



Trends in Cesarean Births In Utah

1992 - 2002

Utah Department of Health

Trends in Cesarean Births in Utah 1992 - 2002

March 2004

Utah Department of Health

This report may be reproduced and distributed without permission.

Suggested citation:

Division of Community and Family Health Services. Trends in Cesarean Births in Utah, 1992-2002. Salt Lake City, UT: Utah Department of Health.

Acknowledgements

The *Trends in Cesarean Births in Utah, 1992-2002* report is a collaborative effort of the Maternal and Child Health Bureau and Office of Health Care Statistics at the Utah Department of Health.

This report was developed under the direction of the Utah Cesarean Report Advisory Committee consisting of the following members:

Cesarean Report Advisory Committee

Laurie Baksh, MPH
*Utah Department of Health
Reproductive Health Program*

Pete Barnard, CNM
*Utah Department of Health
Reproductive Health Program*

Lois Bloebaum, RN, BSN
*Utah Department of Health
Reproductive Health Program*

Jane Dyer, MS, CNM, FNP,
MBA
*University of Utah
College of Nursing*

Claudia Gerard, MS, CNM
*University of Utah
College of Nursing*

Greg Gochnour, MD
Porter Family Practice

Shaheen Hossain, PhD
*Utah Department of Health
Data Resources Program*

Gail McGill, MS, RN
*Intermountain Health Care
Utah Valley Regional Medical Center*

Brian Oshiro, MD
*Intermountain Health Care
McKay Dee Hospital*

Steven Pickard, MBA
*Utah Department of Health
Office of Health Care Statistics*

Nan Streeter, MS, RN
*Utah Department of Health
Bureau of Maternal and Child Health*

Michael Varner, MD
*University of Utah
Obstetrics and Gynecology*

Janie Wilson, MS, RN
Intermountain Health Care

Wu Xu, PhD
*Utah Department of Health
Office of Health Care Statistics*

We would like to extend our thanks to the Office of Vital Records and Statistics and Office of Health Care Statistics for providing us with data and statistical expertise. We would also like to acknowledge the following individuals for their valuable comments, suggestions, and time as they reviewed the report:

Laurie Baksh, MPH
Lois Bloebaum, RN, BSN
Jeff Duncan, MS
Lois Haggard, PhD
Brenda Ralls, PhD
Nan Streeter, MS, RN
Anna West, MPH
Wu Xu, PhD
Karen Zinner, MPH

This report was prepared by:

Shaheen Hossain, PhD
Robert Satterfield, MSTAT
Steven Pickard, MBA
Tara Johnson, BS

TABLE OF CONTENTS

ABOUT THIS REPORT	i
EXECUTIVE SUMMARY	iv
SECTION 1: Introduction	1
SECTION 2: Trends and Patterns of Cesarean Rates	3
SECTION 3: Maternal Characteristics and Medical Conditions Related to Cesarean Births	6
SECTION 4: National Objectives for Cesarean Births (HP 2010)	12
SECTION 5: Trends in Vaginal Birth After Cesarean	15
SECTION 6: A New Cesarean Classification System	18
SECTION 7: Costs Associated with Cesareans	22
SECTION 8: Conclusions and Recommendations	23
REFERENCES	26
APPENDIX	29

LIST OF TABLES AND FIGURES

Table 1: Risks and Benefits of Cesarean Sections Compared with Vaginal Delivery	1
Table 2: Cesarean Rates by Maternal and Pregnancy Characteristics, Utah, 1992-2002.....	6
Table 3: Cesarean Rates by Maternal Race and Ethnicity, Utah, 1992-2002.....	8
Table 4: Medical Conditions Requiring a Cesarean	9
Table 5: Percentage of Total Births with Selected Medical Risk Factors and Labor Complications, Cesarean Rates and Odds Ratios for Cesarean Delivery, 1992-2002.....	9
Table 6: Cesarean Rates by Selected Medical Risk Factors and Labor Complications by Each Year, Utah, 1992-2002	10
Table 7: VBAC Rates by Maternal Characteristics, Utah, 1992-2002	16
Table 8: Robson Classification System	19
Table 9: Percentage of Births and Cesarean Rates by Robson Criteria, Utah, 1998-2001	20
Figure 1: Rate of Cesarean Sections, Utah vs. U.S., 1992-2002	3
Figure 2: Proportions of Cesarean Births (Primary and Repeat) of All Live Births, Utah, 1992-2002	4

Figure 3: Rate of Primary Cesareans, Utah, 1992-2002	5
Figure 4: Rate of Repeat Cesareans, Utah, 1992-2002	5
Figure 5: Cesarean Rate by Maternal Age, Utah, 1992-2002	7
Figure 6: Primary Cesarean Rate among Low-Risk Women Giving Birth for the First Time, Utah vs. U.S., 1998-2002	13
Figure 7: Repeat Cesarean Rate among Low-Risk Women, Utah vs. U.S., 1998-2002	14
Figure 8: Rate of Vaginal Birth After Cesarean, Utah vs. U.S., 1992-2002	15
Figure 9: Average Length of Stay by Method of Delivery, Utah, 1992-2002	22
Figure 10: Average Hospital Charges by Method of Delivery, Utah, 1992-2002	22

APPENDIX

Table A: Cesarean Rates and Vaginal Births After Cesarean (VBAC) Rates, Utah, 1992-2002.....	30
Table B: Cesarean (overall, primary, and repeat) and VBAC Rates by Hospitals, Utah, 1992-2002.....	31
Table C: Overall Cesarean Rates by Maternal County of Residence, Utah, 1992-2002.....	32
Table D: Overall and Primary Cesarean Rates by Maternal Age Category, Utah, 1992-2002.....	33
Table E: Overall and Primary Cesarean Rates by Maternal Race and Ethnicity, Utah, 1992-2002.....	34
Table F: Cesarean Rates by Selected Medical Risk Factors and Labor Complications by Each Year, Utah, 1992-2002.....	35
Table G: Cesarean Rates among Low-Risk Women (HP 2010) by Hospitals, Utah, 1998-2002.....	36
Table H: VBAC Rates by Maternal Characteristics, Utah, 1992-2002.....	37
Table I: Cesarean Rates by Robson Criteria by Year, Utah, 1998-2001.....	38
Table J: Average Hospital Length of Stay and Hospital Charges, Utah, 1992-2002.....	39
Figure A: Total Cesarean Rates by State, United States, 2002.....	40
Figure B: Utah Cesarean Rates by Maternal County of Residence, 1992-2002.....	41



About This Report

Background

Cesarean section is currently the most frequently performed major surgical procedure in the U.S. Despite a steady decline between 1989 and 1995, the national cesarean rate has been climbing since 1996. In 2002, cesarean sections reached an all time high in the U.S. of 26.1%. This increase has raised concerns regarding the appropriateness of current cesarean section practice. Although cesarean deliveries can be a valuable intervention to mothers and infants, unnecessary cesarean deliveries are costly and potentially life threatening.¹ Some researchers have expressed concerns that cesarean sections are being over utilized and are being performed in the absence of clinical indications.

Cesarean rates in Utah, while consistently lower than the national rates, experienced an increase of 22% between 1997-2002 (15.8 to 19.2 per 100 live births). In 2002, close to 1 in 5 women (19.2) delivered by cesarean. This report presents trends in cesarean births in Utah for the period of 1992-2002. Maternal characteristics, medical conditions, and hospital charges associated with cesarean delivery are also discussed.

Where did the data come from?

This report utilized two different data sources: birth certificate and hospital discharge data.

Birth certificate data were used to assess Utah's cesarean trend and to measure the progress toward national objectives. Data include all births to Utah residents during 1992-2002. Birth

What is a cesarean section?

A cesarean section (c-section) is a surgical procedure where an infant is delivered through an incision made in the mother's abdominal and uterine wall. The term "cesarean" is based on the belief that the Roman emperor Julius Caesar was born in this manner.

certificate data, collected by the Utah Office of Vital Records and Statistics, are a rich data source that provides detailed demographic, pregnancy characteristics (gestation, parity, prenatal care) and medical and labor complications of the mother. Birth outcomes and other characteristics of the newborn are also included.

