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Early maternal-newborn contact and positive birth experience

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Abstract

Background—In recent years there has been increasing recognition of the importance of early maternal-newborn contact for the health and well-being of the newborn and promotion of breastfeeding. However, little research has investigated the association between early maternal-newborn contact and the mother's birth experience.

Methods—As part of a large-scale prospective, cohort study (the First Baby Study (FBS)), nearly 3,000 women who delivered in Pennsylvania (2009-2011) reported how soon after delivery they first saw, held, and fed their newborns. Birth experience was measured via telephone interview 1-month postpartum, using the FBS Birth Experience Scale, a 16-item scale which addresses women's feelings about the delivery. General linear models were used to measure associations between time to first maternal-newborn contact and birth experience, controlling for relevant confounders, including maternal age, race/ethnicity, insurance coverage, delivery mode, gestational age, and pregnancy and delivery complications.

Results—The sooner that new mothers first saw, held and fed their newborns after delivery the more positive their childbirth experiences (all P -values $< .001$). Women who delivered by cesarean were less likely to see, hold and feed their newborns shortly after delivery than those who delivered vaginally (all P -values $< .001$), and reported less positive birth experiences ($P < .001$). However, if they first saw, held and fed their newborns shortly after delivery they reported more positive birth experiences than those who delivered vaginally ($P = .010$).

Discussion—Early maternal-newborn contact after delivery was associated with positive birth experiences for new mothers, particularly those who delivered by cesarean.

Keywords

Childbirth experience; maternal-newborn contact; cesarean delivery

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INTRODUCTION

The childbirth experience (especially of the first birth) represents an enduring milestone in a childbearing woman's development as a mother,¹⁻⁴ and has implications for her psychological health,⁵⁻⁷ bonding with her newborn,⁷ and plans to have subsequent children.⁷ Women who deliver by cesarean report substantially less positive childbirth experience,⁸⁻⁹ with less positive memories about the delivery enduring for years afterwards.¹⁰⁻¹¹

In recent years there has been increasing recognition of the importance of the first few minutes after delivery as a window of opportunity to promote maternal-newborn bonding, successful breastfeeding, and a positive childbirth experience for the mother and her family.¹²⁻¹⁴ First maternal-newborn interactions, such as seeing, holding, and feeding the newborn, are part of the complex and not yet fully understood psychobiological process of maternal-newborn bonding.¹³⁻¹⁶ Recent research has documented the positive effects of early maternal-newborn contact on the newborn's thermoregulation, stress reactivity and autonomic functioning.¹⁷⁻¹⁸ However, hospitals have post-delivery routines in place that may involve immediate or early separation of the mother and newborn in order to assess the newborn and care for the mother.¹² In addition, there are a variety of circumstances in which the newborn or mother may require post-delivery medical care that precludes immediate or early maternal-newborn contact. In the case of cesarean delivery, the focus is generally on the post-incision care of the mother and there may be little or no opportunity for the mother to see, hold or feed her newborn for several hours after the delivery.¹⁹

Although there is growing evidence of the value of immediate or early maternal-newborn contact, particularly within the first hour after delivery,¹⁹⁻²⁰ we found little research which quantified time to first maternal-newborn contact or investigated factors associated with how soon after delivery new mothers first see, hold and feed their newborns in U.S. hospitals. In addition, we found little research measuring variation in time to first maternal-newborn contact in relation to maternal birth experience. While it is well-documented that women who deliver by cesarean report a more negative birth experience than those who deliver vaginally,⁷⁻⁹ it is not clear how time to first maternal-newborn contact plays a role in this association between mode of delivery and birth experience, if at all.

As part of a large-scale prospective, cohort study of first childbirth, we asked new mothers how soon after delivery they first saw, held and fed their newborns. This provided a unique opportunity to investigate associations between demographic and clinical factors and time-intervals before first maternal-newborn contact, and the effects of these time-intervals on maternal experience of childbirth, controlling for confounding variables.

