

# Maternal Preference for Cesarean Delivery

## Do Women Get What They Want?

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**OBJECTIVE:** To estimate the association between delivery preferences during pregnancy and actual delivery mode.

**METHODS:** This was a prospective cohort study using data from the Norwegian Mother and Child Cohort Study (N=65,959). We analyzed predictors of birth outcome by means of women's preferences for mode of delivery and a range of medical and socioeconomic factors with multivariable logistic regression models. The term "elective" cesarean delivery includes cesarean deliveries planned 8 hours or more before delivery and performed as planned.

**RESULTS:** When asked about delivery preference at 30 weeks of gestation, 5% of the women reported a preference for a cesarean delivery, 84% had a preference for vaginal delivery, and 11% were neutral. Among those with a cesarean delivery preference, 48% subsequently had a cesarean delivery (12% acute and 36% elective), and of those with a vaginal preference 12% delivered by cesarean (8.7% acute and 3.1% elective). When adjusting for maternal characteristics and medical indications, the odds for an acute cesarean delivery among nulliparous women with a cesarean delivery preference was almost

two times higher (odds ratio [OR] 1.97, 95% confidence interval [CI] 1.49–2.62) and for elective cesarean delivery the preference was 12 times higher (OR 12.61, 95% CI 9.69–16.42) than for women with a vaginal preference. For multiparous women, the corresponding figures were OR 3.13 (95% CI 1.39–7.05) and OR 10.04 (95% CI 4.59–21.99). When multiparous women with previous cesarean deliveries were excluded, the OR for an elective cesarean delivery was 26 times higher given a cesarean delivery preference compared with a vaginal delivery preference (OR 25.78, 95% CI 7.89–84.28). Based on a small subset of women with planned cesarean delivery on maternal request (n=560), we estimated a predicted probability of 16% for nulliparous women (25% for multiparous women) for such cesarean delivery.

**CONCLUSION:** Pregnant women's expressed preferences for delivery mode were associated with both elective and acute cesarean deliveries.

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**LEVEL OF EVIDENCE: II**

The increase in cesarean delivery rates in industrialized countries since the 1970s has caused concern, both from medical and societal points of view. Higher maternal age, more twin pregnancies, and other factors that increase the risk of adverse birth outcomes do not fully explain the increased rates of cesarean delivery.<sup>1</sup> Improvements in anesthetic and operative techniques with subsequent reduced operative risks may make physicians and patients more comfortable with a cesarean birth, even in cases in which maternal or fetal health is not directly threatened by a trial of labor. Conceivably, some of the increase can be ascribed to changes in clinical management<sup>2</sup> in combination with a lower threshold among obstetricians for performing operative delivery.<sup>3</sup> Another explanation of increasing cesarean delivery rates may lie in changes in women's preferences and their effect on medical decision-making. When asking women about their wishes for delivery,

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studies indicate that 6%–17% prefer cesarean delivery.<sup>4–13</sup> Therefore, the question is regarding to what extent women's expressed preferences play a role in decisions about delivery mode. Do pregnant women get what they want?

In Norway, all deliveries take place at public hospitals, free of charge to the women, and no private suppliers offer delivery services. In a white paper,<sup>14</sup> the Ministry of Health emphasized that women do not have the right to demand a cesarean delivery, a planned cesarean delivery should be medically indicated. However, attentiveness to patient preference should be a part of the calculus underlying the decision. Based on the guidelines in the white paper, the main objective of this study was to estimate the association between delivery preferences during pregnancy and actual delivery mode, controlling for individual characteristics and medical indications. The hypothesis was that preferences may play a role in elective, but not acute, cesarean deliveries.

## MATERIALS AND METHODS

Data stem from the Norwegian Mother and Child Cohort Study (version IV) and from the Medical Birth Registry of Norway. The Norwegian Mother and Child Cohort Study was conducted by the Norwegian Institute of Public Health<sup>15</sup> and approved by The Regional Committee for Medical Research Ethics and the Norwegian Data Inspectorate.

