

# Cesarean Section Rates in Italy by Hospital Payment Mode: An Analysis Based on Birth Certificates

## ABSTRACT

This study, based on birth certificate data from 1985 through 1987, investigated cesarean section (CS) rates in the Lazio region of Italy and their relationship with mode of hospital care payment. Use of abdominal delivery increased from 22.3% in 1985 to 24.3% in 1987. CS rates were highest (34.7%) in private hospitals. A marked variation in the use of CS was associated with mode of hospital care payment independently from other predictors of abdominal delivery. (*Am J Public Health*. 1992;82:257-261)

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### Introduction

Cesarean section (CS) deliveries have consistently increased in the past decades in Europe, North America, and the Pacific.<sup>1</sup> In the United States one out of four deliveries took place by CS in 1988,<sup>2</sup> and CS is the most common surgical procedure.<sup>3</sup> High CS rates are also observed in developing countries such as Brazil<sup>4</sup> and Puerto Rico.<sup>5</sup>

Several explanations and hypotheses have been offered to explain this impressive change in medical practice, such as a policy of subsequent cesarean delivery after a first cesarean, reluctance to deliver breech babies vaginally, and fear of malpractice suit.<sup>6</sup>

The use of CS for delivery is associated with nonclinical factors: socioeconomic status of women,<sup>7</sup> physician practice style,<sup>8,9</sup> physician work schedule,<sup>10</sup> and private or clinic care.<sup>11</sup> It has been shown in the United States that source of payment for obstetrical care is strongly associated with CS use, with women privately insured having the highest CS rate.<sup>12</sup> This observation was not confirmed in other countries with different health care systems.

In a previous preliminary report focusing on 1985 data regarding the Lazio region of Italy, we observed a high overall frequency of CS (22.5%) and a higher rate in private maternities (32.3%), where women pay all expenses for delivery.<sup>13</sup> To confirm this preliminary finding and investigate CS time trends, we analyzed birth certificate data for single infants born in 1985 through 1987 to women resident in the Lazio region. We compared the rates of CS by hospital payment mode after controlling, with logistic regression analysis, for the potential confounding effects of age, parity, birth weight, gestational age, presentation at birth, and day of delivery.

### Materials and Methods

The study was based on an analysis of the birth certificates of single infants

(live or stillborn) weighing more than 500 g and born to women resident in Lazio, a large region of central Italy, in the years 1985 through 1987. The largest city of the region is Rome, and the total regional population is about 5 100 000. Birth certificates are collected by the Medical Birth Registry coordinated by the Epidemiology Unit of the Regional Health Authority. Data on births are routinely linked to death certificates regarding deaths in the first year of life. The characteristics of the registry and the validation of data are described elsewhere.<sup>14</sup>

Hospital of birth was classified according to mode of medical care payment. There are three types of maternities in the Italian National Health Service (NHS): (1) NHS public hospitals, where medical care is provided free of any charge; (2) NHS private hospitals, where NHS pays a portion of the expenses (e.g., daily fees and medication) and the patient is responsible for physician fees and special services (e.g., individual room); and (3) private hospitals, where patients pay all expenses and no support is provided by NHS.

There are 96 maternities in the region (56 NHS public hospitals, 26 NHS private hospitals, and 14 private hospitals), with a total of about 47 000 births per year. All private hospitals are small units with a low number of births (e.g., the mean in 1986 was 191 births per year). Only 5 hospitals have more than 1500 births per year; 2 are teaching hospitals.