METHODS

Design and participants

This was a planned secondary analysis of data from the First Baby Study (FBS).²¹ The FBS was a prospective cohort study designed to investigate the association between mode of delivery at first childbirth and subsequent childbearing. Women were recruited from a variety of settings, including childbirth education classes, low-income clinics, targeted

mailings, local magazine ads, and postings at participating hospitals. Interviews were conducted by telephone. Women met inclusion criteria if they were English or Spanish-speaking, nulliparous, aged 18 to 35 years old, expecting a singleton, and planning to deliver at a hospital in Pennsylvania. Women were excluded if they had had a prior pregnancy of 20 weeks gestation or longer, were a surrogate, were planning for adoption, or were planning to deliver outside the hospital. Participants delivered between 34 and 42 weeks gestation. Deliveries occurred between January 2009 and April 2011 at 76 hospitals across Pennsylvania. The baseline and 1-month postpartum interviews were completed by 3,006 women. This study was approved by the Penn State College of Medicine Institutional Review Board and all participants provided written informed consent. Statistical analyses were conducted using the statistical software package SPSS 25 (SPSS Inc., Chicago, IL).

Measures

The outcome of interest for this analysis was maternal birth experience, measured by a 16-item instrument administered at the 1-month postpartum telephone interview, the FBS Birth Experience Scale. This scale was developed by the FBS investigators based on qualitative interviews of new mothers, and pilot-tested before use. Respondents were asked “Thinking back to right after you had your baby (or if unconscious, after you woke up), please tell me how you felt, using the following scale – extremely, quite a bit, moderately, a little bit and not at all.” The interviewer asked about 16 feelings. These feelings were “exhausted”, “on cloud nine”, “disappointed”, “in pain”, “sick”, “delighted”, “upset”, “excited”, “worried”, “calm” “like a failure”, “thankful”, “traumatized”, “sad”, “angry”, and “proud of myself”. Items that measured positive feelings were reverse scored. Total scores on this instrument could range from 16 (very negative birth experience) to 80 (very positive birth experience). The overall Cronbach’s alpha was 0.74 and the instrument exhibited strong construct validity as a measure of childbirth experience, as can be seen in several previous publications.^{7,22}

As part of the 1-month postpartum interview the new mothers were asked: “Thinking about when your baby was born, how soon after delivery were you able to see your baby for the first time?” “...hold your baby for the first time?” and “...feed your baby for the first time?” These questions were developed by one of the authors (IP), with the goal of comparing time to first maternal-newborn contact by mode of delivery. In response to these questions, participants answered either “right away” or reported the time from delivery to first maternal-newborn contact. These variables were categorized because the distributions were highly kurtotic (76.2% reported that they first saw their newborn right away, for example), highly skewed to the right (some women were not able to first hold their newborn for weeks after delivery, for example), and the majority of women answered these questions in terms of common time intervals, such as “10 minutes”, “30 minutes” or “1 hour”, which created a multimodal distribution. For each time-interval variable we began with 9 to 10 categories and combined categories in order to arrive at 3 categories per variable that were significantly different from each other in terms of mean birth experience scores. For the variable of time to first see the newborn the three categories were: right away, 1-30 minutes after delivery, and > 30 minutes after delivery. For the variable of time to first hold the newborn the categories were: 5 minutes or less, > 5-30 minutes, and > 30 minutes. For the variable of

time to first feed the newborn the categories were: 30 minutes or less, > 30 minutes-2 hours, and > 2 hours.

In order to identify variation across the three time-interval variables taken together, we created a summated scale of time to first maternal-newborn contact (the Combined Time-Interval Scale), by summing women's scores on each of the time-interval variables, each scored 1 to 3. Therefore, scores on this scale ranged from 3 (1 point assigned if the mother saw her newborn right away, 1 point if she held her newborn in 5 minutes or less, and 1 point if she fed her newborn in 30 minutes or less) to 9 (3 points assigned if the mother did not see her newborn until more than 30 minutes after delivery, 3 points if she did not hold her newborn until more than 30 minutes after delivery, and 3 points if she did not feed her newborn until more than 2 hours after delivery). Reliability analyses indicated that these three items worked well together. The corrected item-total correlations ranged from 0.46 to 0.59 and the overall Cronbach's alpha was 0.69 (appropriate for a 3-item scale).