The Norwegian Mother and Child Cohort Study is a national cohort consisting of more than 100,000 pregnancies recruited into the study from 1999 through 2008; in total, 50 of 52 maternity units participated. Women could participate during more than one pregnancy. The total participation rate was 38.5% of all invited pregnancies.<sup>15,16</sup> Women were recruited to the study through a postal invitation during the same period as they were invited to the routine ultrasound examination offered in Norway to all pregnant women at 17–18 weeks of gestation. Informed written consent was obtained from each participant. The study encompasses information on socioeconomic factors, physical and mental health, medication, and a variety of environment exposures and lifestyle habits before and during pregnancy. This information is collected through comprehensive questionnaires targeting the mother at 17 weeks of gestation through 36 months after birth. In the present study we used information from questionnaire 1 (17 weeks of gestation), questionnaire 3 (30 weeks of gestation), questionnaire 4 (surveyed 6 months postpartum), in addition to data from Medical Birth Registry of Norway.

Based on a theoretical and empirical model, we selected variables, including maternal preferences, that we hypothesized could be associated with delivery outcomes. The outcome variable was mode of delivery. Information about type of delivery and classification into elective or acute cesarean delivery was extracted from the Medical Birth Registry of Norway; missing information was supplemented with information from the Norwegian Mother and Child Cohort Study. The term “elective” cesarean delivery includes a cesarean delivery planned 8 hours or more before delivery and performed as planned; otherwise, the cesarean delivery is defined as acute (ie, unplanned). An acute cesarean delivery is unplanned or may include a planned cesarean delivery if the operation is performed other than planned. Information about an elective cesarean delivery performed because of women's preference, hence a proxy for cesarean delivery on maternal request, was based on postpartum information from the women (survey 6 months postpartum: “Was your child delivered by cesarean?” “If yes, was the cesarean planned?” “If planned cesarean, why?”, with the response, “own preference”).

The “preference for delivery” was measured by the response to the following statement: “If I could choose I would prefer to have a cesarean” (week 30 of pregnancy) captured on a six-point response scale. The responses “agree completely” and “agree” were classified as “cesarean preference,” responses “agree somewhat” or “disagree somewhat” were classified as “neutral preference,” whereas responses “disagree” and “disagree completely” were classified as “vaginal preference.” We adjusted for confounding factors such as socioeconomic (age, education, and marital status), pre-existing maternal chronic diseases (includes hypertension, heart and renal diseases, epilepsy, or rheumatoid arthritis, as well as maternal diabetes, including gestational diabetes), and delivery-specific factors (including plurality, fetal presentation, previous cesarean delivery, preeclampsia, fetal distress, and dystocia). The term “dystocia” includes mechanical disproportion, slow progress, or oxytocin augmentation. The delivery-specific factors constitute the main medical indications for performing cesarean deliveries in Norway.<sup>17</sup> Women with placenta previa were excluded from the analyses, because placenta previa late in pregnancy is an absolute indication for cesarean delivery.

Data were analyzed with PASW Statistics 18. Differences in cross tables were tested with Pearson  $\chi^2$  tests, and associations between the variables were analyzed by correlation coefficients (Pearson or Spearman as appropriate).



We performed multivariable logistic regressions to estimate the association between delivery preference and delivery mode: vaginal compared with any cesarean, vaginal compared with acute cesarean, vaginal compared with elective cesarean (excluding cesarean delivery on maternal request as judged by the women), and vaginal compared with planned cesarean because of own preferences (cesarean delivery on maternal request). Vaginal birth was the reference group. All regression analyses were performed separately for nulliparous and multiparous women. In addition, we performed subgroup analyses for women with previous cesarean deliveries compared with no previous cesarean deliveries. We tested for relevant interactions by introducing interaction terms between preference and, respectively, education, presentation, plurality, dystocia, fetal distress, and previous cesarean delivery, and we retained those that were statistically significant.

Predicted probabilities<sup>18</sup> of acute cesarean delivery, elective cesarean delivery, and cesarean delivery on maternal request were calculated on the basis of the estimated coefficients in the regression analyses. We first predicted the probability of cesarean delivery for a “reference woman” inspired by the “standard primipara” method suggested by Paterson et al.<sup>19,20</sup> This woman has low expected risk of intervention and adverse outcomes. She is younger than age 35, has higher education of up to 4 years, is married or cohabitant, is without pre-existing chronic disease, and has had no previous cesarean delivery. She carries a single fetus in cephalic presentation with no delivery complications such as dystocia, preeclampsia, or fetal distress. She has a vaginal delivery preference when asked during pregnancy. Second, we predicted the probability of a cesarean delivery, given a cesarean delivery preference (given all other characteristics). Subsequently, we predicted the probability of cesarean delivery for various types of women, eg, if a relative indication such as a previous cesarean delivery is present, either singly or in combination with a cesarean delivery preference.