To complement the birth data, information from the inpatient hospital discharge data (HDD) is also included in this report. Since birth records do not provide an indication of the economic impact of cesarean deliveries, HDD were used to offer some insight on the greater cost of cesarean deliveries as well as the resulting longer hospital stays. These data were provided by the Utah Office of Health Care Statistics.



How is the report organized?

This report provides a comprehensive overview of cesarean rates in Utah. The report is organized into 8 sections. Section 1 provides general information on cesarean delivery. Comparison of state and national trends of cesarean section rates based on birth certificate data for the period 1992-2002 are provided in Section 2. Section 3 explores maternal characteristics, medical conditions, and labor complications related to cesarean deliveries for the same time period. Section 4 discusses national Healthy People 2010 objectives and provides the cesarean rates (primary and repeat) for low-risk women. Discussion on vaginal births after cesarean (VBAC) rates based on birth certificate data and possible explanations of the downward trend are provided in Section 5. Section 6 presents a discussion of a new cesarean classification system developed by a British obstetrician, Michael Robson. This system is being used in an increasing number of hospitals in the United Kingdom and throughout the world. A brief discussion on hospital length of stay and costs related to cesarean delivery based on hospital discharge data (1992-2002) is provided in Section 7. The last section offers conclusions and recommendations for decreasing the rate of cesarean sections.

How are the rates calculated?

All rates using birth record data are per 100 total births to women in specified categories (overall, primary, and repeat cesarean). However, rates based on hospital discharge data are per 100 deliveries. Method of delivery on the birth certificate is

coded as a check box option, whereas hospital discharge data utilizes DRG and ICD-9-CM codes. The calculations of cesarean rates are provided below.

Overall C-section Rate	.....	The number of total cesarean births divided by number of total live births, multiplied by 100.
Primary C-section Rate	.....	The number of first cesarean births divided by total number of births to women who have not had a previous cesarean, multiplied by 100.
Repeat C-section Rate	.....	The number of repeat cesarean births divided by the total number of births to women who have had a previous cesarean, multiplied by 100.
VBAC Rate	.....	The total number of vaginal births to women who had a previous cesarean divided by the total number of women with a previous cesarean, multiplied by 100.
HP 2010 primary C-section among low risk women	.....	The number of first cesarean births among low-risk women (singleton babies at 37 weeks gestation or more with a vertex fetus) giving birth for the first time divided by total births to low-risk women giving birth for the first time, multiplied by 100.
HP 2010 repeat C-section among low risk women	.....	The number of repeat cesarean births (who previously delivered an infant by cesarean) among low-risk women divided by total number of previous cesarean births among low-risk women who have had a previous cesarean, multiplied by 100.



What are the limitations of data?

Limitations of the data include concerns about the quality and accuracy of reporting medical risk factors and labor complications data reported on birth certificates. A number of studies compared birth certificate data with medical records and have found some degree of under-reporting of medical information on the birth certificate.^{2,3}



Executive Summary

This report presents trends in cesarean births in Utah for 1992-2002 with comparisons to national trends. The following are highlights from the report.

- Cesarean section is currently the most frequently performed major surgical procedure in the U.S. Although the use of cesarean is often warranted, this delivery method is nevertheless associated with increased risk for maternal and perinatal morbidity.
- The national cesarean rate has been increasing since 1996 and reached 26.1 (per 100 live births) in 2002, the highest ever reported in the United States.
- Although the Utah rate is lower than the U.S., the recent increase in cesareans for four consecutive years is a concern. Utah cesarean rate increased 22% between 1997 and 2002 (15.8 to 19.2 per 100 live births).
- The primary cesarean births constituted the largest portion of all cesarean births. During 1992-2002, primary cesarean births accounted for 58% of total cesareans. The primary cesarean rate increased 12% from 10.9 (per 100 live births to women with no prior cesarean) in 2001 to 12.2 in 2002.
- The proportion of repeat cesarean births in Utah is higher than the national. In 2002, repeat cesarean births accounted for 44% of all cesarean births. Nationally during the same year, over one-third (39%) of all cesareans were repeat cesareans.
- The likelihood of cesarean birth increased with an increase in maternal age. Cesarean rates were highest for women 35 years of age and over.
- Cesarean rates examined by maternal medical conditions show that rates were higher among women with cephalopelvic disproportion (CPD), breech or malpresentation, and placenta previa.
- Utah has achieved the HP 2010 goal of reducing primary cesarean rates among low-risk women. However, Utah has not achieved the HP 2010 goal of reducing repeat cesarean rates among low-risk women.
- In the past, Utah's vaginal birth after cesarean (VBAC) rates have been exceptionally high. However, the rate dropped significantly, from 35.6 (per 100 live births to women with a prior cesarean) in 1999 to 24.0 in 2002. Yet, Utah's VBAC rate is still substantially higher than the national rate.
- Cesarean deliveries are associated with longer hospital stays and higher costs than vaginal births. The average length of stay for cesareans with complications was 4.4 days, compared to 1.7 days for a vaginal delivery. The average hospital charge for cesarean deliveries with complications was \$7197 compared to \$2831 for vaginal deliveries.



Section 1: Introduction

There is a serious concern about the recent worldwide rise in rates of cesarean deliveries. According to the World Health Organization (WHO), no region in the world should have a cesarean section rate greater than 15% of all deliveries. In the U.S., however, the current rate is 26.1%, making it one of the highest among developed nations. This rate represents a five-fold increase since 1965 when the rate was 4.5%. Many health care professionals, alarmed by this dramatic increase, are questioning the frequency with which cesareans are performed in this country.

Although the use of cesarean is often warranted, this delivery method is nevertheless associated with increased risk for maternal and perinatal morbidity. The decision to perform a cesarean section needs to be carefully weighed according to the risks and benefits of the procedure. Compared with vaginal birth, maternal risks for cesarean include increased risk of death, surgical injury, infection, and hemorrhage (see Table 1). Women are more likely to experience pain and poor health after a cesarean birth, and are more likely to require readmission to the hospital. Babies born by cesarean are more likely to be admitted to intensive care for breathing problems and pulmonary hypertension. Cesarean deliveries are generally two and one-half times more expensive than vaginal deliveries.⁴

Cesarean delivery has also been associated with postpartum depression and negative feelings about the experience of childbirth.⁵ After a cesarean, the interval between time of birth and initial contact with the newborn is prolonged in comparison

Table 1: Risks and Benefits of Cesarean Sections Compared with Vaginal Delivery

Risks	Benefits
Hemorrhage	Less perineal pain
Increased risk of infection	Lower risk of urinary incontinence
Longer length of hospital stay	Lower risk of prolapse
Re-hospitalization	
Placenta previa in future pregnancies	
Hysterectomy	
Postoperative pain	
Difficult recovery	
More abdominal pain	
Increased risk of death	

with that of a vaginal delivery. Women with a cesarean are more likely to spend extended time in bed because of pain and feel unable to care for their newborn. They are also less likely to breastfeed their newborn.⁶

Although Utah consistently had a lower cesarean rate than the U.S., the recent increase in cesarean for four consecutive years is a concern. This report presents a comprehensive overview of cesarean rates and vaginal birth after previous cesarean (VBAC) rates in Utah for 1992-2002. The main objectives of this report are to:

- analyze trends in cesarean rates;



- examine the relationship between maternal and pregnancy characteristics and cesarean deliveries;
- assess cesarean rates by maternal medical risk factors and labor/delivery complications;
- explore trends in VBAC rates; and
- evaluate the length of hospital stay and cost associated with different methods of delivery.

