Mode of Delivery Preference Among Pregnant Nulliparous Women

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Abstract

Background: Nearly a third of women in the United States deliver by cesarean at first childbirth. The extent to which women's prenatal mode of delivery preference contributes to the cesarean decision is not clear. Little research has measured pregnant nulliparous women's prelabor mode of delivery preference in relation to actual mode of delivery in the United States.

Materials and Methods: A total of 3006 pregnant nulliparous women were asked about mode of delivery preference during pregnancy as part of the First Baby Study, a prospective study of women delivering in Pennsylvania hospitals, 2009–2011. Multivariable regression models were used to assess the association between women's preference for cesarean delivery and two decision stages: (1) the decision to have planned prelabor cesarean and (2) the intrapartum decision to have unplanned cesarean among those attempting vaginal delivery, adjusting for confounders.

Results: Overall, 3.1% preferred cesarean delivery, 3.0% had no preference, and 93.9% preferred vaginal. Among those who preferred vaginal delivery, 4% had a planned cesarean; among those with no preference, 13.3% did; and among those who preferred cesarean, 33.7% did. In adjusted models, preference for cesarean was strongly associated with having planned prelabor cesarean (adjusted odds ratio [aOR] = 6.02; 95% confidence interval [CI] = 3.26–11.12), but was not significantly associated with unplanned cesarean among those who attempted vaginal delivery (aOR = 1.35; 95% CI = 0.77–2.38).

Conclusions: Although preference for cesarean delivery among nulliparous women was uncommon, women who preferred cesarean were more likely to have planned prelabor cesarean delivery than those who preferred vaginal delivery.

Keywords: mode of delivery, nulliparous, patient preference, planned cesarean

Introduction

ONE OF THE basic tenets of patient-centered care is that patient treatment preferences should be discussed with the patient and decision making should be shared, if at all possible.¹ Shared decision making in the context of mode of delivery is a unique process because it can take place over the course of several months of patient–provider discussions, with many factors to consider.² Women may have strong mode of delivery preferences,³ and may be at

increased risk of postpartum depression and/or post-traumatic stress symptoms if they deliver by the mode they did not prefer.^{4,5}

The mode of delivery decision-making process is quite different for nulliparous women in comparison with multiparous women. For multiparous women, previous delivery experience plays an important role in determining subsequent delivery mode. Only 10% of women in the United States with a previous cesarean deliver vaginally in subsequent pregnancies.⁶ Therefore, the effect of women's mode of delivery

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at first childbirth is particularly important. However, very little is known about the association between prenatal mode of delivery preference among pregnant nulliparous women in the United States in relation to actual mode of delivery. In addition, little research on the topic of mode of delivery preference in relation to actual mode of delivery among nulliparous pregnant women has distinguished between prelabor, planned cesarean delivery, and cesarean delivery that occurs during labor. Mode of delivery decision-making can be seen as a two-stage process: the first stage is the decision to forgo a trial of labor and have a prelabor, planned cesarean delivery, or to attempt vaginal delivery; the second stage occurs only among the women who attempt vaginal delivery and ultimately leads to vaginal or unplanned cesarean delivery. Although there are important clinical factors that play a role in decisions made at these two stages, it is likely that women's prelabor mode of delivery preference plays a role as well.

Media coverage of the topic of elective cesarean delivery in US newspapers and magazines has given the impression that "maternal request cesarean" occurs commonly in the United States, primarily for reasons of scheduling or convenience.⁷ In reality, however, little is known about maternal request cesarean in the United States. Most of the research on maternal request cesarean has been conducted in other countries,^{8,9} the results of which may or may not be generalizable to childbirth in the United States. Maternal request cesarean delivery is defined as a planned cesarean delivery that occurs before the onset of labor, due to maternal request for cesarean delivery, and with no medical or obstetric indication.¹⁰ In a 2012 national survey of 2400 women who had recently given birth in the United States, just >1% of those who had a primary planned cesarean delivery reported that it was because they requested it, and that there was no medical reason for the procedure.¹¹ However, this was a one-time retrospective survey, so it is not clear how mode of delivery preference in pregnancy or other factors shaped the decision to have a planned cesarean delivery.

This article reports findings from a cohort study of 3006 nulliparous women in Pennsylvania. We investigated factors associated with women's mode of delivery preference, measured shortly before first childbirth, and the role of this preference at two decision stages: the decision to have planned cesarean rather than to attempt vaginal delivery and the decision to have unplanned cesarean among those attempting vaginal delivery. In addition, we measured the percentage of cesarean deliveries that could be defined as due to maternal request, that is, planned cesarean deliveries that occurred because the woman requested it and in the absence of a medical indication.

Materials and Methods

This study of women's mode of delivery preference was a planned secondary analysis of data from the First Baby Study (FBS).¹² The FBS was a prospective study designed to investigate the association between mode of first delivery and subsequent childbearing. Nulliparous pregnant women were recruited from a variety of venues throughout the state of Pennsylvania, including low-income clinics, childbirth education classes, hospital tours, hospital intranet postings, health fairs, ultrasound centers, newspaper advertisements,

targeted mailings sent by Medicaid insurers, and posters and brochures placed in strategic locations (libraries, grocery stores, and in provider's offices). Recruitment of the study participants began in January, 2009 and concluded in April, 2011. Inclusion criteria were singleton pregnancy, aged 18–35 years, English or Spanish speaking, and planning to deliver in a hospital in Pennsylvania. Exclusion criteria included planning to deliver at home or in a birthing center not attached to a hospital, planning for the child to be adopted, planning to have a tubal ligation, and a prior pregnancy of 20 weeks gestation or more. The inclusion and exclusion criteria were based on the primary objective of the FBS: to study childbearing subsequent to first childbirth.