A  $P < .05$  was considered statistically significant. Observations with missing values for any of the variables were excluded from the analyses.

## RESULTS

Only women who responded to questions about their preferred choice of delivery method were included in the present study. The study sample consisted of 65,959 women (33,107 nulliparous and 32,852 multiparous women) after excluding 164 with missing

information about parity and 392 women with placenta previa.

The mean age of the respondents was 30 years, and 84% were younger than age 35. The majority was married or cohabitant and 39% had completed higher education of up to 4 years, whereas 23% had started or completed more than 4 years of higher education. Approximately 2% of the total population was pregnant with more than one fetus. Among the multiparous women, 13.5% had a previous cesarean delivery.

In the total study sample, 15% ( $n=9,847$ ) delivered by cesarean, of which 62% ( $n=6,097$ ) of the cesarean deliveries were classified as acute. The cesarean delivery rate was higher among nulliparous women than multiparous women (17% compared with 13%,  $P < .001$ ), among pregnancies with more than one fetus compared with singleton pregnancies (41% compared with 15%,  $P < .001$ ), and among multiparous women with a previous cesarean delivery compared with no previous cesarean delivery (45% compared with 8%,  $P < .001$ ). Of the total study population, 0.8% ( $n=560$ ) stated that they had undergone a planned cesarean delivery because of maternal request (cesarean delivery on maternal request; 136 nulliparous women and 424 multiparous women). The proportion of cesarean delivery on maternal request constituted 16% of the elective cesarean deliveries, or 5.7% of all cesarean deliveries.

In the study sample ( $N=65,959$ ), 5.0% reported a cesarean delivery preference, 11% were neutral, and 84% had a vaginal delivery preference. The proportions with a cesarean delivery preference were 3.5% and 6.6% among nulliparous women and multiparous women, respectively, whereas the corresponding proportions for a vaginal delivery preference were 85% (nulliparous) and 83% (multiparous). A cesarean delivery preference was reported among 4.2% of multiparous women with no previous cesarean deliveries compared with 22% among multiparous women with previous cesarean deliveries.

Among those who reported a cesarean delivery preference, 52% delivered vaginally, whereas 12% had an acute cesarean delivery and 36% delivered by elective cesarean. Among those who reported a vaginal delivery preference, 88% delivered vaginally, whereas 8.7% had an acute cesarean delivery and 3.1% had an elective cesarean delivery ( $P < .001$ ). Among nulliparous women with a vaginal preference, 3.2% delivered by elective cesarean compared with 21% among those with a cesarean delivery preference. Among multiparous women, the corresponding proportions were 3.0% and 44% (Table 1).



**Table 1. Distribution of Delivery Method Relative to Delivery Preference (Percentage Within Delivery Preference) According to Parity**

Delivery Preference	Delivery Method*									
	Cesarean									
	Vaginal		Acute		Elective		Cesarean Delivery on Maternal Request		Unspecified	
	P0	P1+	P0	P1+	P0	P1+	P0	P1+	P0	P1+
Vaginal	84.4	91.6	11.8	5.4	3.2	2.8	0.0	0.2	0.6	0.2
Neutral	78.7	78.9	14.5	10.0	5.2	9.1	0.8	1.8	0.8	0.3
Cesarean	64.1	45.1	15.2	10.9	12.4	28.9	8.1	14.8	0.3	0.3

P, para.

Data are %.

\* Para 0, n=33,107; para 1+, n= 32,852.