We used the hospital discharge data linked with the birth certificate data to develop four dichotomous composite measures of childbirth morbidity, including high-risk deliveries, fetal congenital conditions, maternal morbidities and newborn morbidities, based on the childbirth composite morbidity indicators described in Korst et al, 2014,²³ using the International Classification of Diseases 9th Revision, Clinical Modification (ICD-CM) diagnostic and procedure codes specified in supplementary tables 1 to 3 of Korst et al.²³ We also counted a condition as present if it was reported in the birth certificate data. We developed these composite childbirth morbidity indicators so that we could measure and control for pregnancy and childbirth complications that would likely be associated with how quickly the mother would be able to first see, hold and feed her newborn, as well as her feelings about the childbirth.

Statistical analyses

The analyses addressed the following four questions:

1. What demographic and clinical factors were associated with the time to first maternal-newborn contact?
2. How did mode of delivery affect the time to first maternal-newborn contact?
3. How did time to first maternal-newborn contact affect the association between mode of delivery and maternal birth experience?, and
4. How did time to first maternal-newborn contact affect maternal childbirth experience, independent of mode of delivery?

The associations between the time-interval variables (time from delivery to first seeing, holding, and feeding the newborn) and demographic and clinical factors were measured using Pearson's X^2 tests. Adjusted odd ratios (aORs) and 95% confidence intervals (CIs) were derived from three multivariable logistic regression models (with all confounding variables in each model) to measure the associations between the demographic and clinical factors and each of the three primary time-interval variables. For these analyses the time-interval categories were dichotomized to compare women who interacted with their

newborns in the shortest time categories within each time-interval variable (saw newborn right away, held newborn in 5 minutes or less and fed newborn in 30 minutes or less) to those who did not.

Sequential general linear models were used to investigate the effect of each of the time-interval variables on the association between mode of delivery and maternal birth experience. In the first model we controlled for the confounding variables, but did not include any of the time-interval variables. In the second model we controlled for the “time to first see the newborn” variable and the confounding variables. In the third model we controlled for the “time to first hold the newborn” variable and the confounding variables. In the fourth model we controlled for the “time to first feed the newborn” variable and the confounding variables. In the fifth model we controlled for the Combined Time-Interval Scale variable and the confounding variables. We carried out an additional analysis to compare mean FBS Birth Experience scores for the women who delivered vaginally to those who delivered by cesarean, among those with a Combined Time-Interval Scale score of 3, via linear regression, controlling for the confounding variables.

Finally, general linear models were used to measure the association between each of the time-interval variables and maternal childbirth experience, controlling for the covariates, including mode of delivery. For these analyses there were four models, one for each of the primary time-interval variables (time to see, hold and feed the newborn), as well as the Combined Time-Interval Scale. For the model with the Combined Time-Interval Scale we conducted a-priori contrasts to compare the adjusted means of those with a score of 3 to those with scores of 4, 5, 6, 7, 8 and 9, in order to compare maternal birth experience among the women with the shortest time-intervals for all three of the maternal-newborn contact domains (those with a Combined Time-Interval score of 3) to those with longer time-intervals.

In the general linear models described above, any one of the time-interval variables was included in only one model at a time because these variables were highly collinear, as one would expect. It would be difficult to hold the newborn without seeing the newborn, for example. Because the adjusted mean birth experience scores resulting from the general linear models were very similar to the unadjusted mean birth experience scores, we show the unadjusted mean birth experience scores only.

RESULTS

The study participants were predominantly white/non-Hispanic (83.2%), and covered by private insurance (77.0%), as seen in Table 1. There were 155 women (5.2%) who had a planned cesarean delivery prior to the onset of labor and an additional 708 (23.6%) who had unplanned cesarean. Based on the childbirth morbidity measures,²³ 44.8% were classified as high-risk deliveries, 6.3% involved fetal congenital conditions, 27.2% involved maternal morbidities and 13.2% involved neonatal morbidities. The majority of the women were able to see their newborn right away (76.2%), about half reported holding their newborn in 5 minutes or less after delivery (56.5%), and less than half reported feeding their newborn in 30 minutes or less (40.4%). Overall, 30% had a Combined Time-Interval Scale score of 3,

indicating that they were able to see their newborn right away as well as hold their newborn in 5 minutes or less and feed their newborn in 30 minutes or less.