The FBS was approved by the Penn State College of Medicine Institutional Review Board (IRB), as well as the IRBs of the hospitals and other institutions involved with participant recruitment. All participants provided signed informed consent. The participants delivered at 76 hospitals in Pennsylvania (and two participants delivered at hospitals outside of the state), between January 2009 and April 2011. Birth certificate and hospital discharge data were obtained for each delivery. The FBS participants were interviewed during pregnancy (baseline) and at multiple points in time after delivery over the course of a 3-year period. For this study of mode of delivery preference, we used data from baseline and 1-month surveys, as well as the birth certificate and hospital discharge data. There were 3080 women who were interviewed at baseline and 74 women who either dropped out of the study after the first interview ($n=68$) or were not included due to stillbirth ($n=6$), leaving an analytic sample of 3006 women who participated in both the baseline and 1-month surveys. The FBS study participants were significantly more likely to be married, college educated, and to have private insurance than women aged 18–35 years delivering their first child in the state of Pennsylvania as a whole, based on comparison with birth certificate data.¹²

The baseline interviews took place by telephone, between 30 and 42 weeks of gestation, at an average gestational age of 35.2 weeks ($SD=1.6$). Interviews were conducted by trained interviewers at the Center for Survey Research, Penn State University, Harrisburg, Pennsylvania, using a computer-aided telephone interview system. As part of the baseline interview, participants were asked, "At this point would you prefer to deliver your baby by cesarean section or have a vaginal delivery?" They were also asked about health history and pregnancy complications thus far, time to conception (if they were trying to conceive), prior miscarriages, and plans for subsequent children. In addition, participants were asked, "Have you been told by a doctor or nurse that you may need to have your baby by cesarean section?" If they answered "yes" to this question, they were asked, "Why did your doctor or nurse say that you might need to have your baby by cesarean section?" Open-ended answers were coded into categories by two of the study investigators. Open-ended questions were coded using a standard protocol that included review of the first half of the responses together to identify potential response categories, independent coding of responses, and then discussion and agreement where codes differed.

Participants also completed several scaled instruments to measure depression (through the Edinburgh Depression Scale)¹³ and fear of childbirth (through the FBS Birth Anticipation Scale [FBS-BAS]).¹⁴ Women with a score of ≥ 13

on the Edinburgh Depression Scale were defined as depressed during pregnancy. A summated score of fear of childbirth was calculated, ranging from 4 (low fear) to 20 (high fear). Total scores were classified into three categories: 4–8 (low fear), 9–12 (medium fear), and 13–20 (high fear). Women were asked, “At the time you conceived were you trying to become pregnant?” If they answered “yes,” they were then asked, “How long did it take for you to become pregnant from the time that you began actively trying to conceive?” Time to conception was categorized as “6 months or less,” which included women whose pregnancies were unintended, versus “more than 6 months.”

In the 1-month postpartum interview, participants were asked whether they had their baby vaginally or by cesarean section. If they reported that they had a cesarean delivery, they were then asked, “Did you have a planned cesarean section that was scheduled to occur before you went into labor, that is, before regular contractions began, or did you have an unplanned cesarean delivery?” The participants were also asked whether they were in labor when they arrived at the hospital. None of the women who reported that they had a planned cesarean delivery reported that they were in labor when they arrived at the hospital.

To identify maternal request cesarean deliveries, we reviewed the International Classification of Diseases, Ninth Revision (ICD-9) diagnostic codes in the hospital discharge data for women who reported that they would prefer to deliver by cesarean section and subsequently had a planned prelabor cesarean delivery. Using the diagnostic codes, we created categories of indications for cesarean delivery, using standard classification algorithms,^{15–17} as we have reported previously.¹⁸ In addition, women who reported in the 1-month interview that they had a planned cesarean section were asked, “What was the main reason that you had a planned cesarean section?” This was an open-ended question with no categorical answers provided by the interviewers. The primary goal of this question was to identify women who had a planned cesarean delivery because they requested it. Responses were coded into categories by the study investigators.

Analyses were performed using SPSS software (version 23; IBM Corp, Armonk, NY). Chi-square analyses were conducted to measure the association between women’s baseline characteristics in relation to (1) mode of delivery preference, (2) the decision to have planned cesarean versus attempting vaginal delivery, and (3) the decision to have unplanned cesarean versus vaginal delivery.

The multivariable analyses focused on the following research questions:

1. *What factors are associated with nulliparous women’s preference for cesarean delivery during pregnancy?* Multinomial logistic regression was used to compare women who preferred cesarean with those who preferred vaginal delivery, and those who had no preference with those who preferred vaginal delivery, controlling for confounding variables.
2. *Is nulliparous women’s preference for cesarean delivery associated with the decision to have a planned cesarean delivery rather than attempting vaginal delivery?* Multivariable logistic regression was used to measure the association between preference for ce-

sarean and having a planned cesarean delivery, controlling for confounding variables.