Women's preference for a cesarean delivery was significantly associated with a cesarean delivery in general (results not shown) and with both acute and elective cesarean deliveries when grouped separately (Table 2). Among nulliparous women with a cesarean delivery preference, the odds ratio (OR) for acute cesarean delivery was almost doubled (OR 1.97, 95% confidence interval [CI] 1.49–2.62), and the OR for an elective cesarean delivery was 12 times higher (OR 12.61, 95% CI 9.69–16.42) than for women with a vaginal delivery preference (Table 2). For multiparous women, the corresponding ORs were 3.13 (95% CI 1.39–7.05) and 10.04 (95% CI 4.59–21.99). Additionally, older maternal age and pre-existing maternal chronic disease increased the OR of having an operative delivery for both parity groups (Table 2). Delivery-specific factors such as breech, dystocia, preeclampsia, and fetal distress were significantly associated with having an acute cesarean delivery in both parity groups. However, even after controlling for such delivery-specific factors, the expressed preferences for delivery mode were predictive of the delivery that occurred (Table 2).

Multivariable logistic regressions for multiparous women with a previous cesarean delivery revealed a nonsignificant association between the preference for and subsequent cesarean delivery, both for acute and elective ones (Table 3). However, the effect of preference was significant for elective cesarean delivery in interaction with medical indication such as dystocia (cesarean delivery preference×dystocia: OR 0.59, 95% CI 0.35–1.00). Similarly, the effect of preference was significant for acute cesarean delivery in interaction with dystocia (cesarean delivery preference×dystocia: OR 0.26, 95% CI 0.15–0.46) and fetal distress (cesarean delivery preference×fetal distress: OR 0.49,

95% CI 0.24–0.97). For the other subgroup—multiparous women with no previous cesarean deliveries—the preferences still were confirmed significant for both elective and acute cesarean deliveries (acute: OR 3.88, 95% CI 1.43–10.55; elective: OR 25.78, 95% CI 7.89–84.28).

Multivariable logistic regressions (Table 4) revealed a significant association between a maternal preference for cesarean delivery during pregnancy and a subsequent delivery by planned cesarean delivery because of own preference (cesarean delivery on maternal request) when adjusted for potential medical indications and maternal confounders. The OR for a cesarean delivery on maternal request, given a cesarean delivery preference, was 381 (OR 380.23, 95% CI 191.27–755.85) among nulliparous women and 261 among multiparous women (OR 261.18, 95% CI 165.09–413.21; Table 4).

The predicted probability for a cesarean delivery (irrespective of subgroups) was 7.7% for nulliparous women and 3.0% for multiparous women. For a nulliparous reference woman, the predicted probability of an elective cesarean delivery was 1.7% given a vaginal delivery preference, 3.9% for those with a neutral preference, and 17.5% among those with a cesarean delivery preference. Compared with a nulliparous woman, a multiparous woman had a slightly lower predicted probability for cesarean delivery given a vaginal (0.8%) preference, but a somewhat higher predicted probability given a cesarean delivery preference (22% among the multiparous women compared with 17% among nulliparous women). The probability of having a planned cesarean delivery because of own preference (cesarean delivery on maternal request) was 16% for nulliparous women and 25% among multiparous women.