In the unadjusted X^2 analyses, white non-Hispanic women were more likely to report that they saw their newborn right away in comparison to minority women, as were women with private insurance in comparison to women with public insurance (Table 2). Less than half of the women who had an unplanned cesarean delivery (47.9%) saw their newborn right away, 7.8% held their newborn in 5 minutes or less and 12.0% fed their newborn in 30 minutes or less. In contrast 87.6% of the women who had a spontaneous vaginal delivery saw their newborn right away, 76.5% held their newborn in 5 minutes or less and 52.2% fed their newborn in 30 minutes or less (all 3 P -values < .001). Women with high risk deliveries were less likely to see their newborns right away, hold them in 5 minutes or less and feed them in 30 minutes or less than women who did not have high risk deliveries (all 3 P -values < .001). If there were neonatal morbidities the mothers were also less likely to see their newborn right away, hold them in 5 minutes or less and feed them in 30 minutes or less (all 3 P -values < .001).

After adjustment for the confounding variables (Table 3), the women who had spontaneous vaginal delivery had considerably increased odds of being able to see their newborn right away (aOR 7.77, 95% CI 6.26- 9.64), hold their newborn in 5 minutes or less (aOR 40.31, 95% CI 29.58-54.92), and feed their newborn in 30 minutes or less (aOR 8.17, 95% CI 6.32-10.56), in comparison to those who delivered by unplanned cesarean. The women with high-risk deliveries were not significantly less likely to see their newborn right away or feed their newborn in 30 minutes or less, but were less likely to hold their newborn in 5 minutes or less in comparison to those who did not have high-risk deliveries. Fetal congenital conditions were not significantly associated with any of the three time-interval measures. However, when there were neonatal morbidities the mothers were significantly less likely to see their newborn right away, hold their newborn in 5 minutes or less and feed their newborn in 30 minutes or less. Women whose labor team included a midwife or doula were more likely to see their newborn right away and hold their newborn in 5 minutes or less than women who did not have the support of a midwife or doula.

Overall, women who delivered vaginally reported a more positive childbirth experience than those who delivered by cesarean, controlling for the confounding variables but not the time to first maternal-newborn contact variables (P < .001) (Table 4). With the “time to first see the newborn” variable in the equation (the second model), mode of delivery remained significant. In the third model, with the variable of “time to first hold the newborn” in the equation, mode of delivery was borderline significant. In the fourth model, with the “time to first feed the newborn” in the equation, mode of delivery was significant. In the fifth model, with the Combined Time- Interval Scale in the equation, mode of delivery was no longer significant (P = .829). Although very few of the women who delivered by cesarean had a Combined Time- Interval Scale score of 3 (n = 19), the mean FBS Birth Experience score for these women was 72.84, which was significantly higher (P = .010) than the mean birth experience score for the 848 women who also had a Combined Time-Interval Scale score of 3, but had delivered vaginally, which was 70.17.

Even after controlling for the confounding variables (including mode of delivery), each of the time-interval variables remained highly significantly associated with birth experience (Table 5). The new mothers with the highest birth experience scores were those with a Combined-Time-Interval score of 3, while those who had a Combined-Time-Interval score of 9 had the lowest birth experience scores. In the a-priori contrasts (controlling for the confounding variables), the mean FBS Birth Experience score of the women with a Combined Time-Interval Scale score of 3 was not significantly different from the mean birth experience score of those with a Combined Time-Interval Scale score of 4 ($P = .169$), but it was significantly different from the mean birth experience scores of those with Combined Time-Interval Scale scores of 5 ($P < .01$) and 6, 7, 8 and 9 (all 4 P -values $< .001$).

DISCUSSION

The results from this secondary analysis from the First Baby Study demonstrated that the shorter the time-intervals before first maternal-newborn contact (seeing, holding and feeding the newborn) the more positive the childbirth experience was for new mothers. In fact, the women who delivered by cesarean, but nonetheless were able to see their newborns right away as well as hold them in 5 minutes or less and feed them in 30 minutes or less, had significantly more positive birth experiences than those who reported the same time-intervals before first maternal-newborn contact but delivered vaginally. These results are important because many studies have reported that women who deliver by cesarean report a less positive birth experience than those who deliver vaginally,^{11,22} as we also found in this study. Short time-intervals before first maternal-newborn contact go a long way toward making the childbirth experience positive for new mothers, even those who are delivered by cesarean.