3. *Is nulliparous women’s preference for cesarean delivery during pregnancy associated with the decision to have an unplanned cesarean delivery among the women who attempted vaginal delivery?* Multivariable logistic regression was used to measure the association between preference for cesarean and having an unplanned cesarean delivery, controlling for the confounding variables.

The confounding variables that were included in all of the multivariable equations were maternal age, race, education, insurance coverage, marital status, prepregnancy body mass index (BMI) category, time to conception, previous miscarriage, whether they had attended childbirth education classes, whether they were planning to have additional children, depression during pregnancy, fear of childbirth, having been told they might need to have a cesarean delivery, hypertension before and/or during pregnancy, and diabetes before and/or during pregnancy. In addition, we created a variable that was a combination of being told they might need cesarean delivery, or having been diagnosed with hypertension or diabetes, as a general measure of having a medical indication for cesarean delivery at the time of baseline interview.

Although some women reported other pregnancy complications, only hypertension and diabetes occurred with adequate frequency to include as potential confounders. These variables were chosen as potentially confounding variables to be investigated in this study because it seemed reasonable to consider that they could influence both the independent and dependent variables in this study (preference for mode of delivery and actual mode of delivery). For example, the conditions of hypertension or gestational diabetes could increase the likelihood that a woman would prefer cesarean delivery, as well as the likelihood that she might need a cesarean delivery.

The purposes of these analyses were to measure factors associated with women’s mode of delivery preference as reported at the time of baseline interview, and the association of this preference with actual mode of delivery. Therefore, these analyses only included pregnancy complications that were self-reported and did not include pregnancy complications that occurred after the baseline interview.

A surprisingly large number of women reported that they had no preference as to mode of delivery; nearly as had many reported a preference for cesarean delivery. Because we considered no mode of delivery preference to be a valid position to take on this issue, we decided to include these women as a third preference group in the analyses.

Because the baseline interviews occurred among women who ranged in gestational age from 30 to 42 weeks, sensitivity analyses were conducted to investigate the association between women’s gestational age at the time of baseline interview in relation to mode of delivery preference, and being told they might need to deliver by cesarean section, through chi-square analyses.

Results

Table 1 shows the participants’ characteristics. Participants were predominantly white (83.3%), college educated

TABLE 1. BASELINE CHARACTERISTICS OF STUDY PARTICIPANTS, *N*=3006

<i>Characteristics</i>	<i>n (%)</i>
Mode of delivery preference	
Vaginal	2820 (93.9)
Cesarean	92 (3.1)
No preference	90 (3.0)
Maternal age at delivery (years)	
18–24	809 (26.9)
25–29	1191 (39.7)
30–36	1002 (33.4)
White race	2500 (83.3)
Education level	
High school degree or less	500 (16.7)
Some college or technical	803 (26.7)
College graduate or higher	1699 (56.6)
Private insurance	2310 (77.0)
Married	2115 (70.5)
Prepregnancy BMI (kg/m ²)	
Underweight/normal	1714 (57.1)
Overweight	666 (22.2)
Obese	620 (20.7)
Time to conception, 6 months or less	2491 (83.1)
Previous miscarriage	477 (15.9)
Childbirth education class during pregnancy	2125 (70.8)
Planning more children	2584 (86.1)
Depressed during pregnancy	181 (6.0)
Fear of childbirth	
Low	1025 (34.1)
Medium	1235 (41.1)
High	746 (24.8)
Being told they might need cesarean	245 (8.1)
Hypertension before and/or during pregnancy	181 (6.0)
Diabetes before and/or during pregnancy	186 (6.2)
Medical indication for cesarean delivery ^a	512 (17.0)

^aWomen who were told they might need a cesarean delivery, or had been diagnosed with hypertension, or diabetes, as of the time of the baseline interview.

BMI, body mass index.

(56.6%), married (77.0%), and had private insurance (77.0%). Most of the women reported a preference to deliver vaginally (93.9%), 3.0% reported no preference, and 3.1% reported that they would prefer to deliver by cesarean section. There were 245 women (8.1%) who reported in the baseline interview that a doctor or nurse had told them that they might need to have their baby by cesarean section. There were a total of 512 women (17.0%) who had a medical indication for cesarean delivery at the time of the baseline interview, that is, they either had been told they might need a cesarean delivery, or had been diagnosed with hypertension (before and/or during pregnancy) or diabetes (before and/or during pregnancy).

Among the 245 women who were told by a doctor or nurse that they might need to deliver by cesarean, the most common reasons given were that their hips were too small or the baby was too big (*n*=72; 29.4%), the baby was in the wrong position (*n*=62; 25.3%), diabetes (*n*=20; 8.2%), possible placenta previa (*n*=16; 6.5%), possible active herpes (*n*=14; 5.7%), hypertension/preeclampsia (*n*=12; 4.9%), uterine fibroids (*n*=8; 3.3%), previous surgery (*n*=8; 3.3%), and the shape of the uterus (*n*=7; 2.9%).

