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Examination of Birth Outcomes with Mode of Delivery for Breech Presentation

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ABSTRACT:

Introduction: Approximately 3% to 4% of all pregnancies at term will have a fetus with a breech presentation. Studies have shown that the US has almost completely abandoned vaginal delivery for breech presentation through the influence of the "Term Breech Trial" (TBT) which concluded that a policy of planned caesarian section would reduce perinatal mortality, late neonatal mortality, and serious neonatal morbidity by approximately two-thirds for term fetuses. However, the recommendations are still being challenged by others.

Objectives: The purpose of the study was to describe who in Virginia is having a vaginal delivery for a breech presentation and to determine if there is a difference in birth outcome based on mode of delivery for breech presentation of term infants.

Methods: This population-based study used all birth records for term infants with breech presentation delivered between 1996 and 2005. Data were obtained from the Center for Health Statistics at the Virginia Department of Health. Descriptive statistics were done to characterize vaginal and caesarean section deliveries. These methods were compared using logistic regression for infant mortality and 5-minute Apgar scores as dependent variables.

Results: In Virginia, over the last ten years, the prevalence of vaginal deliveries dropped from 13.1% to 6.6% for full term infants with a breech presentation, a decrease of almost 50%. Black women, younger mothers between the ages of 12 and 24, and women with less than or equal to a high school education had the highest occurrence of vaginal births. In the logistic models, the risk for infant death was highest for black women [OR = 1.93; (1.56, 2.38)], women with more than 13 prenatal visits [OR = 1.25; (1.02, 1.53) for 13-15 visits, OR = 2.33; (1.82, 2.98) for >15 visits], infants who had a low birth weight [OR = 2.81; (2.08, 3.79)], and women who had a vaginal delivery [OR = 1.42; (1.10, 1.84)] The characteristics that were associated with a lower 5-minute Apgar score for breech infants delivered vaginally included the mother's method of payment, [Medicaid OR 1.75; (1.03, 2.97) and self pay OR 2.33; (1.13, 4.83)], low birth weight [OR = 2.54; (1.24, 5.22)], and delivery type [OR = 4.71; (2.95, 7.52)].

Discussion/Conclusions: Our data showed that women who have a vaginal delivery for a term breech infant were more likely to be black, 12-24 years of age, no private insurance, and fewer prenatal visits and was associated with higher infant mortality and lower 5-minute Apgar scores. However, our results indicated that these infants had other significant problems, as indicated by the association with a high number of prenatal visits. Therefore, having physicians who are experienced in delivering breech infants vaginally, careful exclusion of risk factors and, educating the patient about the risks and complications of a vaginal delivery for breech fetuses could help decrease the potential risks for the mother and the infant.

INTRODUCTION:

In 2004, almost 30% of infants in the United States were delivered by caesarean section breaking the record that had been set the previous year, making a caesarean section the most common major surgical procedure for women[1]. Between 1996 and 2004, the overall rate of abdominal deliveries has increased by more than 40% with rates for a vaginal birth after a caesarian section (VBAC) on an even steeper decline of 9.2%[1]. The possibility that the percentage of United States' births delivered by caesarean section may be unreasonably high has caused continual debate throughout the medial community[2, 3].

Approximately 3% to 4% of all pregnancies at term will have a fetus with a breech presentation[4]. The management and the optimal mode of delivery for breech presentation has been a subject of controversy for many years[5, 6, 7]. Several studies reported that a difference in perinatal outcomes was not present, while others have recommended that elective caesarean section is followed by better neonatal outcomes[8]. Studies have shown that the US has almost completely abandoned vaginal delivery for breech presentation[5]. In Virginia, approximately 100,000 births occur each year. In 2005, roughly 3,000 births had a breech presentation with the majority (92%) delivered by caesarian section.

In October 2000, the "Term Breech Trial" (TBT) was published in *The Lancet.* The TBT was one of the largest randomized control studies where women with breech presentation were randomly assigned to caesarean section or vaginal deliveries. It was an international multi-center trial with 121 centers in 26 countries. The TBT concluded that a policy of planned caesarian section for infants with a breech presentation would reduce perinatal mortality, late neonatal mortality, and serious neonatal morbidity by

approximately two-thirds for term fetuses[4, 7]. The trial concluded that breech infants with a vaginal birth had a three times higher combined mortality and serious morbidity rate than babies with a caesarean birth[4, 9]. Furthermore, the trial stated that a vaginal delivery at term should not be encouraged for breech fetuses[4, 10]. The TBT also claimed that there were no differences between the two delivery groups in terms of maternal mortality or serious maternal morbidity[4]. The researchers predicted that for every additional 14 planned caesarean sections performed, one baby would avoid death or serious morbidity[4]. The impact of the trial resulted in an increase of planned caesarean section in the centers that participated in the study. In the Netherlands, the caesarean rate for breech infants increased from 50% in 2000 to 80% in 2001. The change in policy occurred in most Dutch hospitals and was associated with a significant decrease in perinatal mortality from 0.35% to 0.18%[11]. The trial led to an overall change in the policy of delivery for breech infants, but the recommendations are still being challenged by others [7, 12].

