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## Strength of Preference for Vaginal Birth as a Predictor of Delivery Mode Among Women who Attempt a Vaginal Delivery

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### Abstract

**OBJECTIVE**—To assess the relationship between strength of preference for vaginal birth and likelihood of vaginal delivery among women attempting this delivery mode.

**STUDY DESIGN**—We conducted a longitudinal study of mode of delivery preferences among women who were less than 36 weeks pregnant. Participants completed a sociodemographic and clinical questionnaire and were asked if they preferred vaginal or cesarean delivery. Participants who preferred vaginal delivery completed a standard gamble exercise to assess the strength of this preference on a 0-to-1 scale (higher scores indicate stronger preference for vaginal delivery); those preferring cesarean delivery were assigned a value of 0. Data on clinical characteristics and delivery mode was obtained via telephone interview or chart review. Logistic regression was used to identify predictors of delivery mode among women who attempted a vaginal delivery.

**RESULTS**—Of 210 participants, 156 attempted a vaginal delivery. Their mean and median vaginal delivery preference scores were 0.70 (SD 0.31) and 0.75 (IQR 0.50–0.99), respectively. In multivariate analyses, women with a prior cesarean delivery (aOR 0.08, CI 0.02–0.39) or who delivered an infant < 4000 grams (aOR 0.04, CI 0.01–0.28) had significantly lower odds of having a vaginal delivery. After controlling for potential confounders, participants with a stronger preference for vaginal delivery were at significantly higher odds of having a vaginal delivery (aOR 1.54, CI 1.01–2.34 for every 0.2 increase on the 0-to-1 scale).

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**CONCLUSION**—Among women who attempt a vaginal delivery, the strength of preference for vaginal birth is predictive of the delivery mode ultimately undergone.

### KEY WORDS/PHRASES

Patient preferences; delivery mode

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## INTRODUCTION

The cesarean delivery rate in the U.S. reached an all-time high of 32.9% in 2009, representing an increase of more than 53% since 1996.<sup>1</sup> Changes in clinical characteristics and provider practice patterns, heightened concern regarding the medicolegal environment, and patient preferences have all been suggested as factors that may be contributing to this rising rate.<sup>2-4</sup> Examination of the specific indications for cesarean delivery reveal that they occur across a broad spectrum of clinical scenarios,<sup>5</sup> ranging from those in which vaginal delivery is contraindicated (e.g., complete placenta previa) to those in which it is performed based entirely on the patient's preference (e.g., cesarean delivery on maternal request). Between these two extremes lie many clinical situations where a patient may be eligible for a vaginal delivery but chooses to undergo a scheduled cesarean delivery, such as elective repeat cesarean delivery, or where a patient attempts a vaginal delivery but ultimately has a cesarean due to diagnoses made during labor, such as arrest disorders or nonreassuring fetal heart rate tracing.<sup>6, 7</sup> The process of shared-decision making between patient and provider varies in each of these scenarios: in the case of women who are eligible for a trial of labor after cesarean or elective repeat cesarean delivery, elicitation of patient preference in discussions regarding approach to delivery has been specifically advocated by professional guidelines,<sup>6</sup> while in the case of cesarean delivery during labor, a recommendation for cesarean is generally initiated based on the provider's assessment of the clinical situation, which leads to a discussion of the risks, benefits, and alternatives with the patient during the process of informed consent. While the process and priority placed on patient preference may vary, in either situation, the patient retains the ultimate decision making power as they retain the right to decline a cesarean delivery even when recommended by their provider.

While the role of patient preferences may be clearly characterized in the situation of a cesarean delivery on maternal request, understanding the impact of patient preference on decision making during labor is more challenging. Despite recent attempts at standardization, the clinical assessment of the need for cesarean delivery during labor remains subjective, and there are many situations in which one could argue that either proceeding with an ongoing attempt at a vaginal delivery or performing a cesarean delivery is appropriate.<sup>5, 8-11</sup> In these contexts, although the provider initiates the discussion as the clinician decision-maker, the extent to which patient preferences contribute to the decision-making process is less certain.<sup>5, 12</sup> Limited evidence suggests that patient choice may drive the decision for cesarean during labor more frequently than previously realized<sup>13</sup> and recent studies have demonstrated that, in certain populations, a stated preference for vaginal delivery may be predictive of whether a woman has a vaginal or cesarean delivery.<sup>14, 15</sup> Less is known, however, about how the strength of this preference may influence the ultimate mode of delivery. The aim of this analysis was to further examine the complex

relationship between patient preferences and delivery mode in a diverse population of pregnant women who attempted a vaginal birth.