**Table 2. Multivariable Logistic Regression of Delivery Outcome\***

Characteristic	Nulliparous Women				Multiparous Women			
	Acute Cesarean Delivery <sup>†</sup> (n Included in Analysis=31,169) (N=31,528)		Elective Cesarean Delivery <sup>‡</sup> (Excluding Cesarean Delivery on Maternal Request) (n Included in Analysis=28,414) (N=28,729)		Acute Cesarean Delivery <sup>§</sup> (n Included in Analysis=30,183) (N=30,681)		Elective Cesarean <sup>  </sup> (Excluding Cesarean Delivery on Maternal Request) (n Included in Analysis=29,839) (N=30,323)	
Age (y)								
Younger than 35	29,078	Ref	26,588	Ref	23,303	Ref	22,995	Ref
35 or older	2,450	1.67 (1.49–1.88)	2,141	2.69 (2.16–3.35)	7,378	1.27 (1.14–1.43)	7,328	1.35 (1.18–1.55)
Education								
Compulsory school	508	Ref	451	Ref	817	Ref	808	Ref
High school	9,798	0.89 (0.68–1.16)	8,810	0.80 (0.46–1.39)	10,952	1.23 (0.84–1.81)	10,768	0.83 (0.50–1.38)
Higher education	12,352	0.75 (0.57–0.98)	11,289	0.78 (0.45–1.35)	11,669	0.86 (0.59–1.27)	11,573	0.64 (0.39–1.07)
fewer than 4 y								
Higher education	7,859	0.67 (0.51–0.87)	7,286	0.82 (0.47–1.43)	6,132	0.99 (0.66–1.46)	6,060	0.69 (0.41–1.17)
more than 4 y								
Marital status								
Married or cohabitating	30,154	Ref	27,468	Ref	30,033	Ref	29,701	Ref
Not married or cohabitating	1,374	1.00 (0.84–1.20)	1,261	1.16 (0.83–1.63)	648	1.15 (0.83–1.60)	622	0.56 (0.35–0.90)
Chronic diseases <sup>¶</sup>								
Not present	30,753	Ref	28,026	Ref	29,866	Ref	29,558	Ref
Present	775	1.33 (1.08–1.64)	703	1.81 (1.25–2.63)	795	1.63 (1.25–2.12)	765	1.28 (0.91–1.82)
Diabetes								
No	31,118	Ref	28,398	Ref	30,275	Ref	29,937	Ref
Pre-existing diabetes	162	2.99 (2.08–4.30)	121	4.47 (2.20–9.11)	150	3.39 (2.14–5.35)	144	3.35 (1.87–6.00)
Gestational diabetes	223	1.99 (1.41–2.81)	189	2.03 (1.02–4.03)	248	1.99 (1.32–2.99)	235	1.21 (0.70–2.09)
Plurality								
1 fetus	31,050	Ref	28,337	Ref	30,232	Ref	29,893	Ref
More than 1 fetus	478	1.59 (1.27–2.00)	392	0.94 (0.66–1.33)	449	0.83 (0.61–1.13)	430	0.57 (0.39–0.84)
Presentation								
Cephalic	30,291	Ref	27,354	Ref	29,833	Ref	29,410	Ref
Breech	1,129	8.37 (7.24–9.67)	1,308	107.25 (89.43–128.64)	760	17.29 (14.37–20.80)	843	80.75 (63.75–102.28)
Previous cesarean delivery								
No	NR	NR	NR	NR	27,499	Ref	26,893	Ref
Yes					3,182	4.75 (4.22–5.34)	3,430	23.21 (19.20–28.06)
Dystocia <sup>‡</sup>								
No	16,380	Ref	15,454	Ref	24,319	Ref	24,460	Ref
Yes	15,148	1.27 (1.18–1.38)	13,275	0.25 (0.20–0.30)	6,362	1.34 (1.18–1.53)	5,863	0.30 (0.23–0.38)
Preeclampsia								
No	29,878	Ref	27,523	Ref	29,907	Ref	29,637	Ref
Yes	1,649	3.70 (3.29–4.16)	1,205	2.07 (1.55–2.76)	774	2.89 (2.33–3.59)	686	1.28 (0.93–1.77)
Fetal distress								
No	28,095	Ref	26,428	NR	29,397	Ref	29,557	NR
Yes	3,433	5.33 (4.86–5.85)	2,301		1,284	15.19 (13.00–17.75)	766	
Preference								
Vaginal	27,046	Ref	24,634	Ref	26,412	Ref	25,694	Ref
Neutral	3,569	1.42 (1.20–1.68)	3,214	2.43 (1.88–3.15)	3,056	2.96 (1.44–6.05)	3,026	3.11 (1.20–8.02)
Cesarean	913	1.97 (1.49–2.62)	881	12.61 (9.69–16.42)	1,213	3.13 (1.39–7.05)	1,603	10.04 (4.59–21.99)

Ref, reference; NR, not relevant.

Data are n or odds ratio (95% confidence interval).

Vaginal delivery was the reference group (=0) for the dependant variable in the multivariable regressions.

\* Interactions between preference and, respectively, education, presentation, plurality, dystocia, fetal distress, and previous cesarean delivery were tested, and significant interaction terms were included in the final model but not illustrated for brevity.

† Significant interaction terms: neutral preference × dystocia (OR less than 1) and cesarean preference × dystocia (OR less than 1).

‡ Significant interaction term: neutral preference × breech presentation (OR less than 1).

§ Significant interaction terms: neutral preference × low education (OR less than 1), cesarean preference × dystocia (OR less than 1), neutral preference × fetal distress (OR less than 1), and cesarean preference × fetal distress (OR less than 1).

|| Significant interaction terms: cesarean preference × higher education (OR more than 1), neutral preference × previous cesarean (OR less than 1), cesarean preference × previous cesarean (OR less than 1), neutral preference × dystocia (OR less than 1), cesarean preference × dystocia (OR less than 1), and cesarean preference × breech presentation (OR less than 1).