The initial cohort considered for the present study consisted of 139 284 single births; 2618 subjects were excluded (90 home births and 2528 with unknown information on mode of delivery and/or hospital of birth). The final cohort studied included 136 666 single hospital births. CS

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TABLE 1—Mode of Delivery by Year, Single Births, Lazio, Italy, 1985–1987

Mode of Delivery	1985		1986		1987	
	n	%	n	%	n	%
Vaginal	34 532	74.9	33 689	74.4	33 035	73.0
Cesarean section	10 276	22.3	10 312	22.8	11 025	24.3
Operative	1300	2.8	1278	2.8	1219	2.7

TABLE 2—Cesarean Section (CS) Rate by Hospital Payment Mode, Single Births, Lazio, Italy, 1985–1987

Hospital	Total Deliveries	CS Rate, %	Odds Ratio	95% Confidence Interval
NHS public	102 871	21.3	1.00	...
NHS private	25 692	26.7	1.34	1.30, 1.38
Private	8103	34.7	1.96	1.87, 2.06
Total	136 666	23.1	...	...

Note. See text for details on hospital classification. NHS = National Health Service.

rates were obtained by dividing the number of caesareans by the appropriate number of births (per 100).

Consistent with past research,<sup>15–17</sup> variables potentially predictive of CS were considered: maternal age, parity, gestational age, birth weight, presentation at birth, and day of the week of birth (weekday vs Sunday). The latter variable was considered because it had been associated with CS frequency in a previous analysis.<sup>18</sup> The Italian birth certificate does not include information on complications of pregnancy such as previous CS, dystocia, and fetal distress.

The strength of the association between CS rate, hospital payment, and the other predictive variables was evaluated using the odds ratio (OR); 95% confidence intervals (CIs) of the ORs were obtained using the test-based method.<sup>19</sup> Time trends were evaluated using the extended Mantel-Haenszel test.<sup>20</sup>

To assess the constancy of the relationship between payment source and CS rates, the data were stratified by maternal age, parity, birth weight, gestational age, presentation at birth, and day of delivery and the adjusted ORs calculated according to the Mantel-Haenszel method.<sup>21</sup> To further validate the findings derived from the above method, logistic regression analysis was employed to simultaneously estimate the independent effect of payment mode adjusted for the other predictive variables. The results of the multivariate analysis closely agreed with those of the tabular one. No statistical criteria

(such as the stepwise procedure) were employed to select variables to be included in the model. Tests of significance for model selection depend on the size of the studied population, and, in large studies such as the present one, any trivial variable may have a highly significant association with the event under study (small *P* values) regardless of its epidemiological and clinical meaning.<sup>22</sup> Adjusted ORs and 95% CIs were derived from the estimated regression coefficient.<sup>23</sup> An interaction term (parity by maternal age) was included in the equation to take into account the joint effect of these two variables.

## Results

The overall rate of CS in the years 1985 through 1987 among the 136 666 women delivering single infants in Lazio was 23.1% (Table 1). A marked statistically significant time trend (*P* < .0001) was observed over the time period studied (from 22.3% in 1985 to 24.3% in 1987). Provisional data for 1988 indicated a rate of 25.2% (R.B., unpublished data, 1991). Operative deliveries (forceps plus vacuum) constituted 2.8% of total deliveries without significant time trends.

A strong relationship was found between mode of hospital payment and CS rate. Women delivering in private hospitals had the highest CS rate (34.7%), while the rate of abdominal deliveries was lowest in NHS public hospitals (21.3%) (Table 2).

## Maternal Age

The CS rate increased with maternal age: rates ranged from 16.4% among women younger than 20 years to 43.8% among those older than 39, an OR of 3.97 (95% CI = 3.54, 4.45). The rate was 18.2% among women 20 through 24, 21.7% among women 25 through 29, 26.4% among women 30 through 34, and 33.9% among women 35 through 39.

CS rates in private hospitals were significantly higher than those in NHS private and public hospitals in all age classes, except among the younger women (Figure 1). In the latter group, women delivering in NHS private institutions experienced the highest CS rate (18.3% vs 14.7% in NHS public and 16.6% in private hospitals); the difference among the three types of hospitals was of borderline statistical significance (*P* = .055). The CS rate among women older than 39 was extremely high in the private hospitals (51.1%).