Several of the reasons the TBT is being criticized is that the recommendations may not be universally applicable because of the implications of family size, mother's preferences, and differences in the standards of care[7, 12]. A major clinical concern of the trial was the large number of health centers in countries with varied levels of development, which introduced a large amount of heterogeneity into the study regarding patient characteristics, the obstetrical providers, the degree of technological advancement in the hospitals, and the overall mortality rate for each country [10, 13].

There is general consensus that a caesarean section delivery is better than a vaginal birth for a breech fetus at term when complications exist, such as fetal distress, maternal illness, and cephlopelvic disproportion (CPD). However, for most breech

fetuses at term, the appropriate mode of delivery is still a controversial issue. Some physicians have the policy of a caesarian section delivery for all breech fetuses because of the results of observational studies[4]. However, other physicians believe that a vaginal birth is justifiable after careful exclusion of risk factors and informing the patient about the risks and complications of a vaginal delivery for breech fetuses[14]. Roumen study concluded that in 80% of cases, carefully selected patients with a breech infant at term could have a successful vaginal delivery. Low parity and a high birth weight have a negative influence on the normal progression on labor[15].

While a liberal elective caesarean section policy is continually becoming the norm, it increases the health risks for the mother, while also escalating the costs for patient care. Dismissing vaginal deliveries for breech infants would constitute unnecessary abdominal deliveries with all of its consequences. Selecting appropriate patients for vaginal deliveries with a breech presentation requires adherence to strict guidelines, qualified healthcare providers, and overall good clinical judgment[16].

Race and demographic factors are two major variables that need to be taken into account when analyzing the mode of delivery for breech infants. Whites had higher rates of abdominal deliveries when compared to African Americans, but this difference disappeared after adjusting for socio-demographic factors and medical history[17]. When deliveries following breech presentation are examined, African Americans were more likely to delivery breech babies vaginally, which was largely attributed to an increased incidence of social factors that were independent of race, such as SES and access to care[17].

One of the major concerns related to the continually increasing rates of caesarean section is the potential health risks to the mother. Caesarean delivery has been shown to enhance the risk of postpartum maternal death[18]. A caesarean section has a three to seven fold increase in maternal mortality when compared to a vaginal delivery[19]. While maternal death has become a rare event in developed countries, the event remains tragic. The excess risk of maternal mortality would have a strong influence on the delicate balance between the potential benefits for the child and the increased risk to the mother's health. Furthermore, maternal death rates in developing countries have shown only minute improvements in the last 20 years, indicating that the method of delivery could potentially be one of the modifiable risk factors in maternal mortality[18].

Any factor that is associated with an increase in maternal mortality is most often linked to severe cases of maternal morbidity[18]. Previous research has indicated that postpartum morbidities are more frequent and of longer duration among women who have a caesarian section versus women who have a spontaneous vaginal birth. Anemia and wound complications are just a few of the postpartum morbidities. A vaginal delivery has also been shown to significantly decrease a woman's risk of rehospitalization, particularly for infectious morbidities[20]. Delivering women by elective caesarean section could also result in a longer hospital stay due to the elective surgical procedure.

Although the TBT study found no differences in maternal mortality and serious morbidity when the two delivery groups were compared, they only followed women for 6 weeks postpartum[19]. An American study found that women who had an abdominal delivery were twice as likely to be readmitted to the hospital for serious complications compared to women that had a spontaneous vaginal birth[20]. Therefore, a policy of a

vaginal birth for breech presentation for women with no risk factors may still be advantageous for mothers and children throughout the world[19].