## MATERIALS AND METHODS

We conducted a secondary analysis of data obtained during the course of a longitudinal study entitled “Mode of Delivery Preferences among a Diverse Population of Pregnant Women,” which took place between 2008 and 2012. The primary goal of that study was to assess women’s preferences for vaginal versus cesarean delivery in the context of prior cesarean delivery, twin gestation, breech presentation, and absent traditional medical indication for cesarean delivery. Patients receiving prenatal care at the University of California, San Francisco (UCSF), or who had participated in one of our prior studies and had expressed an interest in participating in future studies, were sent a letter of invitation to participate in this study, with an opt-in/opt-out card. Those who opted in or who did not return the card were contacted by research staff to assess eligibility and interest in participation. To address the goals of the overall study, patients who were carrying a twin pregnancy, had a history of a prior cesarean delivery, or who had a fetus in breech presentation were oversampled during the latter stages of study recruitment. Patients carrying twins were additionally recruited from the inpatient obstetrics service, the UCSF Prenatal Diagnostic Center, as well as through online postings.

English-speaking women at less than 36 weeks gestation were eligible for enrollment in the study, which included an in-person meeting with a trained study interviewer at 26–36 weeks gestation and a phone interview at 8–10 weeks postpartum. All participants signed written informed consent that included participation in both interviews and permission to have their medical record reviewed.

The face-to-face interview began with a sociodemographic and attitudinal questionnaire that included items related to race/ethnicity, education, income, reproductive and delivery history, and characteristics of the woman’s current pregnancy. After providing this information, participants were asked, “if you could choose, which type of delivery would you want to have?” with response options of “definitely a vaginal birth,” “probably a vaginal birth,” “probably a cesarean delivery,” and “definitely a cesarean delivery.” They were then given the opportunity to elaborate on the reasons for this preference, which was recorded in a free text format as part of the questionnaire.

Participants who indicated that they would “definitely” or “probably” prefer a cesarean delivery if they could choose either delivery mode were assigned a vaginal preference score of 0. Participants who indicated that they would “definitely” or “probably” prefer a vaginal delivery completed a series of exercises using “ELICIT,” a computerized tool developed by our group<sup>16</sup> to assess patient preferences, or utilities.

We used the standard gamble as our preference metric.<sup>17</sup> This method measures the strength of an individual’s preference for a specific outcome based on the chance of an undesired outcome (versus the ideal outcome) she would take to avoid an intermediately ranked outcome. Utility values range from 0 to 1, with higher values indicating a willingness to

accept a higher probability of the undesired outcome occurring, and thus a stronger preference for the ideal outcome.

In our study, participants who indicated that they would prefer vaginal birth were asked to choose between the certainty of a planned cesarean delivery (the intermediately ranked outcome) or an alternative with a specified probability of an attempted vaginal delivery ending in a cesarean delivery (the undesired outcome) and the complementary probability of an uncomplicated vaginal delivery (the ideal outcome). The probability of the undesired outcome was then varied until the participant was indifferent between the two alternatives. The utility value is calculated at this indifference point. For this study, the utility value was equal to the probability that the attempted vaginal birth would end in a cesarean at which the woman would opt for the planned cesarean delivery. For example, a woman with a very strong preference for a vaginal delivery might indicate that she would opt to attempt a vaginal delivery even if the likelihood that this attempt would end in a cesarean delivery was as high as 95%; her utility for a vaginal delivery would be 0.95. On the other hand, a woman with a weaker preference for vaginal delivery might indicate that she would opt for a planned cesarean even if the chance that her attempt at vaginal delivery would end in a cesarean delivery was as low as 5%; her utility for a vaginal delivery would be 0.05.

The primary outcome for this analysis was mode of delivery undergone (vaginal versus cesarean), which was assessed at the time of the post-partum interview. For participants who did not complete a postpartum interview, information on their delivery mode was obtained via chart review. The presence or absence of specific medical complications that are associated with delivery mode (delivery history, twin gestation, induction before 40 weeks gestation, pre-pregnancy body mass index [BMI], diabetes, hypertension, clinical chorioamnionitis and infant birth weight) were also obtained via chart review.

Bivariate logistic regression was used to estimate the association between the strength of the woman's preference for vaginal delivery and delivery mode undergone. The effect of vaginal delivery preference score on mode of delivery was further assessed in multivariate analyses that included sociodemographic characteristics (age, race/ethnicity and educational attainment), and the clinical factors, listed above, that are known to affect mode of delivery. An interaction term was created to test the possibility of a differential effect of this strength of preference for women who had previously had a cesarean versus those who had not.