## Parity

The rate of CS significantly decreased with parity (23.9% for parity 0 and 22.4% for parity higher than 0). Within each parity class, the highest CS rate was observed in private hospitals (Figure 2). Since delivering in private hospitals can be judged as a proxy of the socioeconomic status of women,<sup>18</sup> and considering that most affluent women tend to be of lower parity and older maternal age,<sup>7</sup> the ORs of CS rates by hospital type were adjusted by maternal age and parity distribution. The adjusted OR<sub>mh</sub> of CS in private hospitals was 1.58 (95% CI = 1.50, 1.66), as compared with 1.96 in the crude analysis; no important change was observed for NHS private hospitals (OR<sub>mh</sub> = 1.32 vs OR<sub>crude</sub> = 1.34).

## Birth Weight and Gestational Age

The rates of CS were highest among women who delivered low-birth-weight (LBW) infants (34.3%), decreased with increasing birth weight (22.5%), and slightly increased for large babies (23.6%) (Table 3).

For each birth-weight class, CS rates significantly increased in going from NHS hospitals to the other two categories (*P* < .0001), although in private units a lower proportion of LBW and large babies at higher risk of CS were reported.

CS rates among women who delivered prematurely were highest (30.0%), decreased for full-term pregnancies, and increased again for postmature babies (24.5%) (Table 4). Again, rates were con-

sistently and significantly higher ( $P < .0001$ ) in private units at any gestational age.

### Complications

The use of CS is associated with various complications of pregnancy that are indications for carrying out the procedure.<sup>24</sup> The only complication reported in the Italian birth certificate is breech presentation of fetus at labor. The overall frequency of this complication was 3.3% and did not vary by hospital type. The rates of CS were highest in private and NHS private hospitals (84.7%), as compared with NHS public hospitals (75.7%) ( $P < .001$ ).

### Day of Delivery

CS rates were consistently lower on Sundays in all types of hospitals (overall CS rate of 15.7%), as compared with weekdays (overall rate of 24.1%). There was a statistically significant trend with regard to frequency of deliveries on Sundays ( $P < .0001$ ): The lowest rate was observed in private hospitals (8.8%), the highest in NHS public units (12.2%), and an intermediate value in NHS private maternities (10%).