Our results are consistent with other studies that reported that women who have a vaginal birth are usually able to hold and feed their newborn sooner than women with cesarean delivery.^{24–25} This longer length of time before first maternal-newborn contact among women who deliver by cesarean in comparison to vaginally appears to have persisted for decades,²⁶ despite strides toward facilitation of early contact, such as routine use of spinal anesthesia for cesarean section (as opposed to general anesthesia). Nonetheless, we were surprised to find that more than half of the new mothers who delivered by unplanned cesarean (52.1%) reported that they did not see their newborns right away.

Strengths and limitations

There are several limitations to this secondary data analysis. First, the participants in the First Baby Study were more likely to be married, have college degrees and be covered by private insurance than the background population of women at first childbirth in Pennsylvania.²¹ In addition, this study was of first-time mothers only. These factors limit the generalizability of our findings. Additionally, this analysis relied on maternal report of time to first maternal-newborn contact, which is subject to recall bias. Some women would likely not have remembered accurately how soon they were first able to see, hold and feed their newborns. Women's reports of the times before they first saw, held and fed their newborns were categorized into relatively broad time-intervals so that we could measure, in a general

sense, the association between time to first maternal-newborn contact and birth experience. However, such broad time-intervals might be of limited utility for clinical purposes. Another limitation of this report is that we did not ask about skin-to-skin contact between the mother and her newborn. We do not know how often immediate or early holding of the newborns in this study involved skin-to-skin contact, or how that factor affected maternal childbirth experience. Finally, these deliveries occurred in the years 2009 to 2011. We do not know to what extent the delivery process has changed in U.S. hospitals since that time period.

This report also has several strengths. The large sample size allowed us to identify relatively uncommon subgroups of women (such as those who delivered by cesarean but nonetheless saw their newborn right away as well as held their newborn in 5 minutes or less and fed their newborn in 30 minutes or less), that would not have been possible with a smaller sample. In addition, we controlled for the effects of childbirth morbidities and complications. Studies of factors associated with birth experience rarely control for childbirth complications, in part because they are often small sample, qualitative studies.⁸ However, in this analysis it was particularly important that we control for childbirth morbidities and complications because these factors would reasonably be expected to affect how soon new mothers could interact with their newborns. In this analysis we found that in the event of neonatal morbidities the mothers were significantly less likely to see, hold and feed their newborns in the earliest time-intervals after delivery.

Conclusion

In summary, the results of this analysis demonstrate that the time before first maternal-newborn contact after delivery matters to new mothers, and the shorter the times before new mothers first see, hold and feed their newborns the more positive they feel about the childbirth in retrospect.

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TABLE 1

Characteristics of the study population (N = 3,006), First Baby Study, Pennsylvania, USA, 2009-2011

Characteristic	no. (%)
Maternal age at delivery, y	
18-24	811 (27.0)
25-29	1,193 (39.7)
30-36	1,002 (33.3)
Race/ethnicity	
White, non-Hispanic	2,502 (83.2)
Black, non-Hispanic	221 (7.4)
Hispanic	166 (5.5)
Other	116 (3.9)
Private insurance	2,312 (77.0)
Mode of delivery	
Spontaneous vaginal	1882 (62.6)
Instrumental vaginal	261 (8.7)
Planned cesarean	155 (5.2)
Unplanned cesarean	708 (23.6)
Late preterm (34 weeks, 0 days to 36 weeks, 6 days)	120 (4.0)
High-risk delivery ^a	1,346 (44.8)
Fetal congenital conditions ^b	190 (6.3)
Maternal morbidities ^c	818 (27.2)
Neonatal morbidities ^d	397 (13.2)
Midwife or doula attended birth	910 (30.3)
Time before mother first saw newborn after delivery	
Right away	2283 (76.2)
1-30 minutes	482 (16.1)
> 30 minutes	231 (7.7)
Time before mother first held newborn after delivery	
5 minutes or less	1684 (56.5)
> 5-30 minutes	557 (18.7)
> 30 minutes	742 (24.9)
Time before mother first fed newborn after delivery	
30 minutes or less	1191 (40.4)
> 30 minutes-2 hours	1011 (34.3)
> 2 hours	744 (25.3)
Combined Time-Interval Scale	
3 ^e	879 (30.0)
4	649 (22.1)