Because the data contained missing values, we fit the logistic regression models to 20 multiply imputed datasets created with SAS PROC MI (version 9.3; SAS Institute Inc, Cary, NC). The imputation model included all variables presented in Tables 1 and 2. Imputed values for binary and categorical variables were rounded and truncated to the nearest category.<sup>18</sup> Parameters and standard errors were estimated by combining the results across the 20 imputed datasets, according to the rules of Rubin<sup>19</sup> and Meng and Rubin.<sup>20</sup> Statistical significance was set at a *P*-value <0.05. All analyses were implemented using SAS Version 9.3 (SAS Institute, Cary, NC).

## RESULTS

Of the 210 women enrolled in the mode of delivery preferences study, 50 had scheduled cesarean deliveries and 4 were missing data regarding mode of delivery. The remaining 156 attempted a vaginal delivery and were included in our analysis. Most of these women were younger than 35 (63.5%) and approximately half were Caucasian (51.3%). Sixty-eight (43.6%) were nulliparous and 26 (17%) had a prior cesarean delivery. The mean preference score for vaginal delivery was 0.70 (SD 0.31) with a median of 0.75 (IQR 0.50–0.99). (TABLE 1) Five women included in our analysis had indicated at the time of their baseline interview that they would prefer to have a cesarean delivery, and thus were assigned a value of zero for their vaginal delivery preference score. Interestingly, none of these women had a medical indication for cesarean delivery. Reasons cited for their preferences included a belief that it would be more convenient, take less time, be less painful, and result in a faster recovery than a vaginal delivery.

135 women (87%) ended up having a vaginal delivery. In multivariate analyses, those with a history of a cesarean delivery (aOR 0.08, 95% CI 0.02–0.39,  $P < 0.001$ ) and who delivered an infant  $< 4000$  grams (aOR 0.04, 95% CI 0.01–0.28,  $P < 0.001$ ) had significantly lower odds of having a vaginal delivery. A significant relationship did not emerge between mode of delivery and age, race/ethnicity, education, prior vaginal delivery, pre-pregnancy BMI, diabetes, hypertension, twin gestation, induction before 40 weeks gestation, or chorioamnionitis. (TABLE 2); these variables were included in the final multivariable model due to their previously demonstrated effect on mode of delivery and potential relationship with mode of delivery preferences. After controlling for potential confounders, participants with a stronger preference for vaginal delivery had significantly higher odds of having a vaginal delivery (aOR 1.54 for every 0.2 increase on this 0-to-1 scale, 95% CI 1.01–2.34,  $P = 0.04$ ). This effect of strength of preference did not differ between women who had previously had a cesarean delivery and those who had not ( $P = 0.59$  for the interaction term of vaginal delivery preference score by prior cesarean delivery in the multivariate model).

## COMMENT

Whether a pregnant woman will have a vaginal or cesarean delivery is ultimately determined by a variety of medical, obstetric and neonatal factors.<sup>3</sup> For some women, such as those who have undergone a prior cesarean delivery or are pregnant with twins, the path toward either a vaginal or cesarean delivery is often initiated prior to the onset of labor. The decision as to whether these patients will even attempt a vaginal delivery is typically made during the antepartum period. For the majority of women, however, the expectation is that a vaginal delivery will be attempted. Whether a vaginal birth is actually achieved is affected by events that occur during the often unpredictable process of labor.<sup>7</sup> We found that, after controlling for many of these factors, the strength of a woman's preference for a vaginal delivery can also have a significant impact on whether or not she achieves this delivery mode.

Our findings echo those of other studies that have found that the vast majority of patients prefer a vaginal birth to a cesarean delivery.<sup>14, 21, 22</sup> In our study, however, this preference, measured between 26–36 weeks gestation, was not entirely predictive of whether the woman

would have a planned vaginal or a planned cesarean delivery. Of note, 5 of the 16 women that preferred a cesarean delivery at the time of their baseline interview ended up attempting a vaginal delivery. While these patients may not have had the option for a cesarean delivery, as few providers that practice at the sites included in our study offer cesarean delivery on maternal request, it is also possible that they simply changed their preference as their pregnancy progressed or after being better informed of the risks and benefits of each delivery mode. The evolving nature of patient preferences during the course of pregnancy has previously been described;<sup>23</sup> this process deserves further study as it has implications for appropriately timed patient counseling and decision making regarding mode of delivery. Such patient counseling can play an important role in managing patient expectations regarding the unpredictable process of labor, which may ultimately increase patient satisfaction and decrease the amount of distress and disappointment that occurs when they undergo a mode of delivery that is not preferred.<sup>12</sup>

Several limitations of our study deserve comment. First, although we were successful in recruiting a racially/ethnically diverse sample of women with a wide range of delivery histories, our study population was relatively small and consisted only of English-speaking patients in the San Francisco Bay area, limiting its generalizability to other groups of women. Furthermore, our sample included a larger proportion of participants who had a prior cesarean delivery or were carrying a twin pregnancy compared to the general population. Finally, in our chart review we assessed only for the presence or absence of a select few complications of pregnancy believed to have the greatest effect on mode of delivery. Our inability to assess the severity of such complications or to include less recognized factors that may also contribute to mode of delivery may limit the interpretation of our results.