¶ Includes preexisting maternal hypertension, heart and kidney diseases, rheumatoid arthritis, and epilepsy.

‡ Captures mechanical disproportion, slow progress, and oxytocin augmentation.



**Table 3. Subgroup Analyses of Multiparous Women According to Previous Cesarean Delivery: Multivariable Logistic Regression of the Effect of Preference on Delivery Outcome\***

Preference	No Previous Cesarean Delivery		Previous Cesarean Delivery	
	Acute (n=27,063, Missing 436)	Elective (n=26,466, Missing 427)	Acute <sup>†</sup> (n=3,120, Missing 62)	Elective <sup>‡</sup> (n=3,373, Missing 57)
Vaginal	Ref	Ref	Ref	Ref
Neutral	3.29 (1.38–7.82)	6.09 (1.47–25.32)	2.13 (0.58–7.84)	1.07 (0.30–3.89)
Cesarean	3.88 (1.43–10.55)	25.78 (7.89–84.28)	1.76 (0.41–7.63)	1.99 (0.70–5.60)

Ref, reference.

Data are odds ratio (95% confidence interval).

Vaginal delivery was the reference group (=0) for the dependant variable in the multivariable regressions.

\* Adjusted for maternal age, education, plurality, presentation, maternal diabetes, maternal chronic diseases, dystocia, preeclampsia, fetal distress (acute cesareans only), and the following interaction terms: preference × presentation, preference × dystocia, and preference × fetal distress (acute cesarean delivery only).

<sup>†</sup> Significant interaction terms: cesarean preference × fetal distress (OR less than 1) and cesarean preference × dystocia (OR less than 1).

<sup>‡</sup> Significant interaction term: cesarean preference × dystocia (OR less than 1).

For both nulliparous and multiparous women, a maternal preference, alone or in combination with relative indications, increased the probability for acute cesarean delivery and elective cesarean delivery (Table 5). There were small effects of varying maternal socioeconomic factors on the predicted probability of having a cesarean delivery (results not shown).

Prediction for the multiparous subgroup changed according to previous and no previous cesarean deliveries. For multiparous women with a previous cesarean delivery, a cesarean delivery preference has a predicted probability of 31% for an acute cesarean delivery and 51% for an elective cesarean delivery. Given a vaginal delivery preference, the corresponding probabilities were 8.7% and 9.6%, respectively. When adding medical indications to the predictions, the predicted probabilities changed considerably, for instance, a breech presentation and a cesarean delivery preference increases the predicted probability of an acute and elective cesarean delivery to 87% and 93%, respectively. Among women with no previous cesarean delivery, the predicted probabilities were generally lower; a cesarean delivery preference has a predicted probability of 7.3% for an acute cesarean delivery and 23% for elective cesarean delivery, whereas given a vaginal delivery preference the corresponding probabilities were 1.7% and 0.8%, respectively (Table 5).

## DISCUSSION

A preference for cesarean delivery in gestational week 30 was associated with cesarean delivery as the actual mode of delivery, even with respect to acute cesarean delivery. Among those with a cesarean delivery preference 12% delivered by acute cesarean and 36% delivered by elective cesarean, compared with 8.7%

acute and 3.1% elective cesarean deliveries among those with a vaginal delivery preference.

A main strength of this study was the comprehensive dataset from a large national cohort, although the participation rate was low. The sample was mainly representative of the Norwegian birth population with respect to the cesarean delivery rate, maternal age, and parity.<sup>15,21</sup> However, multiparous women and women with low socioeconomic status were underrepresented in our sample. A possible weakness in our study population lies in the potential for self-selection. Nonresponders may have different opinions than the responders. Also, women who disliked their first delivery may opt for no more pregnancies, and multiparous women consequently represent a selected group compared with nulliparous women.