Characteristic	no. (%)
5	501 (17.1)
6	308 (10.5)
7	309 (10.5)
8	150 (5.1)
9 ^f	136 (4.6)
FBS Birth Experience Scale, mean \pm SD	68.65 \pm 6.39

Missing data: Race/Ethnicity (n = 1); Insurance (n = 2); Fetal congenital conditions (n = 13); Time before mother first saw newborn after delivery (n = 10); Time before mother first held newborn after delivery (n = 23); Time before mother first fed newborn after delivery (n = 60); Combined Time-Interval Scale (n = 77); FBS Birth Experience Scale (n = 33).

^aWomen were classified as having a high-risk delivery if they had one or more of 23 pregnancy complications listed in Supplementary Table 1 of Korst et al²³, such as antepartum bleeding, diabetes, hypertension and malpresentation, as indicated by ICD-9-CM codes in the hospital discharge data or reported in the birth certificate data.

^bNewborns were classified as having fetal congenital conditions if they had one or more of 29 fetal congenital anomalies or adrenogenital disorders listed in Supplementary Table 1 of Korst et al²³, such as cardiac congenital anomalies, urinary tract congenital anomalies and hemolytic disease, as indicated by ICD-9-CM codes in the hospital discharge data or reported in the birth certificate data.

^cWomen were classified as having maternal morbidities if they had one or more of 50 delivery-related complications listed in Supplementary Table 2 of Korst et al²³, such as 3rd or 4th degree perineal laceration, cardiac arrest, and postpartum hemorrhage, as indicated by ICD-9-CM codes in the hospital discharge data or reported in the birth certificate data.

^dNewborns were classified as having neonatal morbidities if they had one or more of 61 complications listed in Supplementary Table 3 of Korst et al²³, such as clavical fracture, meconium aspiration, respiratory distress syndrome and transient tachypnea, as indicated by ICD-9-CM codes in the hospital discharge data or reported in the birth certificate data.

^eA score of 3 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn right away after delivery as well as held her newborn in 5 minutes or less after delivery, and fed her newborn in 30 minutes or less after delivery.

^fA score of 9 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn more than 30 minutes after delivery as well as held her newborn more than 30 minutes after delivery and fed her newborn more than 2 hours after delivery.

TABLE 2

Unadjusted bivariate analyses of demographic and clinical factors by time-interval before mothers first saw, held and fed their newborns after delivery, First Baby Study, Pennsylvania, USA, 2009-2011

Factors	Mother saw newborn right away, no. (%)	Mother held newborn in 5 minutes or less, no. (%)	Mother fed newborn in 30 minutes or less, no. (%)
Maternal age at delivery, y			
18-24	598 (74.0)	471 (58.4) *	328 (41.3)
25-29	932 (78.3)	691 (58.4)	473 (40.6)
30-36	753 (75.5)	522 (52.6)	390 (39.6)
Race/ethnicity			
White, non-Hispanic	1919 (77.0) *	1418 (57.1)	977 (39.8)
Non-white	368 (72.2)	265 (53.2)	214 (43.9)
Insurance			
Private	1793 (77.9) ***	1303 (56.7)	932 (41.0)
Public	488 (70.6)	381 (55.7)	259 (38.5)
Mode of delivery			
Spontaneous vaginal	1648 (87.6) ***	1436 (76.5) ***	966 (52.2) ***
Instrumental vaginal	213 (81.6)	181 (69.6)	113 (43.8)
Planned cesarean	87 (56.1)	13 (8.4)	30 (19.7)
Unplanned cesarean	335 (47.9)	54 (7.8)	82 (12.0)
Late preterm (34 weeks, 0 days to 36 weeks, 6 days)			
Yes	82 (68.3)	55 (46.6) *	30 (25.6) ***
No	2201 (76.5)	1629 (56.9)	1161 (41.0)
High-risk delivery			
Yes	927 (69.2) ***	590 (44.4) ***	440 (33.5) ***
No	1356 (81.9))	1094 (66.1)	751 (46.0)
Fetal congenital conditions			
Yes	135 (71.1)	107 (56.9)	67 (35.6)
No	2139 (76.6)	1572 (56.5)	1120 (40.8)
Maternal morbidities			
Yes	613 (75.0)	439 (54.1)	289 (36.0) **
No	1670 (76.6)	1245 (57.3)	902 (42.1)
Neonatal morbidities			
Yes	240 (60.9) ***	143 (36.6) ***	79 (20.4) ***
No	2043 (78.5)	1541 (59.5)	1112 (43.5)
Midwife or doula attended birth			
Yes	729 (80.6) ***	582 (64.3) *	392 (43.9) *
No	1554 (74.3)	1102 (53.0)	799 (38.9)