Strengths of our study include the fact that the participants were interviewed during their 2nd and 3rd trimesters, when most were likely to have already formed opinions and preferences regarding their mode of delivery. In addition, we not only addressed stated preferences for vaginal birth versus cesarean delivery, but also for the strength of this preference, which was quantified using validated methods that assess how patients value health outcomes. Patient preferences in the setting of health care decisions have been shown to be associated with a number of factors, including sociodemographic characteristics,<sup>24</sup> health status, knowledge and literacy,<sup>25</sup> provider influence,<sup>26, 27</sup> social norms<sup>28</sup>, and prior medical experiences.<sup>29</sup> With regards to pregnancy and labor, preferences regarding mode of delivery have been shown to be widely divergent, highly influenced by personal values, and driven by a variety of complex factors.<sup>30, 31</sup> Such factors include a woman's desire to experience or avoid the process of labor, concerns regarding the safety of the baby, and considerations regarding her future health.<sup>4, 32</sup> Decision making regarding mode of delivery is thus more complicated than can be captured by simply asking a patient to choose between two options. Our methods allowed us to demonstrate some of this complexity and further explore how variation in strength of patient preferences can affect whether an attempted vaginal delivery ends in a vaginal birth.

The question of exactly how patient preferences exert their effect on delivery mode remains unanswered. Patients who are highly motivated to have a vaginal delivery may be more

willing to tolerate the higher levels of uncertainty and risk that are sometimes inherent to the often long and complicated process of labor. In turn, their attitudes may affect the decision making of their providers as they consider the somewhat subjective diagnoses of non-reassuring fetal heart tracing, arrest of dilation, or arrest of descent.

While further research on how providers combine patient preferences with their own knowledge and experience is needed, we believe our study sheds light on the important role that patient preferences can play in affecting the ultimate delivery mode among women who attempt a vaginal delivery. Given the potential for patient preferences to affect delivery outcomes, it may be useful for providers to initiate a discussion regarding mode of delivery and elicit patient preferences prior to the onset of labor. Such discussions may enable patients to express informed preferences and better engage in discussions and decision making during labor such that they will be more satisfied with their experience, even when a vaginal delivery is not achieved. Providers' recognition of the important role of patient preferences in this context may also improve patient-provider communication and yield insight into the complex process of decision-making regarding mode of delivery during labor.

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**Table 1**

Sociodemographic and clinical characteristics by delivery mode undergone among women who attempted a vaginal delivery (n=156)

	Total (n=156)	Vaginal Delivery (n=135)	Cesarean Delivery (n=21)	P-value
Age, n(%)				0.11
34 years	99 (63.5)	89 (65.9)	10 (47.6)	
35 years	57 (36.5)	46 (34.1)	11 (53.4)	
Race/ethnicity, n(%)				0.99
African American	39 (25.0)	34 (25.2)	5 (23.8)	
Caucasian	80 (51.3)	69 (51.1)	11 (52.4)	
Latina or Hispanic	14 (9.0)	12 (8.9)	2 (9.5)	
Other <sup>a</sup>	23 (14.7)	20 (14.8)	3 (14.3)	
Educational attainment, n(%)				0.05
Some college or less	59 (37.8)	52 (38.5)	7 (33.3)	
College graduate	49 (31.4)	46 (34.1)	3 (14.3)	
Professional or graduate degree	48 (30.8)	37 (27.4)	11 (52.4)	
Nulliparous, n(%)	68 (43.6)	61 (45.2)	7 (33.3)	<0.001
Multiparous, n(%)				
Prior cesarean deliveries only	19 (12.2)	10 (7.4)	9 (42.9)	
Prior vaginal deliveries only	62 (39.7)	60 (44.4)	2 (9.5)	
Prior cesarean and prior vaginal deliveries	7 (4.5)	4 (3.0)	3 (14.3)	
Pre-pregnancy BMI (kg/m <sup>2</sup> )				0.85
< 25	80 (51.1)	70 (51.9)	10 (46.0)	
25–29	49 (31.4)	41 (30.4)	8 (36.9)	
30	27 (17.5)	24 (17.8)	4 (17.1)	
Twins, n(%)	25 (16.0)	21 (15.6)	4 (19.0)	0.69
Diabetes <sup>b</sup> , n(%)	10 (6.3)	7 (5.2)	3 (14.3)	0.11
Hypertension <sup>c</sup> , n(%)	22 (14.0)	17 (12.6)	5 (23.8)	0.25
Induced prior to 40 weeks, n(%)	33 (21.2)	26 (19.3)	7 (33.3)	0.16
Chorioamnionitis, n(%)	10 (6.7)	8 (5.9)	2 (9.5)	0.48
Infant birth weight < 4000 grams, n(%)	11 (7.2)	6 (4.4)	5 (23.8)	0.01
Strength of preference for vaginal delivery, mean (+/- SD) <sup>d</sup>	0.70 (0.31)	0.71 (0.30)	0.60 (0.36)	0.12