Table 2 shows the unadjusted associations between participants' characteristics and mode of delivery preference. The majority (75.4%) of the women who were told they might need cesarean delivery reported a preference for vaginal delivery, and 16% preferred cesarean. Among the 2755 women who were *not* told that they might need a cesarean delivery, 95.6% preferred vaginal delivery and 1.9% preferred cesarean. Among the women with a medical indication for cesarean delivery, 9.0% preferred cesarean delivery, 84.5% preferred vaginal delivery, and 6.5% reported that they had no preference. In addition, among the 92 women who preferred cesarean delivery, half had a medical indication for cesarean delivery (*n*=46).

The women with no mode of delivery preference tended to fall in-between the women who preferred vaginal and those who preferred cesarean delivery in terms of the factors associated with mode of delivery preference (Table 2). For example, 86.8% of the women who preferred vaginal delivery were planning to have more children, as were 77.8% of those with no preference and 71.7% of those who preferred cesarean; 5.5% of the women who preferred vaginal delivery were depressed during pregnancy, as were 11.1% of those with no preference and 16.3% of those who preferred cesarean; 23.4% of the women who preferred vaginal delivery were highly fearful of childbirth, as were 35.6% of those with no preference and 54.4% of those who preferred cesarean; 6.5% of the women who preferred vaginal delivery were told during pregnancy that they might need cesarean delivery, as were 23.3% of those with no preference and 42.4% of those who preferred cesarean.

Table 3 shows the unadjusted associations between participants' characteristics (including mode of delivery preference) and outcomes of the two decision stages: (1) the decision to have planned cesarean versus attempting vaginal delivery and (2) the decision to have unplanned cesarean among those who attempted vaginal delivery. A little more than 5% of the study participants had prelabor planned cesarean delivery, whereas 23.6% had unplanned cesarean delivery. There were 2851 who attempted vaginal delivery, among whom 708 had unplanned cesarean delivery (24.8%). The first column in Table 3 compares women who had planned cesarean with those who attempted vaginal delivery. Among the women who preferred vaginal delivery, 4% (*n*=112) had a planned cesarean delivery; among those with no preference, 13.3% (*n*=12) did; and among the women who preferred cesarean delivery, 33.7% (*n*=31) did. Therefore, among the 155 women who had planned cesarean delivery, the majority (72.3%) would have preferred to deliver vaginally. Among the women with a medical indication for cesarean delivery, 15.2% had a planned cesarean delivery in comparison with 3.1% of the women who did not have a medical indication for cesarean (*p*<0.0001).

Table 4 reports the results of multinomial logistic regression analysis to compare women who preferred cesarean delivery with those who preferred vaginal delivery, and to compare women who reported no preference with those who preferred vaginal delivery, controlling for all of the factors in one equation. The factor most strongly associated with preference for cesarean delivery (versus preference for vaginal delivery) was being told that they might need a cesarean delivery (aOR=9.13; 95% CI=5.54–15.04). This was also the factor most strongly associated with reporting no mode of delivery

TABLE 2. PARTICIPANTS' CHARACTERISTICS BY MODE OF DELIVERY PREFERENCE

	<i>Mode of delivery preference</i>			p
	<i>Vaginal (n=2820)</i> n (%)	<i>No preference (n=90)</i> n (%)	<i>Cesarean (n=92)</i> n (%)	
Maternal age at delivery (years)				0.292
18–24	770 (95.2)	16 (2.0)	23 (2.8)	
25–29	1117 (93.8)	40 (3.4)	34 (2.9)	
30–36	933 (93.1)	34 (3.4)	35 (3.5)	
Race				0.314
White	2341 (93.6)	79 (3.2)	80 (3.2)	
Non-white	478 (95.4)	11 (2.2)	12 (2.4)	
Education				0.601
High school degree or less	472 (94.4)	10 (2.0)	18 (3.6)	
Some college or technical	755 (94.0)	24 (3.0)	24 (3.0)	
College graduate or higher	1593 (93.8)	56 (3.3)	50 (2.9)	
Insurance				0.712
Private	2171 (94.0)	71 (3.1)	68 (2.9)	
Public	647 (93.8)	19 (2.8)	24 (3.5)	
Marital status				0.386
Married	1988 (94.0)	67 (3.2)	60 (2.8)	
Not married	832 (93.8)	23 (2.6)	32 (3.6)	
Prepregnancy BMI (kg/m ²)				<0.0001
Underweight/normal	1624 (94.7)	44 (2.6)	46 (2.7)	
Overweight	632 (94.9)	12 (1.8)	22 (3.3)	
Obese	562 (90.6)	34 (5.5)	24 (3.9)	
Time to conception				0.001
≤6 months	2358 (94.7)	63 (2.5)	70 (2.8)	
>6 months	458 (90.3)	27 (5.3)	22 (4.3)	
Previous miscarriage				0.618
Yes	445 (93.3)	14 (2.9)	18 (3.8)	
No	2375 (94.1)	76 (3.0)	74 (2.9)	
Childbirth education class during pregnancy				<0.0001
Yes	2022 (95.2)	62 (2.9)	41 (1.9)	
No	798 (91.0)	28 (3.2)	51 (5.8)	
Planning more children				<0.0001
Yes	2448 (94.7)	70 (2.7)	66 (2.6)	
No	176 (88.0)	9 (4.5)	15 (7.5)	
Do not know	196 (89.9)	11 (5.0)	11 (5.0)	
Depressed during pregnancy				<0.0001
Yes	156 (86.2)	10 (5.5)	15 (8.3)	
No	2658 (94.5)	80 (2.8)	75 (2.7)	
Fear of childbirth				<0.0001
Low	982 (95.9)	24 (2.3)	18 (1.8)	
Medium	1177 (95.3)	34 (2.8)	24 (1.9)	
High	661 (89.0)	32 (4.3)	50 (6.7)	
Being told they might need a cesarean				<0.0001
Yes	184 (75.4)	21 (8.6)	39 (16.0)	
No	2634 (95.6)	68 (2.5)	53 (1.9)	
Hypertension before and/or during pregnancy				<0.0001
Yes	158 (87.3)	14 (7.7)	9 (5.0)	
No	2662 (94.4)	76 (2.7)	83 (2.9)	
Diabetes before and/or during pregnancy				0.001
Yes	164 (88.2)	8 (4.3)	14 (7.5)	
No	2656 (94.3)	82 (2.9)	78 (2.8)	
Medical indication for cesarean delivery**				<0.0001
Yes	432 (84.5)	33 (6.5)	46 (9.0)	
No	2388 (95.9)	57 (2.3)	46 (1.8)	