A sample with this many covariates allows us to control for many relevant confounders, although confounding cannot be totally disregarded because of unobserved variables, the least not being cultural ones. The present study had limited information on provider characteristics. Patient preference for delivery mode was measured at one time point, and preferences may change during pregnancy.<sup>12</sup>

The OR of an elective cesarean delivery was almost 10 times higher among nulliparous women given a cesarean delivery preference (relative to a vaginal preference), whereas it was 12 times higher among multiparous women (Table 2). Even after including factors such as previous cesarean delivery, breech, dystocia, and fetal distress, which are significantly associated with the choice of delivery mode, the ORs and the related predicted probabilities illustrate that the maternal preference is, in itself, significantly associated with cesarean delivery (Tables 2 and 5).



**Table 4. Multivariable Logistic Regression of Planned Cesarean Delivery Attributable to Own Preference\***

	Cesarean Delivery on Maternal Request			
	Nulliparous Women <sup>†</sup> (n=27,614, n Included in Analysis=26,692)		Multiparous Women <sup>†</sup> (n=29,058, n Included in Analysis=27,974)	
Age (y)				
Younger than 35	25,628	Ref	22,183	Ref
35 or older	1,986	4.87 (2.90–8.19)	6,875	0.97 (0.74–1.27)
Education				
Low education (up to high school)	8,900	Ref	11,039	Ref
Higher education	17,849	0.98 (0.65–1.47)	16,964	1.45 (1.14–1.85)
Marital status				
Married or cohabitant	26,406	Ref	28,454	Ref
Not married or cohabitant	1,208	0.63 (0.26–1.50)	604	0.91 (0.44–1.88)
Chronic diseases <sup>§</sup>				
No	26,964	Ref	28,345	Ref
Yes	650	1.45 (0.53–3.96)	713	0.87 (0.40–1.92)
Diabetes				
No	27,318	Ref	28,722	Ref
Maternal diabetes (including gestational diabetes)	278	4.50 (1.40–14.43)	331	0.69 (0.26–1.80)
Plurality				
One fetus	27,302	Ref	28,686	Ref
More than one fetus	312	2.81 (1.18–6.70)	372	1.78 (0.80–4.00)
Presentation				
Cephalic	26,958	Ref	28,523	Ref
Breech	592	25.43 (12.45–51.95)	473	20.17 (8.73–46.60)
Dystocia <sup>  </sup>				
No	14,597	Ref	23,357	Ref
Yes	13,107	0.22 (0.06–0.78)	5,683	0.18 (0.05–0.60)
Preeclampsia				
No	26,506	Ref	28,437	Ref
Yes	1,107	0.30 (0.08–1.05)	621	0.41 (0.16–1.04)
Previous cesarean				
No	NR	NR	26,428	Ref
Yes			2,630	9.64 (4.97–18.68)
Preference				
Vaginal	23,740	Ref	24,986	Ref
Neutral	3,043	18.10 (8.69–37.70)	2,774	14.02 (7.90–24.87)
Cesarean	831	380.23 (191.27–755.85)	1,298	261.18 (165.09–413.21)

Ref, reference.

Data are n or odds ratio (OR) (95% confidence interval).

Vaginal delivery was the reference group (=0) for the dependant variable in the multivariable regressions.

\* The following interaction terms were tested between preference and, respectively, education, presentation, plurality, dystocia, fetal distress, and previous cesarean. Only significant interaction terms were included in the final model but not illustrated for brevity.

<sup>†</sup> Significant interaction term: cesarean preference × dystocia (OR<1).

<sup>‡</sup> Significant interaction terms: cesarean preference × dystocia (OR<1) and cesarean preference × previous cesarean (OR<1).

<sup>§</sup> Includes preexisting maternal hypertension, heart and kidney diseases, rheumatoid arthritis, and epilepsy.

<sup>||</sup> Includes mechanical disproportion, slow progress, and oxytocin augmentation.

Interpreting the preferences and delivery route in the group with previous cesarean deliveries is a challenge. The preference was significant in analyses without interactions. However, including interactions between preference and delivery-specific risk factors (dystocia and fetal distress), the preference alone was not significant. Apparently, the medical factors, including previous cesarean delivery, rather than preferences influence delivery mode.