BMI, body mass index; SD, standard deviation

<sup>a</sup>Includes Asian/Pacific Islander (n=22) and Native American (n=1).

<sup>b</sup>Includes pregestational and gestational diabetes.

<sup>c</sup>Includes chronic hypertension, gestational hypertension, preeclampsia, and eclampsia.

<sup>d</sup>Measured using the standard gamble. Scores ranged from 0=preference for cesarean delivery to 1=strongest preference for vaginal delivery.

**Table 2**

Unadjusted and adjusted predictors of vaginal delivery among women who attempted a vaginal delivery (n=156)

	Unadjusted		Adjusted <sup>a</sup>	
	OR (95% CI)	P-value	aOR (95% CI)	P-value
Age		0.11		0.26
34 years	2.13 (0.84–5.38)		2.17 (0.55–8.51)	
35 years	Reference		Reference	
Race/Ethnicity		.99		0.51
African American	Reference		Reference	
Caucasian	0.92 (0.30–2.87)	0.89	3.68 (0.55–24.78)	0.18
Latina or Hispanic	0.88 (0.15–5.16)	0.89	2.87 (0.21–39.53)	0.43
Other <sup>b</sup>	0.98 (0.21–4.55)	0.98	1.50 (0.16–14.16)	0.72
Education				
Some college or less	Reference		Reference	
College graduate or higher degree	0.80 (0.31–2.11)	0.65	0.73 (0.12–4.24)	0.72
History of prior cesarean delivery <sup>c</sup>	0.10 (0.03–0.28)	<0.001	0.08 (0.02–0.39)	<b>&lt;0.001</b>
History of prior vaginal delivery	3.72 (1.19–11.63)	0.01	3.16 (0.57–17.50)	0.17
Pre-pregnancy BMI 30 kg/m <sup>2</sup>	1.04 (0.29–3.77)	0.79	1.50 (0.20–11.03)	0.66
Twins	0.78 (0.24–2.56)	0.69	0.69 (0.11–4.47)	0.70
Diabetes <sup>d</sup>	0.28 (0.06–1.19)	0.11	0.37 (0.05–2.96)	0.36
Hypertension <sup>e</sup>	0.47 (0.14–1.61)	0.25	0.73 (0.13–4.04)	0.68
Induced prior to 40 weeks	0.48 (0.18–1.31)	0.16	0.69 (0.11–4.47)	0.22
Chorioamnionitis	0.54 (0.10–2.82)	0.48	0.73 (0.06–9.15)	0.77
Infant birth weight 4000 grams	0.15 (0.04–0.55)	0.01	0.04 (0.01–0.28)	<b>&lt;0.001</b>
Strength of preference for vaginal delivery <sup>f</sup>	1.26 (0.95–1.67)	0.12	1.54 (1.01–2.34)	<b>0.04</b>

OR, odds ratio; aOR, adjusted odds ratio; CI, confidence interval; BMI, body mass index

<sup>a</sup>Multivariate model is controlled for predictors included in the table, statistically significant predictors are highlighted in bold.

<sup>b</sup>Includes Asian/Pacific Islander (n=22) and Native American (n=1).

<sup>c</sup>For those with history of both prior vaginal and prior cesarean delivery, mode of most recent delivery was used.

<sup>d</sup>Includes pregestational and gestational diabetes.

<sup>e</sup>Includes chronic hypertension, gestational hypertension, preeclampsia, and eclampsia.

$f$  Odds ratio for every 0.2 increase in strength of preference on a 0 to 1 scale with 0 = preference for cesarean delivery and 1= strongest preference for vaginal delivery.