* χ^2 results, $n=3002$, four women answered “don’t know” to the preference question and were not included in these analyses.

**Women who were told they might need a cesarean delivery, or had been diagnosed with hypertension, or diabetes, according to the baseline interview.

TABLE 3. PARTICIPANTS' CHARACTERISTICS BY PLANNED CESAREAN DELIVERY, $N=155$, AND UNPLANNED CESAREAN DELIVERY, $N=708$

	<i>Planned cesarean</i>	p^*	<i>Unplanned cesarean</i>	p^{**}
Mode of delivery preference		<0.0001		0.042
Vaginal	112 (4.0)		661 (24.4)	
No preference	12 (13.3)		27 (34.6)	
Cesarean	31 (33.7)		20 (32.8)	
Maternal age at delivery (years)		<0.0001		<0.0001
18–24	19 (2.3)		162 (20.5)	
25–29	63 (5.3)		277 (24.5)	
30–36	73 (7.3)		269 (29.0)	
Race		0.027		0.038
White	139 (5.6)		569 (24.1)	
Non-white	16 (3.2)		139 (28.5)	
Education		0.055		0.685
High school degree or less	17 (3.4)		118 (24.4)	
Some college or technical	37 (4.6)		183 (23.9)	
College graduate or higher	101 (5.9)		407 (25.4)	
Insurance		0.003		0.332
Private	134 (5.8)		551 (25.3)	
Public	21 (3.0)		157 (23.4)	
Marital status		<0.0001		0.742
Married	130 (6.1)		490 (24.7)	
Not married	25 (2.8)		218 (25.2)	
Prepregnancy BMI (kg/m^2)		<0.0001		<0.0001
Underweight/normal	74 (4.3)		322 (19.6)	
Overweight	27 (4.0)		180 (28.1)	
Obese	54 (8.7)		206 (36.4)	
Time to conception		<0.0001		0.427
≤6 months	109 (4.4)		324 (24.6)	
>6 months	46 (9.1)		122 (26.5)	
Previous miscarriage		0.884		0.091
Yes	24 (5.0)		127 (28.0)	
No	131 (5.2)		581 (24.2)	
Childbirth education class		0.164		0.558
Yes	102 (4.8)		509 (25.1)	
No	53 (6.0)		199 (24.1)	
Planning more children		0.099		0.972
Yes	127 (4.9)		609 (24.8)	
No	10 (5.0)		48 (25.0)	
Do not know	18 (8.3)		51 (25.5)	
Depressed during pregnancy		0.887		0.463
Yes	9 (4.9)		47 (27.2)	
No	146 (5.2)		659 (24.7)	
Fear of childbirth		0.346		0.885
Low	45 (4.4)		238 (24.3)	
Medium	71 (5.7)		293 (25.2)	
High	39 (5.2)		177 (25.0)	
Being told they might need a cesarean		<0.0001		0.008
Yes	72 (29.4)		58 (33.5)	
No	83 (3.0)		650 (24.3)	
Hypertension before and/or during pregnancy		0.817		0.006
Yes	10 (5.5)		58 (33.9)	
No	145 (5.1)		650 (24.3)	
Diabetes before and/or during pregnancy		0.001		0.005
Yes	19 (10.2)		57 (34.1)	
No	136 (4.8)		651 (24.3)	
Medical indication for cesarean delivery***		<0.0001		<0.0001
Yes	78 (15.2)		144 (33.2)	
No	77 (3.1)		564 (23.3)	

* χ^2 results, planned cesarean ($n=155$) versus attempting vaginal delivery ($n=2851$), among 3006 study participants.

** χ^2 results, unplanned cesarean ($n=708$) versus vaginal delivery (2143) among those attempting vaginal delivery ($n=2815$).

***Women who were told they might need a cesarean delivery, or had been diagnosed with hypertension, or diabetes, as of the time of the baseline interview.