Interestingly, a cesarean delivery preference during pregnancy is associated not only with increased rates of elective cesarean deliveries but also with acute cesarean deliveries. These associations may be causal, but interpretation of the findings should be performed with care. It is not clear how the preferences may play a role in the decision-making among those involved (the pregnant woman, the midwife, and the obstetrician). A woman with a vaginal delivery preference



**Table 5. Predicted Probability of an Elective or Acute Cesarean Delivery Given Specific Maternal or Fetal Characteristics According to Parity and Preference for Delivery Mode\***

	Predicted Probability (%) of a Cesarean Delivery					
	Nulliparous Women		Multiparous Women			
	Elective	Acute	No Previous Cesarean		Previous Cesarean	
Elective			Acute	Elective	Acute	
Reference woman	1.7	6.1	0.8	1.7	9.6	8.7
Cesarean preference	17.5	11.3	23.1	7.3	51.1	30.6
Age older than 35 y	4.3	9.8	1.0	2.2	13.3	9.4
Age older than 35 y plus cesarean preference	36.3	17.6	27.9	9.7	60.1	32.3
Plurality	1.6	9.4	0.41	1.3	8.8	12.1
Plurality plus cesarean preference	16.6	16.9	13.6	5.9	48.7	38.9
Breech	64.3	35.1	43.6	24.7	70.9	58.8
Breech plus cesarean preference	94.5	71.4	87.3	60.6	93.4	86.8
Dystocia	0.4	7.6	0.2	1.9	3.3	13.6
Dystocia plus cesarean preference	1.4	8.9	1.9	3.5	16.5	15.8
Fetal distress	NR	25.7	NR	27.3	NR	35.1
Fetal distress plus cesarean preference	NR	32.2	NR	38.8	NR	54.8

NR, not relevant.

\* Unless mentioned, other variables are as defined for a reference woman. The reference woman is younger than age 35, has higher education of up to 4 years, is married or cohabitant, is without pre-existing chronic disease, and has had no previous cesarean delivery. She carries a single fetus in cephalic presentation and has no delivery complications such as dystocia, preeclampsia, or fetal distress. She has a vaginal delivery preference when asked during pregnancy.

may have a strong preference to avoid a cesarean delivery in case of slow progress, whereas a woman with a cesarean delivery preference may push the obstetrician to perform an acute cesarean delivery earlier.

Approximately one out of five pregnant women achieved an elective cesarean delivery given a cesarean delivery preference during pregnancy. Multiparous women with cesarean delivery preference have a higher probability of delivering by elective cesarean delivery because of maternal request than do nulliparous women (25% compared with 16%; Table 5). With a previous delivery experience, regardless of whether good or bad, a multiparous woman will gain insight into delivery and may increase her ability to present arguments to support fulfillment of her wish. However, health care personnel might be more attentive to multiparous women because their previous birth experience per se lends credence to their preferences.

Even adjusting for a wide range of confounding factors, we cannot rule out the possibility that women might have a cesarean delivery because of an underlying relative indication, earlier education, or influence from the provider's perspective, but they still might have indicated having cesarean delivery because of own preference. In our study, 16% of the elective cesarean deliveries and almost 6% of all cesarean deliveries were cesarean delivery on mater-

nal request. The cesarean delivery on maternal request rate is similar to those of previous studies, even though we based the estimate on patient reports and most previous studies are based on physicians' records.<sup>17,22-24</sup> We did not have data to explore the compliance between a cesarean delivery indication recorded as "maternal request" by the women and the concurrent view of the obstetrician. We acknowledge that the patient's preference is not independent of the attitude of the provider.

Obstetricians' willingness to perform a requested cesarean delivery may be influenced by their opinions about cesarean delivery compared with vaginal delivery. Previous studies have found that obstetricians' compliance with patient-requested cesarean deliveries range from 15% to 79%.<sup>25</sup> Even though maternal preferences play a role in the decision, the providers' attitudes are still a major factor in determining the delivery mode that occurs.

If clinicians or policymakers aim to reduce the proportion of cesarean deliveries, they may be more successful if they are aware of women's preferences. Exploring delivery preferences during pregnancy might be useful to identify a population at risk for negotiating a cesarean delivery because of personal preferences, and the concerns that give rise to the preference might be addressed. It should be noted, however, that our findings provide no information about how women's preferences play a role in obste-





tricians' decisions. More information about the decision process is needed to better understand how preferences play a role in the decision-making about delivery mode.

Women's preferences have an effect on the choice of delivery mode. A better understanding of women's preferences and how they interact with the providers' attitudes about cesarean delivery may be useful in developing policies to influence cesarean delivery rates.

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