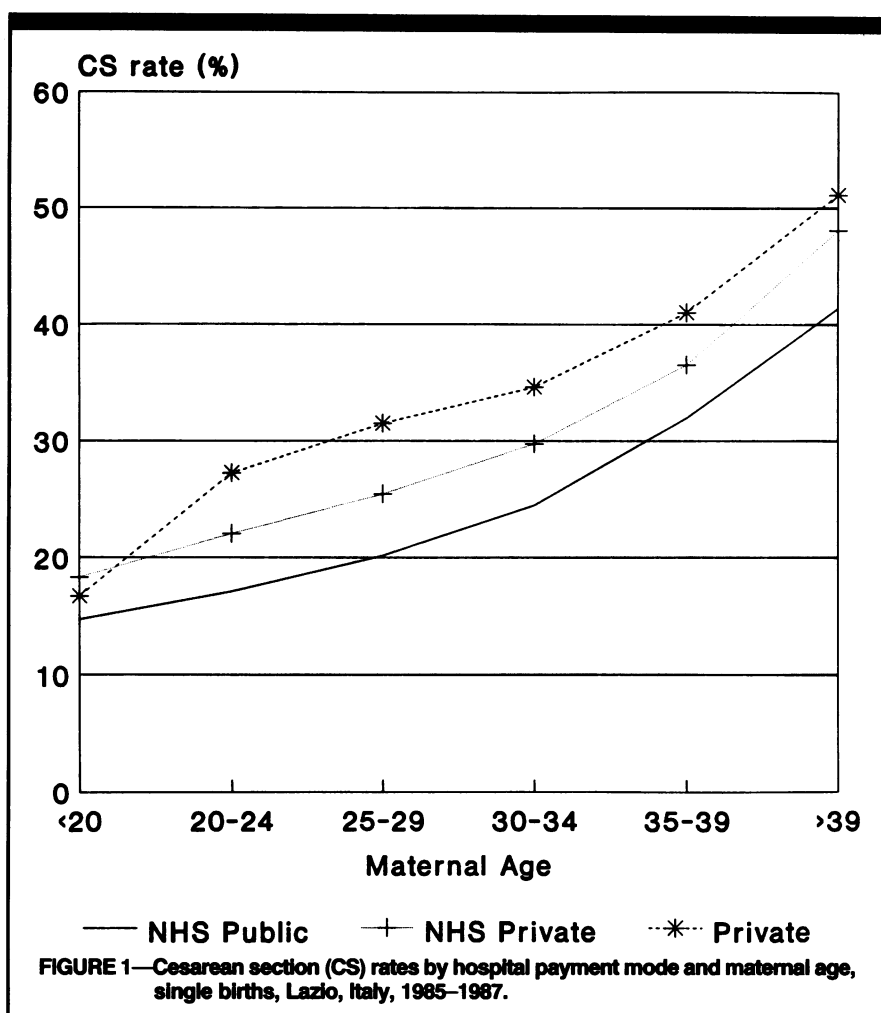
### Multivariate Analysis

The results of the simultaneous multiple logistic adjustment are shown in Table 5. The ORs referring to maternal age and parity are shown for each combination of these two variables. Compared with the univariate analysis of unadjusted ORs, the multivariate assessment indicated that hospital payment mode was still associated with the likelihood of CS when allowance was made for the effects of the other variables present in the model. However, the OR associated with private hospitals was lower than the one observed in the crude analysis. This could be attributed to the maternal age-parity effect discussed previously, in part counterbalanced by the combined effect of the other variables in the model. The CS OR associated with NHS private maternities was practically identical to the one observed in the crude analysis.

The effect of maternal age on CS rate was marked for older/parity 0 women as compared with younger women and women of the same age at parity higher than 0.

### Discussion

This study showed that in the Lazio region of Italy, approximately one of four babies was born by CS in the time period



1985 through 1987, the highest rate reported in Europe so far. Lazio figures were comparable to those observed in the United States in the same time period,<sup>25</sup> and were largely beyond the figure considered acceptable by international agencies.<sup>26</sup> The proportion of operative deliveries (forceps and vacuum) was minimal and did not follow any time trend.

Mode of payment for obstetric care was strongly associated with CS rates after controlling for the effects of the other available determinants of abdominal delivery. Because of the limited information included in the Italian birth certificate, the effect of some known determinants of CS could not be taken into account, namely previous CS delivery, dystocia, and fetal distress. However, it is unlikely that these variables were differently distributed in the three types of hospitals to such an extent as to modify the observed effect of mode of payment on CS rates. In fact, the heterogeneous CS rates by payment mode were also observed in primiparous women (Figure 2). On the other hand, data referring to breech deliveries, the only compli-

cation of pregnancy reported in the birth certificate, confirmed higher CS rates in NHS private and private maternities than in NHS public hospitals.

The heterogeneity of CS rates by hospital payment mode might be attributable to the interaction of a variety of factors, including characteristics of patients, mix of physicians, and organizational features. In the Lazio region, delivering in private maternities can be judged as a proxy of high socioeconomic status,<sup>18</sup> which is associated with higher CS rates.<sup>7</sup> In addition, a multiplicity of financial incentives, such as a higher physician fee for CS as compared with vaginal delivery and congruence of physician interest with that of hospital (long hospital stay after CS), may influence directly or indirectly the clinical decision.<sup>27</sup> It is interesting to note that, in Italy, most obstetricians work part-time in both public hospitals and private institutions (NHS private or private), making the two health care settings fully comparable with regard to physician training and age. This suggests that different decision-making rules were applied to different health-