TABLE 4. MULTINOMIAL LOGISTIC REGRESSION COMPARING WOMEN WHO PREFER CESAREAN ($N=92$) WITH THOSE WHO PREFER VAGINAL ($N=2820$) AND WOMEN WHO HAVE NO PREFERENCE ($N=90$) WITH THOSE WHO PREFER VAGINAL

	<i>Prefer cesarean versus prefer vaginal</i>	<i>No preference versus prefer vaginal</i>
	<i>Adjusted OR (95% CI)</i>	<i>Adjusted OR (95% CI)</i>
Maternal age at delivery (years)		
18–24	0.97 (0.43–2.20)	1.19 (0.72–1.97)
25–29	1.05 (0.61–1.81)	0.81 (0.35–1.88)
30–36	Reference	Reference
Race		
White	2.81 (1.30–6.03)	1.53 (0.73–3.19)
Non-white	Reference	Reference
Education		
High school degree or less	Reference	Reference
Some college or technical	0.89 (0.42–1.86)	1.48 (0.65–3.39)
College graduate or higher	1.18 (0.51–2.73)	1.70 (0.69–4.17)
Insurance		
Private	1.08 (0.52–2.25)	0.89 (0.42–1.86)
Public	Reference	Reference
Marital status		
Married	1.05 (0.53–2.07)	1.12 (0.57–2.22)
Not married	Reference	Reference
Prepregnancy BMI (kg/m^2)		
Underweight/normal	Reference	Reference
Overweight	1.02 (0.57–1.81)	0.61 (0.32–1.18)
Obese	0.98 (0.54–1.78)	1.61 (0.97–2.69)
Time to conception		
≤ 6 months	Reference	Reference
> 6 months	1.52 (0.84–2.72)	2.01 (1.21–3.33)
Previous miscarriage		
Yes	0.85 (0.47–1.53)	1.21 (0.66–2.22)
No	Reference	Reference
Childbirth education class		
Yes	Reference	Reference
No	3.49 (2.14–5.70)	1.33 (0.80–2.20)
Planning more children		
Yes	Reference	Reference
No or do not know	1.98 (1.15–3.41)	1.87 (1.07–3.27)
Depressed during pregnancy		
Yes	2.34 (1.18–4.66)	2.21 (1.05–4.67)
No	Reference	Reference
Fear of childbirth		
Low	Reference	Reference
Medium	1.13 (0.59–2.14)	1.10 (0.64–1.89)
High	3.29 (1.82–5.96)	1.74 (0.99–3.09)
Being told they might need a cesarean		
Yes	9.13 (5.54–15.04)	3.81 (2.18–6.65)
No	Reference	Reference
Hypertension before and/or during pregnancy		
Yes	1.22 (0.56–2.67)	1.99 (1.05–3.80)
No	Reference	Reference
Diabetes before and/or during pregnancy		
Yes	1.55 (0.76–3.16)	1.28 (0.56–2.94)
No	Reference	Reference

All variables in this table included in the multinomial logistic regression model.

preference (aOR=3.81; 95% CI=2.18–6.65). Women who attended a childbirth education class during pregnancy were significantly more likely to prefer vaginal delivery, as opposed to cesarean, than women who did not attend childbirth education class, but were not significantly more likely to prefer

vaginal delivery, as opposed to having no mode of delivery preference.

Table 5 shows the results of two multivariable logistic regression analyses: the first to measure the association between participants' characteristics (including mode of delivery

TABLE 5. MULTIVARIABLE LOGISTIC REGRESSION MODELS: (1) COMPARING WOMEN WHO HAD PLANNED CESAREAN (N=155) WITH THOSE WHO ATTEMPTED VAGINAL DELIVERY (N=2851) AND (2) COMPARING WOMEN WHO HAD UNPLANNED CESAREAN (N=708) WITH THOSE WHO DELIVERED VAGINALLY (N=2142)

	<i>Planned cesarean versus attempting vaginal delivery</i>	<i>Unplanned cesarean versus vaginal delivery</i>
	<i>Adjusted OR (95% CI)</i>	<i>Adjusted OR (95% CI)</i>
Mode of delivery preference		
Vaginal	Reference	Reference
No preference	1.97 (0.95–4.07)	1.46 (0.89–2.40)
Cesarean	6.02 (3.26–11.12)	1.35 (0.77–2.38)
Maternal age at delivery (years)		
18–24	Reference	Reference
25–29	1.89 (0.94–3.78)	1.61 (1.20–2.17)
30–36	2.28 (1.09–4.73)	2.08 (1.50–2.87)
Race		
White	1.21 (0.65–2.23)	0.66 (0.51–0.85)
Non-white	Reference	Reference
Education		
High school degree or less	Reference	Reference
Some college or technical	0.71 (0.35–1.43)	0.85 (0.63–1.15)
College graduate or higher	0.71 (0.34–1.48)	0.88 (0.63–1.23)
Insurance		
Private	1.24 (0.61–2.53)	1.22 (0.91–1.65)
Public	Reference	Reference
Marital status		
Married	1.76 (0.91–3.38)	0.72 (0.55–0.95)
Not married	Reference	Reference
Prepregnancy BMI (kg/m ²)		
Underweight/normal	Reference	Reference
Overweight	0.93 (0.57–1.51)	1.60 (1.29–1.98)
Obese	1.96 (1.27–3.02)	2.33 (1.86–2.91)
Time to conception		
≤6 months	Reference	Reference
>6 months	1.47 (0.96–2.25)	0.93 (0.74–1.13)
Previous miscarriage		
Yes	1.30 (0.78–2.15)	0.88 (0.70–1.11)
No	Reference	Reference
Childbirth education class during pregnancy		
Yes	1.38 (0.90–2.12)	0.91 (0.74–1.13)
No	Reference	Reference
Planning more children		
Yes	Reference	Reference
No/do not know	0.80 (0.48–1.32)	1.08 (0.83–1.39)
Depressed during pregnancy		
Yes	1.16 (0.49–2.72)	0.69 (0.48–1.01)
No	Reference	Reference
Fear of childbirth		
Low	Reference	Reference
Medium	1.26 (0.83–1.92)	1.01 (0.83–1.24)
High	0.85 (0.51–1.42)	0.94 (0.75–1.20)
Being told they might need a cesarean		
Yes	10.46 (6.99–15.67)	1.21 (0.85–1.72)
No	Reference	Reference
Hypertension before and/or during pregnancy		
Yes	2.15 (1.00–4.67)	0.86 (0.61–1.22)
No	Reference	Reference
Diabetes before and/or during pregnancy		
Yes	1.48 (0.79–2.77)	0.89 (0.62–1.27)
No	Reference	Reference