Row percents are shown in this table.

*
P<.05,

**
P<.01,

p<.001, based on chi-square analyses.

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TABLE 3

Multivariable logistic regression analyses of demographic and clinical factors by time intervals before mothers first saw, held and fed their newborns, controlling for confounders, First Baby Study, Pennsylvania, USA, 2009-2011

Factor	Mother saw newborn right away	Mother held newborn in 5 minutes or less	Mother fed newborn in 30 minutes or less
	Adjusted OR (95% CI)	Adjusted OR (95% CI)	Adjusted OR (95% CI)
Maternal age at delivery, y			
18-24	Reference	Reference	Reference
25-29	1.27 (0.96-.69)	1.22 (0.93-1.60)	1.08 (0.86-1.37)
30-36	1.19 (0.88-1.60)	1.09 (0.81-1.47)	1.16 (0.90-1.50)
White non-Hispanic	0.94 (0.72-1.23)	1.01 (0.77-1.34)	0.65 (0.51-0.83)
Private insurance	1.51 (1.15-2.00)	1.12 (0.85-1.49)	1.26 (0.99-1.62)
Mode of delivery			
Spontaneous vaginal	7.77 (6.26-9.64)	40.31 (29.58-54.92)	8.17 (6.32-10.56)
Instrumental vaginal	4.71 (3.29-6.74)	30.15 (20.19-45.02)	6.18 (4.36-8.76)
Planned cesarean	1.46 (1.01-2.11)	1.19 (0.63-2.28)	1.71 (1.06-2.75)
Unplanned cesarean	Reference	Reference	Reference
Not late preterm (gestational age of 37 weeks or later)	1.29 (0.81-2.04)	1.44 (0.90-2.31)	1.88 (1.19-2.97)
Not high-risk delivery	1.18 (0.97-1.44)	1.24 (1.02-1.51)	1.07 (0.90-1.26)
No fetal congenital conditions	1.10 (0.76-1.60)	0.68 (0.45-1.02)	1.05 (0.74-1.47)
No maternal morbidities	1.15 (0.93-1.42)	1.40 (1.14-1.73)	1.42 (1.18-1.70)
No neonatal morbidities	2.16 (1.6-2.79)	2.92 (2.23-3.83)	2.68 (2.04-3.54)
Midwife or doula attended birth	1.29 (1.04-1.60)	1.44 (1.17-1.78)	1.09 (0.91-1.30)

Each of the three multivariable logistic regression models controls for maternal age, race, insurance coverage, mode of delivery, late preterm delivery, high-risk delivery, fetal congenital conditions, maternal morbidities, neonatal morbidities and the support of a midwife or doula during labor.

Bolding denotes statistical significance, $P < .05$.

TABLE 4

General linear models of the association between mode of delivery and maternal satisfaction with the childbirth experience (FBS Birth Experience Scale), controlling for each of the time-interval variables and the confounders, First Baby Study, Pennsylvania, USA, 2009-2011