In 1953, the Apgar score was introduced as a grading scale for newborns evaluating the effects of resuscitation and has since become universally used at one and five minutes post birth[21]. Five variables used to grade infant health are assigned a value ranging from 0 to 2, and the total Apgar score is the sum of all the components and can range from 0 to 10. A score of 7 or above is an indication that the infant is in good to excellent physical condition[22]. A lower 5-minute Apgar score defined as 6 or below, indicates a potential compromise to the newborn's health[21]. Studies have shown that a vaginal breech delivery can have a negative influence on 5-minute Apgar scores[23]. A Danish study found a 15-fold increase in low 5-minute Apgar scores for vaginally delivered infants with a breech presentation[24]. Therefore, while managing breech deliveries; special attention should be given for possible signs and symptoms of fetal distress[23].

The purpose of this study was first to describe who in Virginia is having a vaginal delivery if they present with an infant in the breech position. Secondly, I looked to see if there is a difference in birth outcome based on mode of delivery for breech presentation of term infants using the Virginia Birth Data from 1996 to 2005. The rate of infant death and infant Apgar score at 5-minutes were used as measures of infant health to determine risks associated with a vaginal delivery of a breech infant.

METHODS:

The data set used for this population-based study consisted of birth certificate data obtained from the Center for Health Statistics at the Virginia Department of Health. Ten years of data were analyzed, including all births from January 1, 1996, through December 31, 2005. The data included all of the births that occurred in Virginia, regardless if the mothers were state residents or not.

The initial data set consisted of information on 978,604 births from 1996 to 2005. Only infants with a breech presentation were included for a total of 35,828 records. (Conflicting entries existed for 11 records so these were excluded). The infants born before 38 weeks of gestation were also excluded resulting in a data set that contained 21,195 records. The reason behind excluding infants that were born before 38 weeks gestation was that infants born prematurely could have an increased rate of infant mortality and morbidity, which if not excluded could have potentially become a confounder throughout the study.

Two dependent variables were examined: infant mortality and 5 –minute Apgar scores. The 5–minute Apgar score was chosen as a dependent variable because it is a good universal predictor of subsequent birth outcomes.

The independent variable of interest for the study was the mode of delivery that consisted of a caesarean section or a vaginal birth. Potential confounding variables for the study population consisted of maternal race, maternal age, maternal education, birth weight and number of prenatal visits.

The maternal race was recoded to White, Black, and "Other" races. Mother's age was grouped into the following categories: 12-24, 25-29, 30-34, and 35-55 years of age.

Maternal education was recoded into three categories: a High School education or less, some college education, and four or more years of college education. The weight at birth was recoded into normal or low birth weight. A child was considered to have low birth weight if it weighted less than 2500 grams[21]. Medicaid, private insurance, and self-pay were the three categories for method of payment. The number of prenatal visits for pregnant mothers was recoded as 0-7, 8-12, 13-15, 16-75 prenatal visits.

Analyses were done using SPSS 14. Frequencies were run on caesarean sections and vaginal births for breech presentation and ANOVA and Chi squares were used for univariate comparisons for each of the variables in the study. Logistic regression was used to determine crude and adjusted Odds Ratios with 95% Confidence Intervals.

RESULTS:

During the 1996-2005 period, there were 978,604 births in Virginia and 35,828 of these were breech infants. Ultimately, we examined birth characteristics of the 21,195 infants with breech presentation and 38 weeks or more gestational age (Figure 1).

In Virginia, over the last ten years, the prevalence of vaginal deliveries for full term infants with a breech presentation decreased by almost 50% from 13.1% to 6.6% of all births. Of the deliveries with a breech presentation, 19,045 (90%) women had a caesarean section while 2,122 (10%) had a vaginal delivery (Table 1, Figure 2).

Table 2 displays the descriptive statistics comparing vaginal versus caesarean section deliveries. Among women who delivered vaginally, 18.4% were black compared to only 13.3% of women who had a caesarean section. When the age of the mother was taken into consideration, the 35 to 55 age group had the highest proportion among both delivery groups. As the age of the mother increased the proportion of caesarean sections increased, with a positive Chi-square for trend seen ($p<0.001$). There was no significant difference in the distribution of education among the two delivery groups. Among infants delivered vaginally, almost 5% were of low birth weight compared to 3% of those delivered by caesarian section.

The majority of women who presented with a breech infant had eight to 12 prenatal visits throughout their pregnancies. Almost 9% (8.8%) of mothers who delivered vaginally had fewer than eight prenatal visits versus 6% of those with a caesarean section. Almost 4% of infants born vaginally died (3.5%) versus 2.4% of those with a caesarean section. Almost 1.5% of infants born vaginally had low 5-minute Apgar scores versus 0.3% of those with a caesarean section. Private insurance was the most common

method of payment for both delivery groups. However, 31% of women who delivered vaginally reported Medicaid or self-pay versus 23% of those with a caesarean section (Table 2).