All variables in this table included in the multivariable logistic regression models.

preference) and the outcome of the first decision stage (the decision to have planned cesarean versus attempting vaginal delivery), controlling for all of the factors in one equation. The second multivariable regression analysis modeled the association between participants' characteristics (including mode of delivery preference) and the outcome of the second decision stage (the decision to have unplanned cesarean among those who attempted vaginal delivery), controlling for all of the factors in one equation. After adjusting for the confounders, prenatal preference for cesarean delivery remained strongly associated with planned cesarean delivery (aOR = 6.02; 95% CI = 3.26–11.12). Other factors that were significantly associated with planned cesarean in the multivariable regression model were maternal age ≥ 30 years, hypertension, prepregnancy obesity, and being told that they might need to have their baby by cesarean section.

As the second multivariable logistic regression model shows in Table 5, among the women who attempted vaginal delivery, those who preferred cesarean were no more likely to deliver by unplanned cesarean than those who preferred vaginal delivery. In addition, women who were told they might need a cesarean delivery during pregnancy were no more likely to have an unplanned cesarean delivery than women who were not told they might need a cesarean delivery. In this model, the factors that were significantly associated with having an unplanned cesarean delivery were maternal age ≥ 30 years, race (non-white women were more likely to have unplanned cesarean), marital status (unmarried women were more likely to have unplanned cesarean), and being both overweight and obese.

Among the 31 women who preferred to deliver by cesarean section and had a planned cesarean delivery, the indications for cesarean delivery reported in the hospital discharge data were as follows: malpresentation ($n = 12$; 38.7%), abnormalities of organs and soft tissues of pelvis ($n = 8$; 25.8%), antepartum bleeding or placental conditions ($n = 5$; 16.1%), hypertension ($n = 5$; 16.1%), macrosomia ($n = 4$; 12.9%), cephalopelvic disproportion ($n = 3$; 9.7%), umbilical cord complications ($n = 3$; 9.7%), placenta previa ($n = 2$; 6.5%), post-term ($n = 2$; 6.5%), severe preeclampsia ($n = 1$; 3.2%), and hydramnios ($n = 1$; 3.2%). Some women had more than one indication for cesarean delivery. Only one of these women reported that she had planned cesarean delivery in the absence of a medical indication and because she requested it, which was corroborated by a lack of medical indications for cesarean delivery reported in her hospital discharge data. In addition, among the 112 women who had planned cesarean delivery but would have preferred vaginal delivery, and the 12 women who reported no preference, all were found to have one or more medical indications for cesarean delivery as reported in their hospital discharge records (data not shown).

The results of the sensitivity analyses indicated that gestational age at the baseline interview was not associated with mode of delivery preference ($p = 0.757$) or being told they might need to have a cesarean delivery ($p = 0.753$).

Discussion

In this study of >3000 nulliparous women in Pennsylvania, we found that only 3% reported a preference to deliver by cesarean section in their third trimester. In reference to our first research question, "What factors are associated with

nulliparous women's preference for cesarean delivery during pregnancy?" we found that women who preferred cesarean were more fearful about the upcoming delivery, more likely to be depressed, less likely to have taken a childbirth education class, less likely to be planning to have more children, and more likely to report that they had been told by a doctor or nurse that they might need a cesarean delivery. Although women with a medical indication for cesarean delivery (defined as having hypertension, diabetes, or being told they might need cesarean delivery) were more likely to prefer cesarean delivery than those without a medical indication, only 9.0% of the women with a medical indication for cesarean delivery reported that they would prefer to deliver by cesarean. In addition, only half of the women who preferred cesarean delivery had a medical indication.

In reference to our second research question, "Is nulliparous women's preference for cesarean delivery associated with the decision to have planned cesarean rather than attempting vaginal delivery?" we found that women who preferred cesarean were more likely to have a planned cesarean than those who preferred vaginal delivery. However, only a third of those who preferred cesarean had a planned cesarean. The majority of the women who had a planned cesarean would have preferred to have a vaginal delivery. The factors that were independently associated with having a planned cesarean delivery in the multivariable regression model were: having been told during pregnancy that cesarean might be necessary, preference for cesarean delivery, being aged ≥ 30 years, and obesity. Although women who had been told they might need a cesarean delivery were more likely to prefer cesarean than those who were not told they might need a cesarean delivery, women who preferred cesarean delivery were substantially more likely to have a planned cesarean delivery than women who preferred vaginal delivery (aOR = 6.02), even after controlling for having been told they might need a cesarean delivery, hypertension, diabetes, and all other confounding variables.