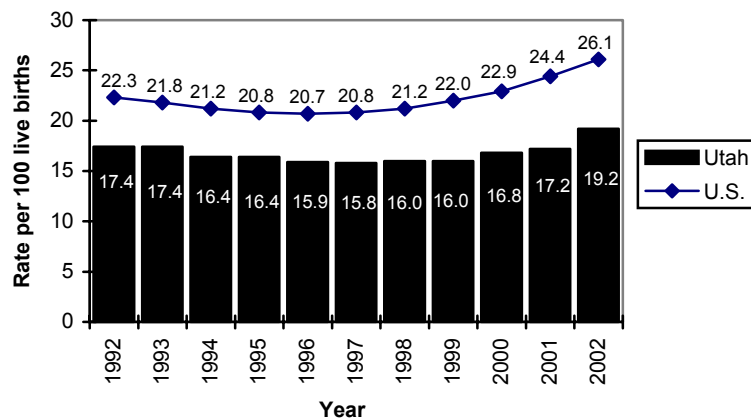


Section 2: Trends and Patterns of Cesarean Rates

Overall Cesarean Rate

According to the Centers for Disease Control and Prevention (CDC), 26.1% of U.S. women delivered babies by cesarean in 2002, the highest rate ever reported in the United States.⁷ This marks a 7% increase from 2001. Utah's cesarean rate is lower than the national rate (see Figure 1). However, in 1998, the cesarean rate began to increase after experiencing a steady decline. Utah's cesarean rate increased 22% between 1997-2002 (15.8 to 19.2 per 100 live births), after declining 10% between 1992-1997 (17.4 to 15.8). In 2002, close to one in five women (19.2) delivered babies by cesarean.

Figure 1: Rate of Cesarean Sections, Utah vs. U.S., 1992-2002



Utah Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

U.S. Data Source: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics Report, vol. 52, no. 10, 2003.

Why are the rates increasing?

The factors that have contributed to the increase in cesarean births in the nation over the last 25 years are not completely known. Current medical literature offers several possible explanations for this increasing trend of cesarean delivery including the following:

1. Physicians are becoming more comfortable with the safety of the procedure and may be offering women the choice of having a cesarean delivery more often. Some physicians are also more likely to perform a cesarean much earlier in labor if there is any hint of complication.⁸
2. Due to complications related to VBAC, women who may be eligible for VBAC are having repeat cesareans. During the 1990s, VBACs were more prevalent and lawsuits related to uterine rupture increased. Physicians are now more cautious and more likely to recommend a repeat cesarean.⁹
3. Scheduling a cesarean is more convenient for both the mother and physician. It limits the uncertain timing of labor and duration of delivery.¹⁰
4. Women are choosing to begin families later in life. Research has revealed a strong relationship between maternal age and the likelihood of cesareans. Since the average age at delivery is increasing, it is possible that some of the increase in cesarean rate could be due to age shifts in the child bearing population.^{3,11}



5. Fear of pain and complications of vaginal deliveries may cause more women to request a cesarean.¹² Also complications related to vaginal delivery, which include damage of the pelvic floor (incontinence and pelvic organ prolapse), may prompt women to opt for a cesarean. The major factors of pelvic floor damage are forceps delivery and episiotomy.¹³
6. Increased use of electronic fetal monitoring resulting in false positive rates for fetal distress may be associated with increased cesarean.^{10,14}
7. There is no absolute consensus among physicians about the definitions of the indications for cesarean. The guidelines for performing a cesarean have become more relaxed. Not only are more medical conditions and complications (multiple gestation, breech, hypertension, herpes) being treated as indications for cesarean delivery but also women without any complications are having a cesarean.

Cesarean Rates by States

A CDC report shows that there is considerable geographic variation in cesarean rates within the United States.¹⁵ Cesarean rates were highest in the South and lowest in the Midwest and West.

- In 2002, the highest cesarean rates were reported by Mississippi (31.1), New Jersey (30.9), Louisiana (30.4), West Virginia (29.3), and Arkansas (29.1) (see Figure A in Appendix).
- Utah had one of the lowest overall cesarean rates in the nation during 2002.

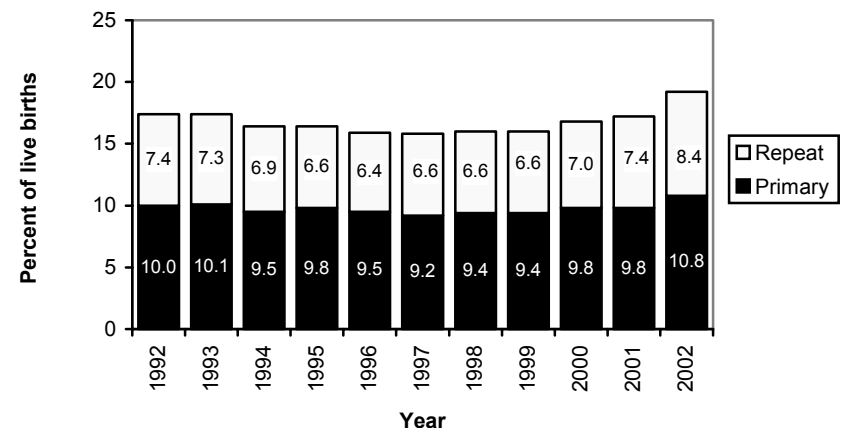
- The other low rates were reported by New Mexico (19.1), Alaska (19.4), Idaho (19.7) and Wisconsin (20.6).
- The increase in the cesarean rates in recent years has been experienced by all regions and states.⁷

Proportion of Primary and Repeat Cesarean

Figure 2 displays the breakdown of Utah's overall cesarean births into contributing components.

- Primary cesareans constitute the largest portion of all cesarean births. During 1992-2002, primary cesarean births accounted for 58% of total cesarean births.
- In 2002, 8.4% of all live births were repeat cesareans, representing 4,117 births and accounting for 44% of all cesarean births. Nationally during this same year, over one-third (39%) of all cesareans were repeat cesareans.

Figure 2: Proportions of Cesarean Births (Primary and Repeat) of All Live Births, Utah, 1992-2002



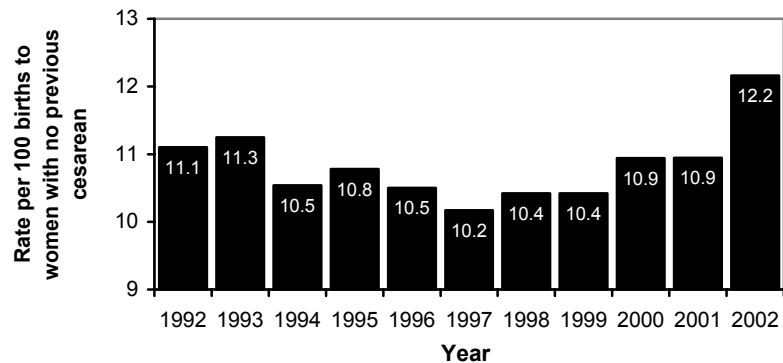
Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002



Primary Cesarean Rate

- The lowest primary cesarean rate in Utah in the past 11 years was observed in 1997 (10.2 per 100 live births to women with no prior cesarean) as shown in Figure 3.
- The primary cesarean rate increased 12% from 10.9 in 2001 to 12.2 in 2002.
- In 2002, 5,316 women had a primary cesarean delivery (see Table A in Appendix).

Figure 3: Rate of Primary Cesareans, Utah, 1992-2002



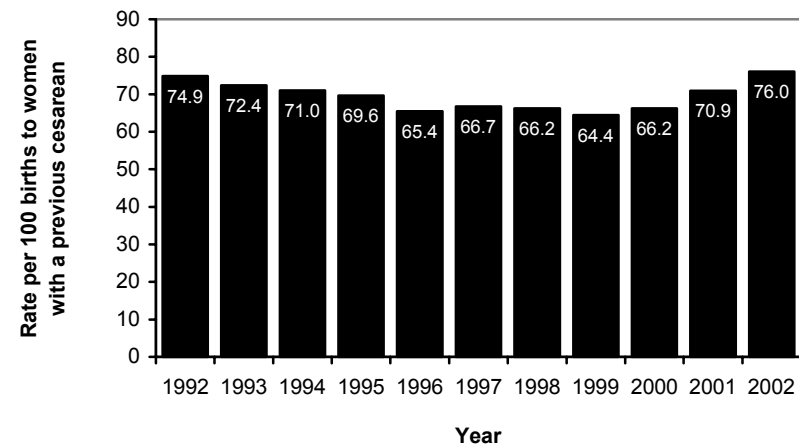
Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Repeat Cesarean Rate

- In Utah, the average repeat cesarean rate during 1992-2002 was 69.4 per 100 live births to women who had a previous cesarean.
- The trend of repeat cesarean over an eleven-year period shows that the rate never fell below 64.4 (see Figure 4).

- The repeat cesarean rate continues to increase in spite of a slight decline in 1999 (64.4 to 76.0).
- The number of repeat cesarean births has increased 38% between 1998 and 2002 (2974 vs. 4117, see Table A in Appendix). While the number of births for primary and repeat cesareans has increased, the rate of increase has been more dramatic for repeat cesarean births compared to primary cesarean births (38% vs. 25%).