Table 3 displays the prevalence and the 95% Confidence Intervals (95% CI) on the variables of interest. Black women had the highest prevalence of vaginal births at 13.4% (95% CI 12.13, 14.60) followed by the "Other" subcategory and then white women. The prevalence of vaginal births was highest for young women and continually decreased with age (Table 3). Women between the ages of 12-24 had the highest prevalence at 11.4% (95% CI 10.47, 12.25). Mothers who had a college education of four years or more had a lower prevalence of 9.3% (95% CI 8.34, 10.33) of vaginal birth compared to mothers who had the equivalent of a high school diploma or less at a prevalence of 10.5% (95% CI 9.86, 11.19). Breech infants with a low birth weight had a higher prevalence of having a vaginal birth at 14.0% (95% 11.52, 16.51) as compared to infants with a normal birth weight with a prevalence of 9.9% (95% CI 9.47, 10.29). Women with fewer prenatal visits, ranging from 0 to 7 visits, had an increased prevalence of delivering vaginally (P = 15.0%; 95% CI 13.00, 16.99). Among breech infants delivered vaginally, 13.9% (11.01, 16.87) died. Women with no reportable insurance had the highest prevalence of vaginal deliveries at 18.3% followed by women that paid with Medicaid at 10.9% (95% CI 9.90, 11.92). Women with private insurance had the lowest rate at 8.5% (95% CI 8.04, 8.92).

Mortality

Table 4 shows the results of both univariate and multivariate logistic regression analysis using death after delivery as the outcome measure. Delivery type, mother's race,

mother's education level, infant weight, prenatal visits, and method of payment were the only variables that had statistically significant crude ORs. A vaginal delivery was found to be significantly associated with infant death with a crude OR of 1.47 (95% CI 1.15, 1.89; p-value <0.01). As in the crude analysis, the adjusted OR value of 1.42 (95% CI 1.10, 1.84; p-value <0.01) was statistically significant. Black women had a significantly higher rate of infant death with breech presentation for the crude OR of 2.17 (95% CI 1.78, 2.64) and still stayed significant after the adjusted analysis with an adjusted OR of 1.93 (95% CI 1.56, 2.38). The "Other" race subcategory had a decrease in infant death risk with an adjusted OR of 0.64 (95% CI 0.42, 0.98). Infants with a low birth weight had a higher risk of death with an adjusted OR of 2.81 (95% CI 2.08, 3.79). Finally, the number of prenatal visits had an impact on the risk for death for breech infants. For mothers with 13 to 15 prenatal visits, the risk for infant death was increased with an adjusted OR of 1.25 (95% CI 1.02, 1.53). The adjusted OR for mothers who had 16 or more prenatal visits was even greater [OR of 2.33 (95% CI 1.82, 2.98)]. We looked for interactions between the predictor variables and found none when looking at the dependent outcome variable for expired.

5-minute Apgar Scores

Table 5 displays the univariate and multiple logistic regression analysis on the birth outcome of interest, the 5-minute Apgar score. Delivery type, mother's race, infant weight, prenatal visits, and method of payment were the only variables that had statistically significant crude values, and therefore the only variables included in Table 5. The delivery type was found to be a statistically significant predictor of low 5-minute

Apgar Scores for breech infants in both the crude and adjusted analyses. Women who delivered vaginally had crude OR of 4.54 (95% CI 2.90, 7.10). After adjusting for race, infant weight, number of prenatal visits and method of payment, a vaginal delivery for a breech infant was found to have an even stronger association with a lower 5-minute Apgar score with an adjusted OR of 4.71 (95% CI 2.95, 7.52). Black women had a statistically significant increased OR of 1.95 (95% CI 1.18, 3.20) for a lower 5-minute Apgar score in crude analysis only, becoming non-significant in the adjusted model. Infants with a low birth weight had a significant crude and adjusted OR value for a low 5-minute Apgar score with a crude OR value of 3.62 (1.86, 7.02) and an adjusted OR of 2.54 (95% CI 1.24, 5.22). The lowest category for prenatal visits was only significant in the univariate analysis, and fell out of the adjusted model. Lastly, the method of payment was found to have a significant influence on a lower Apgar score. Mother's that paid with Medicaid had a crude OR of 2.12 (95% CI 1.30, 3.47), which decreased slightly after the adjusted analysis, but still remained significant with an adjusted OR of 1.75 (95% CI 1.03, 2.97). For mother's that used self pay, the crude and adjusted ORs were both significant with a crude OR of 2.99 (95% CI 1.51, 5.92) and a slight decrease in the risk for the adjusted OR of 2.33 (95% CI 1.13, 4.83). We looked for interactions between the predictor variables and found none when looking at the dependent outcome variable for low 5-minute Apgar scores.