In reference to our third research question, "Is nulliparous women's preference for cesarean delivery during pregnancy associated with the decision to have unplanned cesarean delivery among the women who attempted vaginal delivery?" we found that neither preference for cesarean nor being told they might need cesarean delivery was associated with having an unplanned cesarean delivery in the multivariable regression model. The strongest predictors of unplanned cesarean were prepregnancy BMI category (being obese or overweight), aged ≥ 30 years, race (being non-white), and marital status (being unmarried).

In this study, a fairly large percentage of the participants (3.0%) reported that they had no specific mode of delivery preference. Although we had no *a priori* hypotheses about these women, we found that they tended to fall in-between women who preferred vaginal delivery and those who preferred cesarean delivery in terms of factors associated with mode of delivery preference. In addition, women with no mode of delivery preference fell in-between women with preference for vaginal and those with preference for cesarean delivery in terms of the percentage who had planned cesarean delivery.

Although the low-risk cesarean delivery rate at first childbirth in the United States was >25% at the time the women in this study delivered (and still is),¹⁹ only 8% of the

participants reported being told by their provider during pregnancy that they might need to have a cesarean delivery. This factor was strongly associated with preference for cesarean delivery such that 16% of the women who were told they might need a cesarean delivery reported a preference for cesarean delivery, whereas only 2% of those not told they might need cesarean delivery reported a preference for cesarean delivery. The women who were told they might need a cesarean delivery reported legitimate and potentially concerning conditions in the baseline interview as the reasons they were told they might need a cesarean, including suspected macrosomia, malposition, diabetes, placenta previa, and possible active herpes. However, we do not know for certain which came first, the preference for cesarean delivery or being told they might need a cesarean delivery, among the 39 women who reported in the baseline interview both a preference to deliver by cesarean and having been told they might need a cesarean delivery.

The results of this study are consistent in several respects with a previous cohort study conducted in Norway.²⁰ In that study, 3.5% of the nulliparous women reported a preference to deliver by cesarean section during pregnancy (similar to our rate of 3.1%), and preference was strongly associated with planned cesarean delivery, as we found in our study. However, in the Norwegian study, preference for cesarean delivery was associated with unplanned cesarean delivery in the adjusted models, but it was not in our study.

Only one of the 3006 women in this study could be classified as having had a maternal request cesarean delivery. Although maternal preference certainly played a role in the decision to have a planned cesarean delivery, all but one of the women who had planned cesarean delivery had one or more medical or obstetric indications reported in the hospital discharge data. In addition, only a third of the women who reported a preference for cesarean delivery had a planned cesarean. Based on these results, as well as the Listening to Mothers survey described previously,¹¹ it looks like maternal request cesarean occurs rarely in the United States. Rather, what likely occurs more commonly could be called “maternal preference cesarean.” As we define it, maternal preference cesarean may or may not involve medical indications for cesarean delivery and occurs as a result of perceived need for cesarean delivery as judged by the woman and her provider, the woman’s fears and concerns, and mode of delivery preference.

Strengths of this study are that it was a large-scale prospective interview study in which we measured mode of delivery preference and a variety of relevant confounders during the third trimester before first childbirth. In addition, the new mothers were queried extensively about the labor and delivery process 1 month after childbirth, allowing us to distinguish between prelabor, planned cesarean delivery, and unplanned cesarean. A limitation of this study is that we only included women aged 18–35 years at enrollment. Women more than the age of 35 years expecting their first child might have been more likely to prefer cesarean delivery and to have a planned prelabor cesarean. In addition, despite intensive efforts to recruit low-income minority women throughout the state, the FBS participants were more likely to be married, college educated, and to have private insurance than childbearing women in Pennsylvania, limiting the generalizability of our results.

In this study, we found that women who preferred cesarean delivery were more likely to report that they had been told by their physician that they might need a cesarean delivery, and that both factors contributed independently to the eventual decision to have a prelabor cesarean versus attempting vaginal delivery. This is an important finding because it adds to our understanding of what preference for cesarean delivery means. Women who believe that they might need cesarean delivery may be more inclined to prefer cesarean because of safety concerns for the baby or themselves. Although we do not know specifically how the decision to have planned cesarean delivery was reached, our results suggest that women’s prenatal mode of delivery preference was part of this decision-making process, but clinical judgement as to the necessity of cesarean played an important role as well, and was the strongest predictor of this decision. In addition, we found that neither mode of delivery preference nor provider prediction of the necessity of cesarean delivery was associated with the decision to have cesarean delivery among the women who attempted vaginal delivery—rather it was the maternal characteristics (particularly obesity and maternal age ≥ 30 years) that were the primary drivers of the intrapartum decision in favor of cesarean delivery.

In summary, in this study, we found that few women preferred cesarean delivery before first childbirth, but those who did were more likely to undergo planned cesarean delivery before the onset of labor. However, if they preferred cesarean delivery but nonetheless attempted vaginal delivery, they were no more likely to have unplanned cesarean than the women who preferred vaginal delivery, after controlling for confounding variables.

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Author Disclosure Statement

The authors report no conflict of interest.

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