Figure 4: Rate of Repeat Cesareans, Utah, 1992-2002



Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data 1992-2002

The cesarean rates by hospital and maternal county of residence are provided in Tables B-C and Figure B in the Appendix.



Section 3: Maternal Characteristics and Medical Conditions Related to Cesarean Births

The cesarean rates by maternal and pregnancy characteristics are presented in Table 2. The following is a brief discussion on each of the characteristics.

Maternal Age

The overall cesarean rate increased with maternal age (see Figure 5). During 1992-2002, older women (35 years and over) were twice as likely to have a cesarean compared to younger age women (Table 2, OR=2.04, CI 1.97-2.11). Past studies consistently reported that women age 35 and older present a higher risk for cesarean delivery.^{3,15,16} The reason for this increased risk among older women is not entirely clear. An in-depth review of cesarean statistics by the American College of Obstetricians and Gynecologists (ACOG) Task Force on Cesarean Delivery Rate has provided several possible reasons:¹³

- Older women may be more likely to have chronic medical conditions and therefore may experience more complications related to pregnancy.³
- Older women tend to have longer labors and are often diagnosed with arrest disorder.
- Induction of labor has also been reported to be a more frequent procedure in older women, which may be associated with increased risk of cesarean.
- Practitioner's attitude toward pregnancy in older women may also contribute to the increase in the rate of cesarean.¹³

The cesarean rates for each year by maternal age are provided in Table D in the Appendix.

Table 2: Cesarean Rates by Maternal and Pregnancy Characteristics, Utah, 1992-2002

Maternal Characteristics	Number of Births	Number of Cesarean Births	Cesarean Rate*	Odds Ratio**	95% Confidence Interval	
					Lower	Upper
Maternal Age						
Less than 20	45870	5970	13.0	—	—	—
20-24	150791	21798	14.5	1.13	1.11	1.17
25-29	145866	24359	16.7	1.34	1.30	1.38
30-34	87817	17295	19.7	1.64	1.59	1.69
35 and over	42549	9954	23.4	2.04	1.97	2.11
Parity						
Nulliparous	171607	29895	17.4	1.07	1.06	1.09
Multiparous	301286	49481	16.4	—	—	—
Education						
<12 years	72414	11848	16.4	—	—	—
HS graduate	151404	27007	17.8	1.11	1.08	1.14
>12 years	249075	40521	16.3	0.99	0.97	1.02
Birth weight						
<2500 g	30790	11443	37.2	3.34	3.26	3.42
2500-3999 g	404863	60963	15.1	—	—	—
≥4000 g	37240	6970	18.7	1.30	1.26	1.34
Plurality						
Singleton	460987	72748	15.9	—	—	—
Multiple (twins or more)	11874	6628	55.8	6.74	6.50	7.00

— This group was used as the reference category.

* Rate per 100 live births.

** Unadjusted odds ratio (OR). If the OR exceeds 1, the risk of cesarean birth is higher. If the OR is less than 1, the risk of cesarean birth is lower.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

The induction of labor prior to 41 weeks of gestation is associated with increased risk of cesarean. ACOG policy states that “the benefits of labor induction must be weighed against the potential maternal or fetal risks associated with this procedure”. ACOG recommends a practitioner should not induce labor in patients with unfavorable cervixes before 41 completed weeks of gestation unless maternal or fetal complications that constitute an indication for induction are present.⁸



Parity

Cesarean rates vary with parity. In Utah, nulliparous women had a slightly higher risk of having a cesarean delivery compared to multiparous women (17.4 vs. 16.4). Some studies have suggested that first time mothers who gave birth at age 35 or older are at higher risk of cesarean delivery.^{3, 17}

A recent study showed the importance of comparing "standard nulliparous" and "standard multiparous" in assessing cesarean rate.¹⁸ The standard has been defined as more than or equal to 37 weeks of gestation, singleton, vertex, and without previous cesarean birth. Utah's data for 1992-2002 demonstrate a higher rate for standard nulliparous compared to standard multiparous (13.0 vs. 2.6).

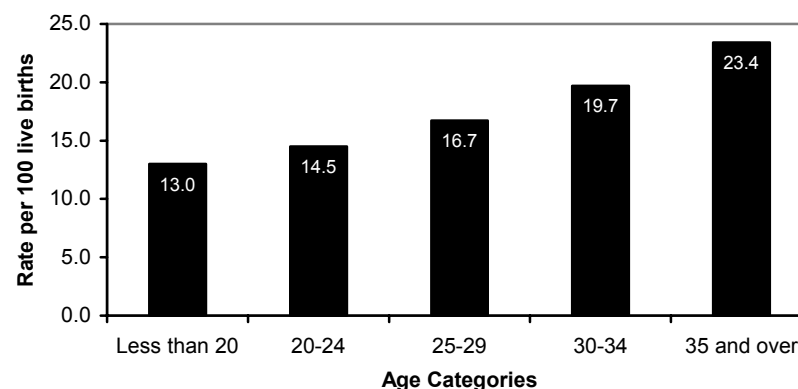
Education

During 1992-2002, the Utah cesarean rate was slightly higher among women who had a high school degree compared to women who had less than a high school degree (17.8 vs. 16.4). However, the rate did not increase for mothers who had additional education.

Birth weight of the baby

Cesarean rates vary by birth weight of the baby. The risk of having a cesarean was three-fold higher among women with low birth weight babies (<2500 g) compared to women with average birth weight babies (2500 g-3999 g). This finding is consistent with earlier research which suggested that problems related to prematurity, multiple gestation, and breech presentation may require an emergency cesarean.¹⁹ Women with high birth weight babies (≥ 4000 g) were 30%

Figure 5: Cesarean Rate by Maternal Age, Utah, 1992-2002



Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

more likely to have a cesarean compared to women with average birth weight babies. Fetal macrosomia often results in difficult labor, particularly dystocia or cephalopelvic disproportion (CPD), which warrant a cesarean delivery.

Plurality

Women with multiple gestations were almost 7 times more likely to have a cesarean compared to women with a single fetus (Table 2, OR=6.74, CI 6.50-7.00). Multiple gestation pregnancies have increased 27% from 1992 to 2002 (2.2% to 2.8%). One of the possible reasons for this rise may be related to the increased use of assisted reproductive technology (ART). At present, advanced education and economic resources have allowed women to achieve motherhood via ART. Options such as fertility drugs, available to aid in conception among older



mothers, have been correlated with higher rates of multiple births and lead to a higher risk of cesarean delivery.¹⁷

Race/Ethnicity

Cesarean rates by maternal race and ethnicity are provided in Table 3.

- The cesarean rate was the highest among African American women (21.9).
- The second highest cesarean rate was among Hispanic women (18.9) followed by Native American women (17.9).
- In 2002, white and Asian women had the lowest primary cesarean rate (12.0 and 12.9, see Table E in Appendix).

Studies have noted a significant association between maternal obesity and increased risk of cesarean.²⁰ National data indicate a substantial increase in the number of overweight women of child bearing age from 1970s to 1990s. Utah birth data show that 13.9% of women giving birth were obese (BMI≥30) in 2002.

Table 3: Cesarean Rates by Maternal Race and Ethnicity, Utah, 1992-2002

Maternal Characteristics	Rate*
Race	
White	16.7
African American/Black	21.9
Native American	17.9
Asian/Pacific Islander	16.6
Other/Unknown	16.0
Ethnicity	
Hispanic	18.9
Non-Hispanic	16.6

* Rate per 100 live births
Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

A study done in 19 Latin American countries looked at the incidences of cesarean sections and correlated these with socioeconomic, demographic, and health care variables. They found that better socioeconomic conditions were associated with higher cesarean section rates.²¹ Researchers also discovered that as a result of the financial gain, obstetricians in Mexico have created a high demand for cesareans by offering them to the higher socioeconomic groups as a distinctive way of giving birth or by presenting them as a frequent outcome in cases of relative indications for a cesarean. With time, other social groups have imitated this trend and may assume that if the more privileged prefer it, it must be better.²²



Cesarean Rate Related to Maternal Medical Risk Factors and Labor Complications

Certain medical conditions indicate a need for a cesarean birth. The major clinical indications for performing a cesarean delivery include previous cesarean birth, breech presentation, dystocia, and fetal distress. However, other conditions that usually require a cesarean involve placenta previa, prolapsed cord, abruptio placenta, and certain other medical problems (see Table 4).