DISCUSSION & CONCLUSIONS:

The study used the 1996 to 2005 Virginia Birth Dataset to determine whether certain measurable birth outcomes were associated with the type of delivery for breech infants. The infants selected for the study had to have had a breech presentation and been born at 38 weeks of gestation or above.

The results of the study coincided with the TBT results concerning increased infant mortality for vaginal births with a breech presentation. For the study population, the two dependent outcome variables, 5-minute Apgar score and whether or not the infant expired directly after birth were found to be significantly affected by delivery type. A lower 5-minute Apgar score and a higher rate of infant death were found for infants delivered vaginally with a breech presentation.

The results from this study indicated that certain maternal characteristics had an association with the delivery type. Black women, younger mothers, between the ages of 12 through 24, and women with less than or the equivalent of a high school education had the highest occurrence of vaginal births with a breech presentation. This was similar to a study conducted by Lee and others where they found that African American women had lower rates of caesarean sections for breech infants[17].

One of the major goals for Healthy People 2010 is eliminating health disparities, with infant mortality high on the list. Lee's study stated that African American infants with a breech presentation have an 18% increase in vaginal deliveries compared to white infants. The suggested reasons for this occurrence included higher levels of teenage pregnancy, an incomplete education, and inadequate prenatal care among African

Americans. The disparities were mainly associated with social factors and were found to be independent of race[17].

In this study, women who had 13 or more prenatal visits had an increased chance of infant death regardless of delivery type. One hypothesis is that the more prenatal visits a pregnant woman has the greater the likelihood of complications related to the pregnancy and problems with the infant's health.

Interesting, the maternal characteristics that contributed to a lower Apgar score for breech infants were vaginal delivery, infant weight and mother's method of payment. Infants with a low birth weight were 2.5 times more likely to have a lower Apgar score than infants with a normal birth weight. Women who paid with Medicaid had a 75% increased likelihood of a lower Apgar score and women who made self payments had a 2.3 times greater risk of having a lower Apgar score than women with private insurance.

It is not possible to make a determination of whether or not delivery type plays a causal role in infant death or Apgar scores. However, when looking at infant death, the data suggest that breech infants delivered vaginally had other problems that would contribute to the poor outcome. It is also possible that similar to the Lee study, women of a lower socioeconomic stratum are more likely to be delivered vaginally and also less likely to have optimal prenatal care.

One limitation of the study is due to the fact that with the continual increase in caesarean sections for breech infants throughout the US each year, it is not possible to determine whether current abdominal deliveries are recommended for medical reasons and just physician choice/protocol. For instance, women who could have delivered a

healthy infant vaginally, but chose to have an abdominal delivery due an increasing trend of delivering breech babies abdominally bias the findings of the study.

Another limitation of the study deals with information bias due to possible incorrect recording of information on the birth certificate. For instance, some physicians could have scored the Apgar tests more leniently than others. The major confounders in the study include unaccounted for variables that are not listed on the Virginia birth record. A mother's preference for a caesarean section would be a good example of an unaccounted for variable.

Selection bias was decreased by implementing a strict inclusion/exclusion criterion. The study had thoroughly defined criteria that had already been formatted through the Virginia Birth Data Dictionary. The results of the study are generalizable to states with similar birth statistics and demographics as Virginia.

The potential importance of the findings from the study is to provide information that will assist physicians and mothers in determining the optimal mode of delivery for breech presentation at term. The public health implications include protecting women and neonates by ensuring that the mothers and the physicians are fully aware of the current benefits and risks associated with vaginal and caesarian section deliveries for breech presentation. Although a caesarean section is perceived as a low risk procedure, maternal mortality and morbidity has been shown to increase with an abdominal delivery. Therefore, having physicians who are experienced in delivering breech infants vaginally, careful exclusion of risk factors and, informing the patient about the risks and complications of a vaginal delivery for breech fetuses could help decrease the potential risks for the mother and the infant.