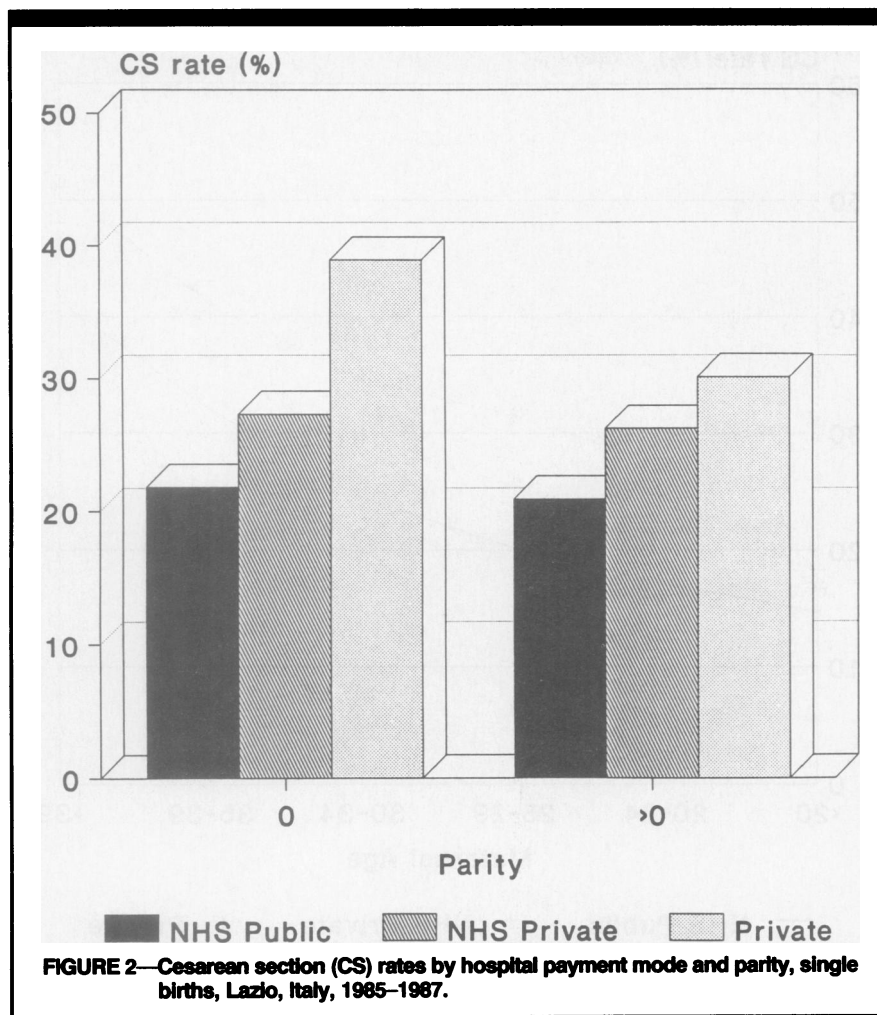


FIGURE 2—Cesarean section (CS) rates by hospital payment mode and parity, single births, Lazio, Italy, 1985-1987.

**TABLE 3—Cesarean Section (CS) Rates by Birth Weight and Hospital Payment Mode, Single Births, Lazio, Italy, 1985-1987**

Birth Weight, g	NHS Public		NHS Private		Private		Total CS Rate, %
	No. of Deliveries	CS Rate, %	No. of Deliveries	CS Rate, %	No. of Deliveries	CS Rate, %	
<2500	4911	33.6	915	37.5	283	47.0	34.3
2500-3999	89 720	20.6	22 712	26.2	7263	34.1	22.5
>3999	7961	21.9	1957	26.9	532	36.7	23.6

Note. NHS = National Health Service.