The birth certificate data provide detailed information on maternal medical risk factors and labor complications. Cesarean rates for women with selected maternal medical risk factors and labor complications are shown in Table 5.

- During 1992-2002, the likelihood of cesarean was four-fold higher among women with eclampsia compared to women who did not have this medical condition.
- Medical risk factors with the next highest cesarean rates were chronic hypertension (36.8), genital herpes (34.4), polyhydramnios/oligohydramnios (34.1), diabetes (32.6), and pregnancy associated hypertension (30.8).

Table 4: Medical Conditions Requiring a Cesarean:

Previous cesarean	Pregnancy-induced hypertension
Cephalo-pelvic disproportion	Suspected fetal macrosomia
Malpresentation/breech	Cord prolapse
Failure to progress/dystocia	Placenta abruptio
Fetal distress	Severe preeclampsia
Placenta previa	Active herpes lesions
Prolonged rupture of membranes	Severe diabetes
Multiple gestation	Cardiac condition

Table 5: Percentage of Total Births with Selected Medical Risk Factors and Labor Complications, Cesarean Rates and Odds Ratios for Cesarean Delivery, Utah, 1992-2002

	% of Births	Cesarean Rate*	Odds Ratio**	95% CI	
				Lower	Upper
Medical Risk Factors					
Anemia	2.7%	19.2	1.18	1.13	1.24
Cardiac disease	0.6%	20.9	1.31	1.20	1.44
Uterine bleeding	2.0%	24.7	1.64	1.57	1.72
Hypertension, pregnancy associated	4.6%	30.8	2.32	2.25	2.39
Diabetes	1.4%	32.6	2.44	2.32	2.57
Polyhydramnios/Oligohydramnios	1.7%	34.1	2.62	2.50	2.75
Genital herpes	0.6%	34.4	2.62	2.43	2.83
Hypertension, chronic	0.5%	36.8	2.90	2.65	3.17
Eclampsia	0.3%	45.6	4.18	3.78	4.61
Complications of Labor/ Delivery					
Febrile	3.3%	20.7	1.31	1.26	1.36
Premature rupture of membrane	2.3%	28.5	2.02	1.93	2.10
Abruptio placenta	0.1%	39.8	3.34	3.16	3.53
Fetal distress	4.2%	49.6	5.43	5.28	5.59
Dysfunctional labor	2.4%	61.4	8.56	8.24	8.90
Cord prolapse	0.3%	62.9	8.49	7.57	9.53
Placenta previa	0.4%	71.8	12.83	11.57	14.24
Breech/malpresentation	5.0%	73.4	17.21	16.70	17.17
Cephalopelvic disproportion (CPD)	2.2%	96.7	167.86	150.66	187.01

* Rate per 100 live births

** Unadjusted odds ratios were calculated for women who experienced any of the medical risk factors or complications and were compared with those women who experienced none.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

- During 1992-2002, women with CPD were at the highest risk of having cesarean delivery (96.7).
- The next highest cesarean rates for labor complications were breech/malpresentation (73.4), placenta previa (71.8), cord prolapse (62.9), and dysfunctional labor (61.4).



Table 6 displays cesarean rates by medical risk factors and labor complications for each year from 1992-2002. Since the cesarean rates were lowest in 1997 for Utah, it was used as the comparison year to calculate the percent change.

- There was a slight increase of proportion of births with breech/malpresentation from 1997 to 2002 (4.7% to 5.9%), yet the cesarean rate for such conditions declined 7% (74.4 to 69.2). Research suggests that there is evidence that external cephalic version can substantially change the incidence of breech presentation at delivery.¹¹
- Cesarean rates for pregnancy induced hypertension has increased 21% from 28.7 in 1997 to 34.8 in 2002.
- During 1992-2002, fetal distress accounted for 4.2% of all births. On average, the cesarean rate for women with fetal distress was 49.6. There was a 15% increase in diagnosis of fetal distress since 1997 (3.9% to 4.5%) with a corresponding increased cesarean rate (52.3 in 1997 to 58.6 in 2002).
- During 1997 to 2002, cesarean rates for dysfunctional labor increased 33% from 57.3 to 76.0.

Most babies move into a head first position in the womb before birth. However, if a baby is still bottom first at term (breech position) then the doctor can use external cephalic version (ECV) to move the baby to head first or vertex position. Studies have shown that there are fewer cesarean births among women with breech babies who have undergone successful ECV compared to women in whom versions were not attempted. Success rate of ECV at term is generally in the range of 50-75%.²³

Table 6: Cesarean Rates by Selected Medical Risk Factors and Labor Complications by Each Year, Utah, 1992-2002

	Year of birth											Percent Change between 1992-1997	Percent Change between 1997-2002
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002		
Overall State Cesarean Rate*	17.4	17.4	16.4	16.4	15.9	15.7	16.0	16.0	16.8	17.2	19.2		
Medical Risk Factors													
Anemia	22.4	16.8	19.8	19.1	20.5	17.1	16.4	16.9	19.9	19.1	22.2	-24	30
Cardiac disease	19.5	18.9	15.1	17.5	23.1	20.1	20.9	23.1	21.8	17.7	24.5	3	22
Diabetes	32.0	31.7	30.9	30.1	35.6	28.2	33.7	32.0	31.0	32.2	36.3	-12	29
Eclampsia	47.6	40.5	36.9	51.1	52.2	45.5	38.3	50.0	45.6	43.6	49.6	-4	9
Genital herpes	43.9	41.3	34.7	42.6	29.6	32.9	34.7	33.6	32.5	29.4	35.4	-25	8
Hypertension, chronic	35.6	44.6	29.9	38.0	34.8	34.9	34.3	36.6	37.9	37.1	39.7	-2	14
Hypertension, preg. associated	34.4	33.6	31.4	31.3	29.0	28.7	30.1	27.5	30.8	30.0	34.8	-17	21
Polyhydramnios/Oligohydramnios	39.9	42.0	40.0	34.3	32.7	33.2	33.8	32.4	33.3	31.8	34.0	-17	2
Uterine bleeding	27.9	26.4	26.5	26.5	25.8	24.2	21.2	24.7	22.7	22.4	28.0	-13	16
Complications of Labor/Delivery													
Abruptio placenta	41.2	42.3	45.6	41.7	39.8	40.0	41.0	40.3	37.4	32.8	41.4	-3	4
Breech/Malpresentation	76.9	77.2	76.2	83.7	80.2	74.4	75.7	69.9	68.8	66.5	69.2	-3	-7
Cephalopelvic disproportion	98.6	97.5	96.7	97.6	96.8	95.3	96.8	96.2	95.2	96.7	95.3	-3	0
Cord prolapsed	70.0	66.3	48.4	51.8	46.8	79.2	67.0	65.4	68.1	68.1	72.9	13	-8
Dysfunctional labor	54.1	52.2	56.9	64.1	56.1	57.3	58.5	45.3	67.7	69.0	76.0	6	33
Febrile	27.3	22.5	24.2	23.8	20.8	18.1	20.6	19.7	20.4	19.8	19.5	-34	8
Fetal distress	53.8	55.0	47.5	47.7	47.4	52.3	53.2	40.4	40.4	53.3	58.6	-3	12
Placenta previa	78.5	86.8	78.2	63.3	67.4	71.0	70.5	72.2	70.2	65.1	73.9	-10	4
Premature rupture of membrane	26.5	27.2	25.0	24.9	25.9	27.4	29.0	27.6	33.7	29.0	35.3	3	29

*Rate per 100 live births
 For a more detailed table, see Table F in Appendix.
 Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002



Patient Choice

A number of health care professionals assert that cesarean deliveries are being performed as a convenience to the pregnant woman or physician and without warranted clinical indications. Many argue that cesareans are overused as a method of delivery. Because of the inherent risks, this issue has become a compelling concern for quality of care.²⁴

Many studies have shown a significant variation in cesarean section rates (e.g., by hospitals or by subpopulations). There is increasing evidence among experts that a large proportion of the variation may be due to “elective” or “patient choice” cesarean sections.²⁵ Patient choice cesarean deliveries are cesareans that are performed without any medical or clinical indication.