FIGURES:

Figure 1: Flowchart of participant selection for the study

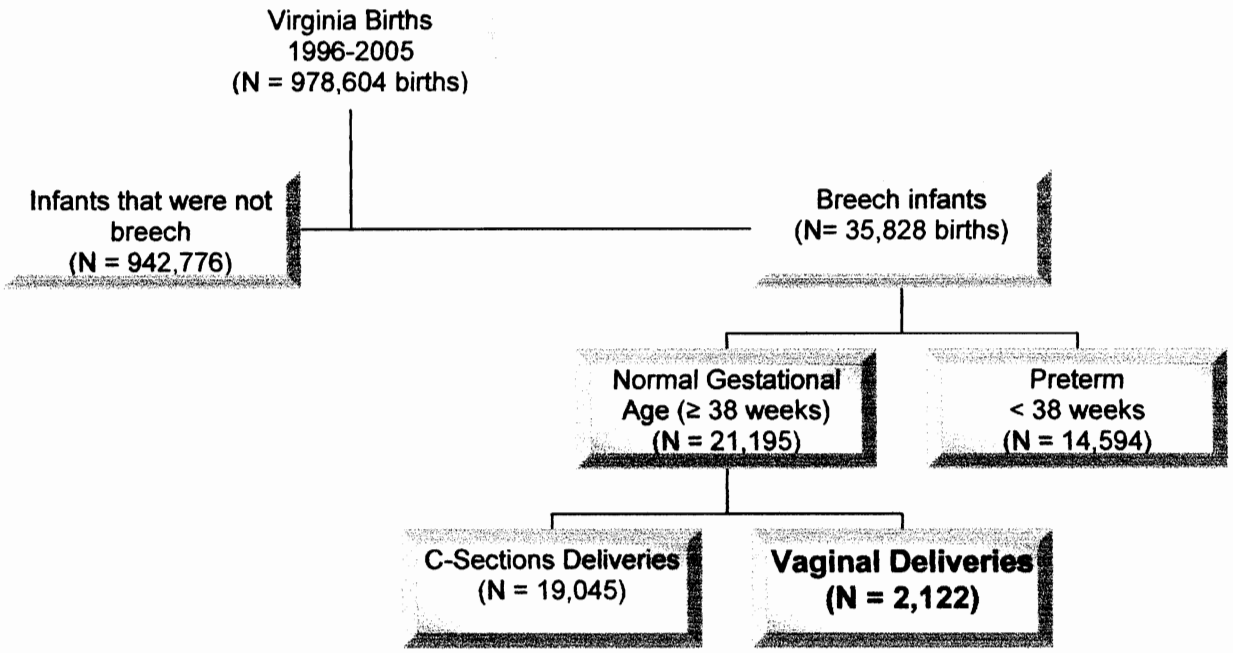
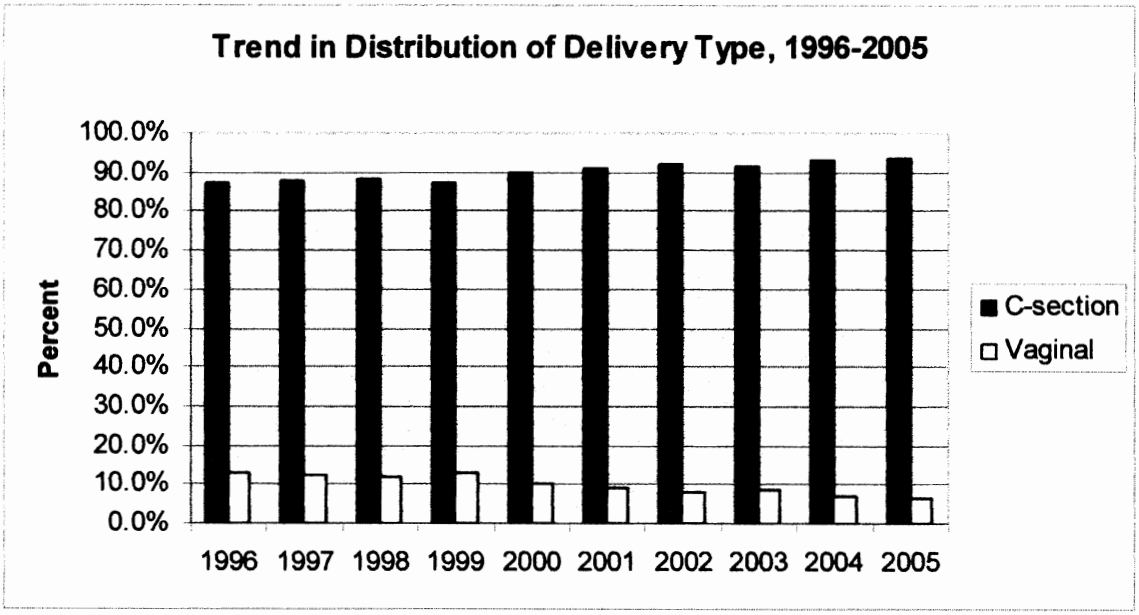


Figure 2: Trend in Distribution of Delivery type, 1996-2005.