FBS Birth Experience Scale Mean \pm SD				
	Mode of delivery		F	P-value
	Vaginal	Cesarean		
<i>Model 1: controlling for confounders, but not time-interval variables</i>	69.47 \pm 5.79	66.64 \pm 7.33	93.95	< .001
<i>Model 2: controlling for time to first see the newborn and confounders</i>				
Time before mother first saw newborn after delivery			27.36	< .001
Right away	69.69 \pm 5.60	67.71 \pm 6.88		
1-30 minutes	68.16 \pm 6.55	66.23 \pm 7.35		
> 30 minutes	66.83 \pm 7.63	64.64 \pm 7.91		
<i>Model 3: controlling for time to first hold the newborn and confounders</i>				
Time before mother first held newborn after delivery			3.20	0.074
5 minutes or less	69.83 \pm 5.46	69.55 \pm 6.25		
> 5-30 minutes	69.20 \pm 5.75	68.00 \pm 6.66		
> 30 minutes	66.24 \pm 8.00	65.93 \pm 7.48		
<i>Model 4: controlling for time to first feed the newborn and confounders</i>				
Time before mother first fed newborn after delivery			40.68	< .001
30 minutes or less	70.07 \pm 5.30	68.54 \pm 7.28		
> 30 minutes-2 hours	69.62 \pm 5.54	67.44 \pm 6.53		
> 2 hours	67.59 \pm 6.99	65.32 \pm 7.85		
<i>Model 5: controlling for Combined Time-Interval Scale score and confounders</i>				
Combined Time-Interval Scale			.046	0.829
3*	70.17 \pm 5.29	72.84 \pm 5.27		
4	69.72 \pm 5.29	69.43 \pm 5.35		
5	69.54 \pm 5.60	67.46 \pm 7.12		
6	67.57 \pm 7.21	67.55 \pm 6.42		
7	66.26 \pm 6.90	66.12 \pm 7.70		
8	64.68 \pm 9.97	65.82 \pm 7.25		
9**	65.05 \pm 8.35	63.81 \pm 8.13		

Means shown are unadjusted.

Each of the 5 general linear models controls for the confounders of maternal age, race, insurance coverage, late preterm delivery, high-risk delivery, fetal congenital conditions, maternal morbidities, neonatal morbidities and the support of a midwife or doula.

* A score of 3 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn right away after delivery as well as held her newborn in 5 minutes or less after delivery, and fed her newborn in 30 minutes or less after delivery.

** A score of 9 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn more than 30 minutes after delivery as well as held her newborn more than 30 minutes after delivery and fed her newborn more than 2 hours after delivery.

TABLE 5

General linear models of the association between each of the time-interval variables and maternal satisfaction with the childbirth experience (FBS Birth Experience Scale), controlling for mode of delivery and the other confounders, First Baby Study, Pennsylvania, USA, 2009-2011

	FBS Birth Experience Scale Mean \pm SD	F	P-value
<i>Model 1</i>			
Time before mother first saw newborn after delivery		21.55	< .001
Right away	69.33 \pm 5.90		
1-30 minutes	67.12 \pm 7.05		
> 30 minutes	65.18 \pm 7.88		
<i>Model 2</i>			
Time before mother first held newborn after delivery		26.23	< .001
5 minutes or less	69.82 \pm 5.49		
> 5-30 minutes	68.80 \pm 6.09		
> 30 minutes	65.99 \pm 7.58		
<i>Model 3</i>			
Time before mother first fed newborn after delivery		26.54	< .001
30 minutes or less	69.93 \pm 5.53		
> 30 minutes-2 hours	68.86 \pm 5.99		
> 2 hours	66.46 \pm 7.51		
<i>Model 4</i>			
Combined Time-Interval Scale		16.08	< .001
3*	70.24 \pm 5.30		
4	69.60 \pm 5.29		
5	69.10 \pm 6.01		
6	67.56 \pm 6.75		
7	66.16 \pm 7.48		
8	65.62 \pm 7.77		
9**	64.01 \pm 8.15		

Means shown are unadjusted.

Each of the four general linear models controls for maternal age, race, insurance coverage, mode of delivery, late preterm delivery, high-risk delivery, fetal congenital conditions, maternal morbidities, neonatal morbidities and the support of a midwife or doula during labor.

* A score of 3 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn right away after delivery as well as held her newborn in 5 minutes or less after delivery, and fed her newborn in 30 minutes or less after delivery.

** A score of 9 on the Combined Time-Interval Scale indicates that the new mother first saw her newborn more than 30 minutes after delivery as well as held her newborn more than 30 minutes after delivery and fed her newborn more than 2 hours after delivery.