HealthGrades, a company that rates the quality of hospitals, recently published a report on the growing trend of patient choice cesarean deliveries.⁴ Hospital discharge data were analyzed from 1,920 hospitals in 18 states, including Utah, for 1999 to 2001. According to the study, from 1999 to 2001, the rate of patient choice cesareans increased almost 20%, from 1.56% to 1.87% of all deliveries. Utah had the lowest patient choice cesarean rate (0.88%) for the three-year period. New York had the highest patient choice cesarean rate (2.24%) followed by Florida (2.04%), Texas (2.03%) and New Jersey (2.00%).

Recent surveys of physicians reveal that a high proportion of them would concede to a pregnant woman's request for an elective cesarean section.²⁶ One recent article in the *New England Journal of Medicine* addressed this issue.²⁷ In the study, researchers encouraged physicians to seek out the root causes of a woman's request for a cesarean and then to discuss

with her both the qualitative and quantitative assessment of risks and benefits of the procedure. With appropriate counseling from the provider, the request for cesarean delivery was often withdrawn.

One argument often cited in favor of elective cesarean is avoidance of pelvic floor damage, which can occur with vaginal delivery. Use of episiotomy and forceps has been demonstrated to be associated with incontinence. Nevertheless, the prevention of pelvic floor injury by routine elective cesarean is not an appropriate solution.²⁸

An elective cesarean section increases the risk to the infant of premature birth and respiratory distress syndrome, both of which are associated with multiple complications, intensive care and higher health costs. Even in mature babies, the absence of labor increases the risk of breathing problems and other complications.²⁹



Section 4: National Objectives for Cesarean Births (HP 2010)

The U.S. Department of Health and Human Services (DHHS) has set specific targets for cesarean births in the Healthy People 2010 (HP 2010) Report. The DHHS has recommended that by the year 2010 the U.S. cesarean delivery rate for low-risk women giving birth for the first time decrease to 15 percent from the 1998 baseline rate of 18 percent. The DHHS further recommends the cesarean delivery rate for women who have had a previous cesarean delivery decrease to 63 percent from the 1998 baseline rate of 72 percent.

HP 2010 Objectives

Reduce cesarean births among low-risk (full term, singleton, vertex presentation) women.

Objective	Reduction in cesarean births	1998 Baseline	2010 Target
16-9a.	Women giving birth for the first time	18	15
16-9b.	Prior cesarean birth	72	63

Data Source: U.S. Department of Health and Human Services, Tracking Healthy People 2010, Washington D.C. <http://www.wonder.cdc.gov> Data2010

Modification in Cesarean National Objectives

HP 2010 cesarean objectives were modified from HP 2000 objectives in two ways: focus and data source.

What is HP 2010?

Healthy People 2010 is a comprehensive set of objectives to improve the health of Americans by the year 2010. It builds on initiatives pursued over the past two decades including *Healthy People 2000*.

The focus of the objective was changed from *all* women giving birth to *low-risk* women. This change takes into account maternal characteristics. All practitioners have some pregnant women in their practice who are at increased risk for cesarean delivery, regardless of management practices. Women at higher risk include those with a previous cesarean delivery through a classical uterine incision as well as women with certain medical or obstetric conditions.¹³ Public health professionals and other experts recognize that many of the cesareans for high-risk groups are unavoidable. However, there is growing concern about the rise in the cesarean rate for low-risk pregnancies. This concern has led to the establishment of revised national goals focusing on low-risk women. "Low-risk" was defined as women having singleton babies at 37 weeks or more with a vertex presentation. Measuring changes in cesarean rates among the low-risk group will be more meaningful and will allow for a more appropriate evaluation of practitioner's cesarean delivery rates. HP 2010 was revised to reflect the importance of case mix by focusing the national reduction goal on low-risk women.²⁵ ACOG affirms, in fact, that two-thirds of



all cesarean deliveries involve two major categories of women (low risk nulliparous women having a primary cesarean and low risk multiparous women having a repeat cesarean).

Another change was the data source. Birth certificate data were identified as the source of data for monitoring HP 2010 objectives whereas HP 2000 used hospital discharge data.

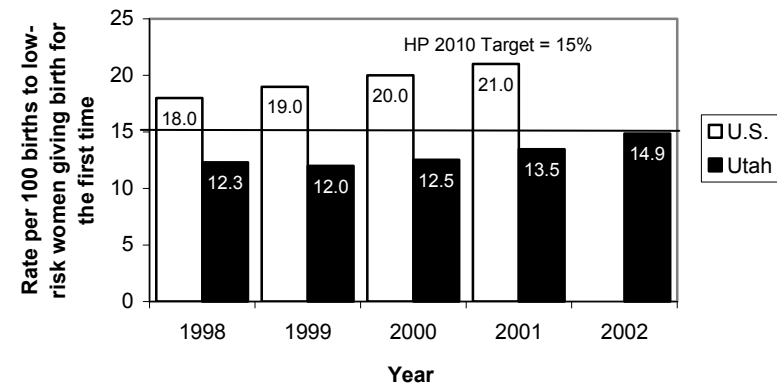
Utah's Progress Toward the HP 2010 Goal

Utah's cesarean rate and HP 2010 goals are presented in Figures 6 and 7. Since 1998 has been used as the baseline year for HP 2010, the trend is only shown for 1998-2002.

- Utah has achieved the HP 2010 goal of reducing primary cesarean rates among low-risk women to 14.9 (target=15%, see Figure 6). Efforts to maintain or lower this rate should be a priority.
- Utah's rates for repeat cesarean among low-risk women were below the HP 2010 goal until 2001, when the rate exceeded the goal and began an upward trend. The current rate of 74.3 is well above the HP 2010 goal of 63.0 (see Figure 7).

Hospital level HP 2010 data are provided in Table G in the Appendix.

Figure 6: Primary Cesarean Rate among Low-Risk Women Giving Birth for the First Time*, Utah vs. U.S., 1998-2002



* HP 2010 Objective 16-9a

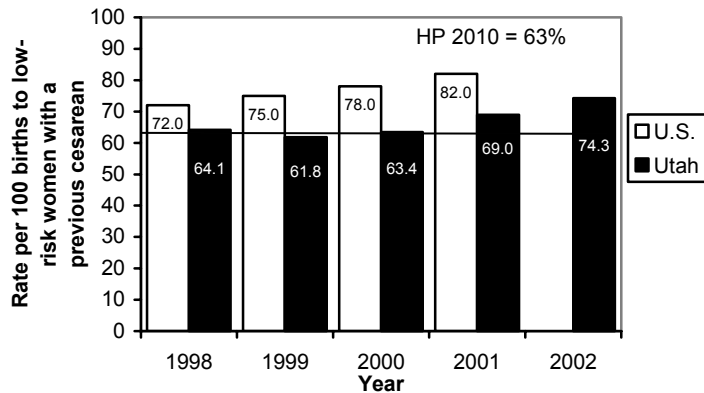
** 2002 U.S. HP 2010 data were not available in the Data2010 query system.

Utah Data Source: Office of Vital Records and Statistics, Birth Certificate Data, 1998-2002

U.S. Data Source: Centers for Disease Control and Prevention, <http://wonder.cdc.gov/Data2010>



Figure 7: Repeat Cesarean Rate among Low-Risk Women*, Utah vs. U.S., 1998-2002



* HP 2010 Objective 16-9b

** 2002 U.S. HP 2010 data were not available in the Data2010 query system.
Utah Data Source: Office of Vital Records and Statistics, Birth Certificate Data, 1998-2002

U.S. Data Source: Centers for Disease Control and Prevention, <http://wonder.cdc.gov>, Data2010

What is "Case Mix"?

