalidate the comparison: it did not control for use of medication. The 1972 NNS that we discussed earlier (*5*) is suggestive in this regard, since a greater use of analgesics was found in C-sections. Similarly, in a study at the University of Southern California of 50,000 deliveries from 1970 to 1974, Paul and co-authors found a primary C-section rate of 16 percent for monitored deliveries and a rate of 7 percent for unmonitored deliveries (*14*). Also, in a trend study of 323 California hospitals, Williams and Hawes found that the C-section rate rose from 5.2 percent in 1966 to 15.4 percent in 1977, primarily in hospitals where labor was electronically monitored (*15*). In a similar 1960–75 trend study in California, Petitti and co-authors also suggested that electronic monitoring was the factor responsible for the rise (*16*). A higher rate of monitoring and of C-sections among traditionally low-risk women may reflect the existence of more "concern," and consequently more technical treatment, for middle-class women, rather than establish a direct cause-and-effect relationship between monitoring and C-sections.

Similarly, Banta and Thacker, in a literature review of the costs and benefits of electronic fetal monitoring, concluded that half of the rise in C-sections can be attributed to electronic fetal monitoring, and that the additional cost over a normal delivery averages $2,300 (*4*). However, Hobbins and co-authors, in an editorial of rebuttal, found severe fault with these conclusions indicting electronic fetal monitoring (*17*).

The limitations of NHDS data do not permit the investigation of electronic fetal monitoring; nor do they permit us to investigate the safety of cesarean section either for the mother or the infant. The data obtained from cause-of-death information on the certificates of death that are available from the Division of Vital Statistics do not permit the ready calculation of the rates of death due to C-section for 1970–78. Furthermore, since in very few States is the type of delivery an item on the birth certificate, one cannot investigate the impact of cesarean section upon the health of the infant by reviewing national vital statistics registration data. However, studies of maternal and infant health

from the 1972 NNS may be suggestive. For example, maternal health complications are significantly associated with cesarean section (*5,18*). About one-fourth (24.5 percent) of the mothers having C-sections had one or more underlying medical conditions, a rate twice that for mothers having spontaneous, forceps, breech, or other kinds of delivery. Similarly, about one-third (31.5 percent) of the mothers having C-sections had one or more complications of pregnancy, again a significantly greater proportion than mothers having other kinds of delivery. Finally, three-fourths (75.1 percent) of the mothers having C-sections were identified by the hospital where the delivery occurred as having had one or more complications of labor, and this complication rate was two to five times greater than that for mothers having other kinds of delivery.

There seems to be no strong association between having insurance coverage and the kind of delivery; also, being insured for medical costs does not seem to provide an incentive for physicians to use surgery as a method of delivering babies.

In still another analysis of the 1972 NNS data (*19*), 52.8 percent of the mothers having C-section deliveries were found to have health insurance for prenatal care; 65.4 percent had health insurance for the hospital stay; and 61.2 percent had insurance coverage for physician care associated with delivery. Furthermore, in another analysis of 1972 NNS data (*20*), no significant relationship was found between the kind of delivery and the earliness and amount of prenatal care. Among mothers who had cesarean sections, 67.1 percent began their prenatal care in the first trimester, 18.8 percent in the second trimester, and 5.3 percent in the third trimester; 8.8 percent had no prenatal care from the hospital where the delivery occurred. Also, among women having cesarean sections, 8.8 percent had no visits for prenatal care, 6.3 percent had 1 to 4 visits, 26.1 percent had 5 to 9 visits, 43.5 percent had 10 to 14 visits, 13.8 percent had 15 to 19 visits, and 1.5 percent had 20 or more visits. Mothers having spontaneous, forceps, breech, or other kinds of delivery had about the same amount of prenatal care as women having cesarean sections. Mothers having cesarean sections seem to have had as much health insurance coverage and as much prenatal care as women having other kinds of deliveries, but they were much more likely to have underlying medical conditions and complications of pregnancy and labor than mothers having other kinds of delivery.

Infant health problems are also associated with C-sections. In an analysis of the 1972 NNS data (*21*), the kind of delivery was found to be related to low infant birth weight (2,500 gm or less). Nationally, 7.0 percent of the inhospital births of liveborn legitimate infants which were studied in the 1972 NNS involved low birth weight. However, 11.2 percent of the cesarean sections involved low birth weight infants. By way of comparison, 6.9 percent of spontaneous deliveries, 4.9 percent of forceps deliveries, 7.3 percent of other deliveries, and 28.4 percent of breech deliveries involved low birth weight babies. When these data were analyzed within period-of-gestation groups, breech deliveries were found to involve the greatest percentage of low birth weight infants in every gestation category of 40 weeks or less. However, cesarean sections were more likely than spontaneous and forceps deliveries to involve low birth weight infants when gestation was 36 weeks or less or from 37 to 39 weeks. Thus, there is a clear association between a mother having a cesarean section and having a low birth weight infant. Finally, the Apgar score has been found to be related to the kind of delivery, and breech deliveries were found to be associated with the lowest Apgar scores (*22*). However, when cesarean sections were compared with spontaneous and forceps deliveries, the Apgar scores for infants delivered by C-section were lower.

Thus, cesarean sections are associated with a wide range of maternal and infant health problems. Since the C-section rate has tripled from 1970 to 1978, it is difficult to argue that cesarean deliveries have increased in response to a proportionate increase in maternal and infant health problems. A logical explanation is that diagnostic techniques for the mother and the in-utero fetus have improved to the point that fetal distress is more easily detected, and obstetrical norms have changed to the point that surgical delivery has increasingly become an acceptable response to that distress. One might question whether monitoring is indeed recording fetal distress of the kind that will have an adverse effect on the infant or whether it is recording "normal" distress that is not harmful. Current obstetrical training suggests that surgical delivery may alleviate fetal distress and improve fetal outcome, but causal studies on this point are lacking.

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SYNOPSIS

PLACEK, PAUL J. (National Center for Health Statistics) and TAFFEL, SELMA M.: *Trends in cesarean section rates for the United States, 1970–78. Public Health Reports, Vol. 95, November–December 1980, pp. 540–548.*

With National Hospital Discharge Survey data collected by the National Center for Health Statistics as a basis, rates of cesarean section deliveries were computed for the United States and its regions for 1970 through 1978. For each year and within each region, trends were examined according to variations in the mother's color, age, and marital status and in the hospital size (number of beds), the form of hospital ownership, and the length of the mother's hospital stay. Within each region and for each variable considered, cesarean section deliveries rose fairly uniformly. Nationally, C-sections comprised 5.5 percent of all deliveries in 1970, but rose steadily to comprise 15.2 percent of all deliveries in 1978.

Overall, 1978 rates were highest in the Northeast, among whites, among women age 30 and over, among married women, in hospitals with 500 beds or more, and in proprietary hospitals. The mean length of the mother's hospital stay in 1978 was 6.7 days for cesarean section deliveries and 3.2 days for other deliveries, down from the mean hospital stay of 7.8 days for C-sections and 3.9 days for other deliveries observed in 1970.