TABLES:

Table 1: Distribution of C-sections and Vaginal Births with Breech Presentation for Birth Year (Excluded Unknowns)

	Total (N=21,195)		C-section (N=19,045)		Vaginal Birth (N=2,122)	
Birth Year	N	%	N	%	N	%
1996	2330	100.00%	2025	86.91%	305	13.09%
1997	2347	100.00%	2063	87.90%	284	12.10%
1998	2208	100.00%	1944	88.04%	264	11.96%
1999	2191	100.00%	1912	87.27%	279	12.73%
2000	2090	100.00%	1882	90.05%	208	9.95%
2001	1983	100.00%	1808	91.17%	175	8.83%
2002	2132	100.00%	1956	91.74%	176	8.26%
2003	2059	100.00%	1886	91.60%	173	8.40%
2004	1925	100.00%	1793	93.14%	132	6.86%
2005	1902	100.00%	1776	93.38%	126	6.62%

Table 2: Distribution of C-sections and Vaginal Births with Breech Presentation for Key Characteristics (Excluded Unknowns) (used Columns)

	Total (N=21,195)	C-section (N=19,045)		Vaginal Birth (N=2,122)		
Expired	**N**	**N**	**%**	**N**	**%**	**p-value**
Yes	538	463	2.4%	75	3.5%	0.002
No	20629	18582	97.6%	2047	96.5%	
	21167	19045	100.0%	2122	100.0%	
Apgar Scores						**p-value**
Low (1-6)	87	58	0.3%	29	1.4%	<0.001
Normal (7-10)	21080	18987	99.7%	2093	98.6%	
	21167	19045	100.0%	2122	100.0%	
Mother's Race						**p-value**
White	16432	14885	78.2%	1547	73.0%	<0.001
Black	2919	2529	13.3%	390	18.4%	
Other	1802	1619	8.5%	183	8.6%	
	21153	19033	100.0%	2120	100.0%	
Mother's Age						**p-value**
12-24	4921	4362	22.9%	559	26.4%	<0.001
25-29	5430	4876	25.6%	554	26.1%	<0.001 - chi-square for trend
30-34	6438	5800	30.5%	638	30.1%	
35-55	4346	3978	20.9%	368	17.4%	
	21135	19016	100.0%	2119	100.0%	
Mother's education level						**p-value**
High School or Less	8267	7397	39.1%	870	41.4%	0.094
Some College	9421	8501	45.0%	920	43.8%	
>4 College	3310	3001	15.9%	309	14.7%	
	20998	18899	100.0%	2099	100.0%	
Child's Birth Weight						**p-value**
Low (<2500)	742	638	3.3%	104	4.9%	<0.001
Normal (2500+)	20425	18407	96.7%	2018	95.1%	
	21167	19045	100.0%	2122	100.0%	
Prenatal visits						**p-value**
0 thru 7	1227	1043	5.6%	184	8.8%	<0.001
8 thru 12	10412	9378	50.0%	1034	49.3%	
13 thru 15	7180	6479	34.5%	701	33.4%	
16 thru 75	2046	1867	9.9%	179	8.5%	
	20865	18767	100.0%	2098	100.0%	
Method of Payment						**p-value**
Medicaid	3649	3251	17.8%	398	20.9%	<0.001
Private Insurance	15430	14121	77.3%	1309	68.7%	
Self-Pay	1083	885	4.8%	198	10.4%	
	20162	18257	100.0%	1905	100.0%	

Table 3: The Prevalence and 95% CI for Vaginal Births for Each Characteristic (Excluding Unknowns)