The substantial variation in cesarean rates across obstetric institutions and practitioners has been the focus of increased attention as efforts to control health care costs have escalated.³⁰ Although some variation in cesarean rates may reflect management practices, part of the variation is also likely to reflect differences in the population/patients cared for by institutions. Some providers may care for populations with a higher prevalence of risk factors that increase the risk of cesarean regardless of management practices. The population of such patients will vary from provider to provider. ACOG's Task Force on Cesarean Delivery Rates recommends using case-mix adjusted cesarean delivery rates in order to account for patient characteristics.¹³

ACOG has adopted the HP 2010 goals and recommends that hospitals and clinical practices monitor their own rates for low-risk nulliparous and multiparous women and compare them with the target rates set by the DHHS. Tracking and monitoring cesarean rates by individual hospitals and clinical practices may help identify potentially avoidable cesareans and where VBAC policies need to be reconsidered.



Section 5: Trends in Vaginal Birth After Cesarean

What is VBAC?

VBAC stands for Vaginal Birth After a Cesarean. It is a vaginal birth after one or more cesareans.

Why is VBAC promoted?

Although many strategies for lowering the cesarean rate have been explored, experts have identified VBAC as one of the key interventions. Promoting VBAC would affect the largest number of women who would otherwise have repeat cesarean deliveries. Repeat cesarean delivery accounts for more than one-third of all cesarean deliveries in the U.S. and is one of the leading indicators for cesarean birth.¹³

What are the benefits of VBAC?

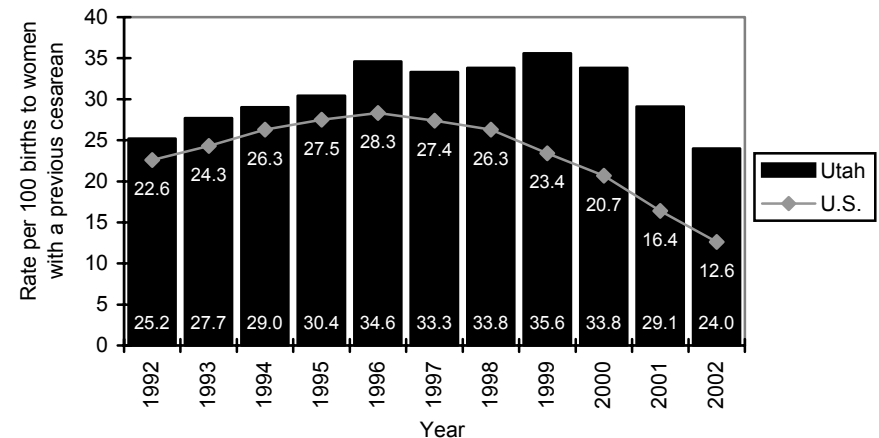
Neither VBAC nor repeat cesarean is free of risk, but successful VBAC usually entails less morbidity than repeat cesarean. Medical benefits of VBAC include reduced risk of maternal death and surgical and postoperative complications. Women are able to resume normal activities at a faster rate. Other benefits of VBAC entail lower cost and shorter hospital stay. On the other hand, repeat cesareans are linked to a host of complications for the baby including prematurity, lacerations, and respiratory problems. The risks for mother include infection, hemorrhage, and hysterectomy.

Current VBAC Rate for the U.S. and Utah

In 2002, the national VBAC rate was 12.7 (per 100 live births to women with a prior cesarean), the lowest ever reported. Since 1996, national VBAC rates have declined. From 1996 to 2002, VBAC rate plummeted by 55% (28.3 to 12.6). Prior to 1996, a

"Craigin dictum" (once a c-section always a c-section) that dominated obstetrical practice for nearly 70 years was revised by ACOG in 1984 to encourage a trial of labor for women who had a low transverse uterine scar.³¹ During 1992-2002, 14,690 of Utah women had a VBAC representing an average VBAC rate of 30.6.

Figure 8: Rate of Vaginal Birth After Cesarean, Utah vs. U.S., 1992-2002



Source of Utah Data: Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002
Source of U.S. Data: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics Report, vol 52, no. 10, 2003

substantial increase in VBAC rate was observed between 1992-1996.

Rates in Utah have followed a similar pattern as the nation, although the decline in VBAC rates did not begin until 1999.



The highest VBAC rate for Utah was observed in 1999 (see Figure 8). During the same year, Utah obtained the HP 2000 goal of 35.0. However, this increase was not sustained and the rate dropped from 35.6 in 1999 to 24.0 in 2002. Utah's VBAC rate is still substantially higher than the national rate. Since VBAC rate is the reverse of repeat cesarean rate, achieving the national HP 2010 goal for the repeat will require increasing the VBAC rate to 37.0. In Utah, close to 3% of births or 1,299 infants were delivered vaginally after the mother had undergone a prior cesarean delivery in 2002 (see Table A in Appendix).

Why are the rates falling?

Physicians have been encouraged to offer women with a previous cesarean delivery an attempt at vaginal birth. Early research showed reasonable success in attempts at VBAC. It has been estimated that between 60-80% of women attempting a trial of labor after cesarean would successfully complete a vaginal delivery.³² However, recent research has focused on safety issues and identified some maternal and neonatal risks associated with VBAC.³³ Maternal risks include uterine rupture, hemorrhage requiring transfusion or hysterectomy, and infection. Neonatal complications include birth trauma and prolonged hypoxia. Even though the occurrence of such risks are rare, about less than one percent, physicians and pregnant women are becoming more cautious about this mode of delivery. Because of potential risks many women are therefore opting for an elective repeat cesarean instead of attempting a VBAC. In addition, 1999 guidelines from ACOG clearly state that patients undergoing a VBAC require the presence of an obstetrician, an anesthesiologist, and

staff capable of performing an emergency cesarean delivery throughout active phase of labor. While larger hospitals have the capacity to comply with this requirement, many smaller hospitals often find this requirement restrictive and challenging.³⁴ Due to this problem, facilities only offer the choice of repeat cesarean. Some insurance companies are requiring women to sign a consent form that may frighten them and cause them to decline an attempt at VBAC.¹⁸

Utah's VBAC Rates by Maternal Characteristics

- As shown in Table 7, VBAC rates were the highest for women who were <20 years old (34.0).
- Rates were higher for Native American (34.2) and Hispanic women (32.0) compared to whites.

Table 7: VBAC Rates by Maternal Characteristics, Utah, 1992-2002

Maternal Characteristics	Rate*
Age Group (yrs)	
< 20	34.0
20-24	31.7
25-29	31.6
30-34	29.8
≥ 35	28.3
Race	
White	30.5
African American/Black	27.2
Native American	34.2
Asian/Pacific Islander	32.3
Other/Unknown	33.6
Ethnicity	
Hispanic	32.0
Non-Hispanic	30.4

*Rate per 100 live births to women with a previous cesarean delivery
Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002



VBAC rates by maternal characteristics for each year from 1992-2002 are provided in Table H in the Appendix.

Strategies Recommended by National Experts to Improve VBAC Rates

Strategies for improving VBAC rates include educating women about the risks for complications and benefits of VBAC, ensuring careful selection of VBAC candidates, developing guidelines for management of labor, and educating health care providers about reducing VBAC risks.³⁵ ACOG has emphasized that VBAC is an important component in reducing repeat cesarean delivery. The following is a list summarizing ACOG's recommendations for VBAC:

1. Most women with one previous cesarean delivery with a low-transverse incision are candidates for VBAC and should be counseled about VBAC and offered a trial of labor.
2. A previous uterine incision extending into the fundus is a contraindication for VBAC.
3. Because the risk of uterine rupture exists, VBAC should be attempted in institutions equipped to respond to emergencies with physicians immediately available to provide emergency care.

Research shows that women with a prior vaginal delivery have higher rates of successful VBACs compared to women without a prior vaginal delivery. Furthermore, women who have had a successful VBAC have a higher success rate in a subsequent trial of labor.³⁴

ACOG also states that the ultimate decision to attempt VBAC or undergo an elective repeat cesarean delivery should be made by the woman and her physician after weighing the risks and benefits. All hospitals are strongly recommended by ACOG to monitor their VBAC rates (see Table B in Appendix).

A study done in 2003 revealed an association of markers of socioeconomic status and ethnicity with VBAC attempt rates. The study found that Medicaid patients were more likely to attempt a VBAC over privately insured or managed care patients. They also found that VBAC attempt rates were higher among Black and Asian women. Possible explanations for these differences could be due to the increased acceptance of recommendations by health care providers by these subpopulations, cultural differences in the importance of vaginal delivery, and differences in level of provider experience with subpopulations.³⁶



Section 6: A New Cesarean Classification System

The Utah Department of Health has begun utilizing a new cesarean classification system. This system was proposed by a British obstetrician, Michael Robson.³⁷ His classification system is based on ten well-defined and mutually exclusive categories (see Table 8). It was thought that these categories could be used to provide insight into the makeup of cesarean rate. The system is simple to understand, organize, and implement. This system is being used in the United Kingdom and internationally and proves to be useful in assessing the cesarean rate.