**TABLE 4—Cesarean Section (CS) Rates by Gestational Age and Hospital Payment Mode, Single Births, Lazio, Italy, 1985-1987**

Gestational Age, wk	NHS Public		NHS Private		Private		Total CS Rate, %
	No. of Deliveries	CS Rate, %	No. of Deliveries	CS Rate, %	No. of Deliveries	CS Rate, %	
<37	5643	29.3	1082	33.6	343	44.3	30.0
37-41	91 160	20.7	23 483	26.2	7430	34.2	22.6
>41	4256	23.4	667	30.0	232	34.9	24.5

Note. NHS = National Health Service.

**TABLE 5—Odds Ratios and 95% Confidence Intervals of Cesarean Sections by Selected Determinants,<sup>a</sup> Single Births, Lazio, Italy, 1985-1987**

Determinant	Odds Ratio	95% Confidence Interval
Hospital payment source		
NHS public	1.00	...
NHS private	1.35	1.31, 1.40
Private	1.64	1.56, 1.73
Birth weight, g		
<2500	1.47	1.38, 1.58
2500-3999	1.00	...
>3999	1.11	1.06, 1.16
Gestational age, wk		
Preterm (<37)	1.07	1.00, 1.14
At term (37-41)	1.00	...
Postterm (>41)	1.27	1.19, 1.36
Presentation		
Breech <sup>b</sup>	13.28	12.32, 14.32
Day of the week		
Weekday <sup>c</sup>	1.67	1.59, 1.75
Parity 0		
Maternal age, y		
<20	1.00	...
20-24	1.23	1.11, 1.36
25-29	1.58	1.43, 1.74
30-34	2.29	2.07, 2.54
35-39	5.07	4.48, 5.73
>39	15.48	12.19, 19.66
Parity > 0		
Maternal age, y		
<20	0.84	0.62, 1.14
20-24	1.11	1.00, 1.24
25-29	1.33	1.21, 1.47
30-34	1.68	1.52, 1.85
35-39	2.17	1.95, 2.40
>39	2.83	2.46, 4.58

Note. NHS = National Health Service.  
<sup>a</sup>Adjusted for all other factors present in the model.  
<sup>b</sup>Cesarean section rate observed in all other presentations taken as reference.  
<sup>c</sup>Sunday cesarean section rate taken as reference.

care settings for comparable clinical situations and comparable availability of diagnostic and surgical facilities. These different rules might be associated with the following factors: scheduling practices (such as 24-hour coverage by a staff obstetrician) that diminish the incentives for “convenience” CS in public maternities,<sup>10</sup> social congruity between obstetricians and middle-class parturients associated with the attitudes of these women toward the potential benefits of medical technology,<sup>7</sup> and the stronger fear of malpractice suits in cases of complication of pregnancy when caring for affluent and

more educated women, although malpractice suits in obstetrics are not common in Italy. All these elements may interact with physician practice style, which is associated with variability of CS use.<sup>8</sup> The decision to undertake a CS section is, in fact, not guided by unequivocal criteria; on the contrary, it is associated with a marked interobserver and, more surprising, intraobserver variability.<sup>28</sup>

In summary, our analysis of birth certificate data showed that the CS rate in 1985 through 1987 in the Lazio region was one of the highest ever reported. No tendency toward a leveling off of the rate, as observed in other countries,<sup>2,5</sup> was detected. This finding, together with the association of CS rate and hospital payment mode, was of great concern and underlines the urgent need for adopting regional and national strategies to reduce the use of abdominal delivery to more acceptable levels. □