	Total (N)	Vaginal Birth (N)	Prevalence (%)	95% CI	
Mother's Race				**Lower**	**Upper**
White	16432	1547	9.41%	8.97%	9.86%
Black	2919	390	13.36%	12.13%	14.60%
Other	1802	183	10.16%	8.76%	11.55%
Mother's Age					
12-24	4921	559	11.36%	10.47%	12.25%
25-29	5430	554	10.20%	9.40%	11.01%
30-34	6438	638	9.91%	9.18%	10.64%
35-55	4346	368	8.47%	7.64%	9.30%
Mother's education level					
High School or Less	8267	870	10.52%	9.86%	11.19%
Some College	9421	920	9.77%	9.17%	10.36%
>4 College	3310	309	9.34%	8.34%	10.33%
Child's Birth Weight					
Low (<2500)	742	104	14.02%	11.52%	16.51%
Normal (2500+)	20425	2018	9.88%	9.47%	10.29%
Prenatal visits					
0 thru 7	1227	184	15.00%	13.00%	16.99%
8 thru 12	10412	1034	9.93%	9.36%	10.51%
13 thru 15	7180	701	9.76%	9.08%	10.45%
16 thru 75	2046	179	8.75%	7.52%	9.97%
Method of Payment					
Medicaid	3649	398	10.91%	9.90%	11.92%
Private Insurance	15430	1309	8.48%	8.04%	8.92%
Self-Pay	1083	198	18.28%	15.98%	20.58%
Expired					
Yes	538	75	13.94%	11.01%	16.87%
No	20629	2047	9.92%	9.51%	10.33%
Apgar Scores					
Low (1-6)	87	29	33.33%	23.43%	43.24%
Normal (7-10)	21080	2093	9.93%	9.53%	10.33%

Table 4: Crude and Adjusted ORs and 95% CIs for Expired Infants

	Total (N)	Crude		Adjusted	
Delivery Type		**OR**	**95% CI**	**OR**	**95% CI**
C-section	19045	referent		referent	
Vaginal	2122	1.47	[1.15, 1.89]**	1.42	[1.10, 1.84]*
Mother's Race					
White	16432	referent		referent	
Black	2919	2.17	[1.78, 2.64]**	1.93	[1.56, 2.38]**
Other	1802	0.61	[0.40, 0.91]*	0.64	[0.42, 0.98]*
Mother's education level					
Elementary plus High School	8267	1.09	[0.90, 1.30]	0.97	[0.78, 1.19]
College	9421	referent		referent	
>4 College	3310	0.74	[0.56, 0.97]*	0.83	[0.62, 1.10]
Infant Weight					
Low (<2500)	742	3.38	[2.53, 4.50]**	2.81	[2.08, 3.79]**
Normal (2500+)	20425	referent		referent	
Prenatal visits					
0 thru 7	1227	1.12	[0.76, 1.67]	0.96	[0.64, 1.44]
8 thru 12	10412	referent		referent	
13 thru 15	7180	1.23	[1.01, 1.49]*	1.25	[1.02, 1.53]*
16 thru 75	2046	2.36	[1.85, 3.00]**	2.33	[1.82, 2.98]**
Method of Payment					
Medicaid	3649	1.47	[1.20, 1.80]**	1.26	[0.99, 1.61]
Private Insurance	15430	referent		referent	
Self-Pay	1083	0.97	[0.65, 1.45]	0.99	[0.65, 1.52]

*** p-value <0.05**

**** p-value <0.01**

Table 5: Crude and Adjusted ORs and 95% CIs for Low 5-minute Apgar Score (1-6)

	Total (N)	Crude		Adjusted	
Delivery Type		**OR**	**95% CI**	**OR**	**95% CI**
C-section	19045	referent		referent	
Vaginal	2122	4.54	[2.90, 7.10]**	4.71	[2.95, 7.52]**
Mother's Race					
White	16432	referent		referent	
Black	2919	1.95	[1.18, 3.20]**	1.5	[0.88, 2.55]
Other	1802	0.75	[0.30, 1.86]	0.75	[0.29, 1.90]
Infant Weight					
Low (<2500)	742	3.62	[1.86, 7.02]**	2.54	[1.24, 5.22]*
Normal (2500+)	20425	referent		referent	
Prenatal visits					
0 thru 7	1227	2.31	[1.14, 4.65]*	1.41	[0.66, 3.04]
8 thru 12	10412	referent		referent	
13 thru 15	7180	1.18	[0.73, 1.91]	1.35	[0.81, 2.22]
16 thru 75	2046	1.1	[0.51, 2.37]	1.25	[0.58, 2.72]
Method of Payment					
Medicaid	3649	2.12	[1.30, 3.47]**	1.75	[1.03, 2.97]*
Private Insurance	15430	referent		referent	
Self-Pay	1083	2.99	[1.51, 5.92]**	2.33	[1.13, 4.83]*

*** p-value <0.05**
**** p-value <0.01**

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