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### References

- Notzon FC, Placek PJ, Taffel SM. Comparisons of national cesarean-section rates. *N Engl J Med.* 1987;316:386-389.
- Taffel SM, Placek PJ, Moien M. 1988 U.S. cesarean-section rate at 24.7 per 100 births—a plateau? *N Engl J Med.* 1990;323:199-200. Letter.
- Rutkow IM. Obstetric and gynecologic operations in the United States, 1979 to 1984. *Obstet Gynecol.* 1986;67:755-759.
- Rodrigues J. Urban hospital cesarean section delivery rates in Paraíba State, Brazil, 1977-1981. *Am J Public Health.* 1988;78:704-705.
- Notzon FC. International differences in the use of obstetric interventions. *JAMA.* 1990;263:3286-3291.
- Taffel SM, Placek PJ, Liss T. Trends in the United States cesarean section rate and reasons for the 1980-85 rise. *Am J Public Health.* 1987;77:955-959.
- Gould JB, Davey B, Stafford RS. Socio-economic differences in rates of cesarean section. *N Engl J Med.* 1989;321:233-239.
- Goyert GL, Bottoms SF, Treadwell MC, Nehra PC. The physician factor in cesarean birth rates. *N Engl J Med.* 1989;320:706-709.
- De Mott RK, Sandmire HF. The Green Bay cesarean section study I. The physician factor as a determinant on cesarean birth rates. *Am J Obstet Gynecol.* 1990;162:1593-1599.
- Fraser W, Usher RH, McLean FH, et al. Temporal variation in rates of cesarean section for dystocia: does 'convenience' play a role? *Am J Obstet Gynecol.* 1987;156:300-304.
- Haynes de Regt R, Minkoff HL, Feldman J, Schwarz RH. Relation of private or clinic care to the cesarean birth rate. *N Engl J Med.* 1986;315:619-624.
- Stafford RS. Cesarean section use and source of payment: an analysis of California hospital discharge abstracts. *Am J Public Health.* 1990;80:313-315.
- Bertollini R, Di Lallo D, Rapiti E, Perucci CA. Cesarean section rates in Italy. *Am J Public Health.* 1987;77:1554. Letter.
- Bertollini R, Di Lallo D, Perucci CA, et al. Description and validation of the natality and infant mortality information system in Lazio. *Neonatalogica.* 1988;2:26-34.
- National Institutes of Health. *Cesarean Childbirth: Report of the NICHD Task Force on Cesarean Childbirth.* Bethesda, Md: National Institutes of Health; 1981. DHHS publication no. (NIH) 82-2067.
- Goldfarb MG. *Who Receives Cesareans: Patient and Hospital Characteristics.* Rockville, Md: National Center for Health Service Research; 1984. DHHS publication no. (PHS) 84-3345.
- Williams RL, Chen PM. Controlling the rise in cesarean section rates by the dissemination of information from vital records. *Am J Public Health.* 1983;73:863-867.
- Bertollini R, Di Lallo D, Di Lena P, Gittarelli D, Papini P, Perucci CA. Rapporto del Sistema di Sorveglianza della natalità e mortalità infantile nel Lazio. Anno 1985-86. *Progetto Salute.* 1990;14:1-178.
- Miettinen O. Estimability and estimation in case-referent studies. *Am J Epidemiol.* 1976;103:226-235.
- Schlesselman JJ. *Case Control Studies. Design, Conduct, Analysis.* New York, NY: Oxford University Press; 1982:203-206.
- Mantel N, Haenszel W. Statistical aspects of the analysis of data from retrospective studies of disease. *J Natl Cancer Inst.* 1959;22:719-748.
- Schlesselman JJ. *Case Control Studies. Design, Conduct, Analysis.* New York, NY: Oxford University Press; 1982:252-254.
- Woolson RF. *Statistical Methods for Biomedical Research.* New York, NY: John Wiley and Sons; 1987.
- Mann LI, Gallant J. Modern indications for cesarean section. *Am J Obstet Gynecol.* 1979;135:437-441.
- Myers SA, Gleicher N. 1988 U.S. cesarean-section rate: good news or bad? *New Engl J Med.* 1990;323:200. Letter.
- World Health Organization. Appropriate technology for birth. *Lancet.* 1985;ii:436-437.
- Stafford RS. The impact of nonclinical factors on repeat cesarean section. *JAMA.* 1991;265:59-63.
- Barrett JFR, Jarvis GJ, MacDonald HD, Buchan PC, Tyrrell SN, Lilford RJ. Inconsistencies in clinical decisions in obstetrics. *Lancet.* 1990;336:549-551.