This ten-category classification system is based on the following obstetric concepts:

A. Category of the pregnancy	B. Previous obstetric record
Single cephalic pregnancy Single breech pregnancy Single oblique or transverse lie Multiple pregnancy	Nulliparous Multiparous (without a uterine scar) Multiparous (with a uterine scar)
C. Course of labor and delivery	D. Gestation
Spontaneous labor Induced labor Cesarean section before labor (emergency or elective)	Gestational age in completed weeks at the time of delivery

Robson's classification system can be considered as an enhancement of prior methods. The classification method that

has been the most popular in the U.S. was developed by Anderson and Lomas in 1984.¹¹ Their system was based on a hierarchy of indications for cesarean delivery with decision rules to assign multiple diagnosis deliveries to a single clinically reasonable category. They attributed cesarean delivery to five mutually exclusive categories: "previous cesarean delivery", "breech", "dystocia", "fetal distress", and "other" indications. When Anderson and Lomas' classification system was initially created, the "other" category consisted of a very small group compared to the 4 remaining categories. However, in recent years, this group has grown significantly resulting in a need for reclassification. Robson provided a more inclusive, long lasting classification system such that there is no need for an "other" category.

The main strengths of the classification system are provided below.

- The ten mutually exclusive categories in this system reflect the groups of women who are most relevant in clinical practice.
- The system takes into consideration the differences in obstetric or patient population and allows comparison of "like" with "like".
- This classification system detects where the major differences in cesarean section rates exist.
- It permits further subcategory (lower hierarchical level) analysis within each category.



- This classification system also has the capability to allow for analysis of the new HP 2010 objectives that monitor cesarean rates among low-risk women. Low-risk women giving birth for the first time are captured in Robson's category 1 and 2, and women who have had a previous cesarean fall within category 5.
- This standardized system allows comparison of cesarean rates for facilities that serve similar types of obstetric populations. It also allows recognition of best practices that lead to lower cesarean rates for certain categories.

There is no 'optimal' cesarean rate that is applicable to all institutions or geographic regions, since the populations and clinical practice patterns of these institutions and regions can vary substantially. Population and practice variables that may affect cesarean rates include (but are not limited to) maternal parity, labor induction rates, previous cesarean delivery, malpresentation, multifetal gestation and medical/obstetrical complication rates.³⁸

Table 8: Robson Classification System

Description
1. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation in spontaneous labor
2. Nulliparous women with a single cephalic pregnancy, at greater than or equal to 37 weeks gestation who either had labor induced or were delivered by cesarean section before labor
3. Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks in spontaneous labor
4. Multiparous women, without a previous uterine scar, with a single cephalic pregnancy at greater than or equal to 37 weeks gestation who either had labor induced or were delivered by cesarean section
5. All multiparous women, with at least one previous uterine scar and single cephalic pregnancy at greater than or equal to 37 weeks gestation
6. All nulliparous women with a single breech pregnancy
7. All multiparous women with a single breech pregnancy including women with previous uterine scars
8. All women with multiple pregnancies, including women with previous uterine scars
9. All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
10. All women with a single cephalic pregnancy at less than or equal to 36 weeks gestation, including women with previous scars

Data Source: Robson, M.S. (2001). Classification of Cesarean Sections. *Fetal and Maternal Medicine Review*, 12, 23-39.



Table 9 displays the Utah cesarean rates by Robson's criteria based on linked birth certificate and hospital discharge data for 1998-2001. The findings are presented below.

- Robson suggested that when reflecting cesarean rates in each group, it is important to consider the relative sizes of each group. Both nulliparous and multiparous women with breech presentation at term (category 6 and 7) had the highest cesarean rate (95.5, 91.7). However, these categories consist of relatively small percentage of births.
- The next highest cesarean rate was observed for category 5, multiparous women with previous cesarean (62.8). This category was the major contributor of overall cesarean rate. This category is clinically very important due to its heterogenous nature. A thorough assessment with counseling by a healthcare provider is needed to consider this category for possible VBAC.
- Close to one-third (31.4%) of total births were accounted for by nulliparous women at term with vertex presentation (category 1 and 2). The cesarean rate for these two categories was 13.2 and 13.9 respectively. The rate for category 2 may suggest rates related to induction. These two categories are the most important groups of women in the obstetric population since they are the second largest group in most obstetric populations after the combined percentage of categories 3 and 4. Monitoring cesarean rate in such categories is critical not only to reduce cesarean delivery for the first delivery but also in subsequent deliveries. It is widely understood that the most effective

way to reduce the overall cesarean rate is to prevent primary cesarean.

Table 9: Percentage of Births and Cesarean Rates by Robson Criteria, Utah, 1998-2001*

Category	Description	Percent of Births	Cesarean Rate
1	Nullipara, ≥ 37 weeks, vertex presentation, spontaneous labor	22.2	13.2
2	Nullipara, ≥ 37 weeks, vertex presentation, induced labor	9.2	13.9
3	Multipara, NO previous cesarean, ≥ 37 weeks, vertex presentation, spontaneous labor	31.9	3.8
4	Multipara, NO previous cesarean, ≥ 37 weeks, vertex presentation, induced labor	15.4	1.7
5	Multipara, previous cesarean, vertex presentation	9.2	62.8
6	Nullipara, term singleton breech presentation	1.1	95.5
7	Multipara, term singleton breech presentation	1.2	91.7
8	Multiple gestation (with or without previous cesarean)	1.4	55.9
9	Singleton pregnancy, oblique or transverse lie (excluding breech)	0.9	38.1
10	Singleton cephalic pregnancy, < 37 weeks (including previous cesarean)	7.3	22.1

* Cesarean rates by Robson criteria by each year (1998-2002) are presented in Table I in the Appendix.
Data Source: Linked Utah Birth and Hospital Discharge Data, 1998-2001, Office of Health Care Statistics



- The cesarean rate for women with a preterm singleton baby was 22.1 (category 10). Tracking cesarean rates for this category has long-term implications as more and more premature babies are being born via cesarean.
- The cesarean rate was lowest for category 3 and 4. This group accounts for the largest percentage of births (47%). Efforts are needed to sustain this lower rate. Otherwise due to its large relative size, any small increase in cesarean rate will result in a large number of cesarean births.

It is necessary to monitor cesareans for both high-risk and low-risk conditions in order to identify the normative rates for specific groups. Implementation of this classification system can stimulate a discussion of variation in rates by hospitals to discover the best practices in delivery management.

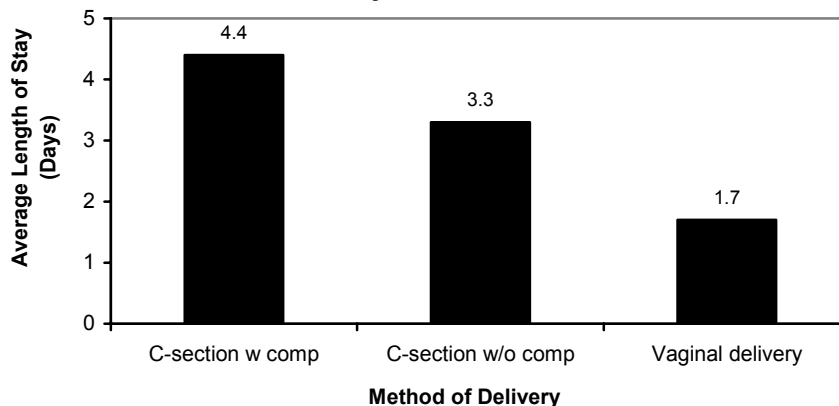


Section 7: Costs Associated with Cesarean Delivery

In Utah, between the period of 1992 to 2002, hospital stays for cesarean deliveries were nearly 3 days longer than for vaginal deliveries. The average length of stay for a cesarean with complications was 4.4 days compared to 1.7 days for a vaginal delivery (see Figure 9).

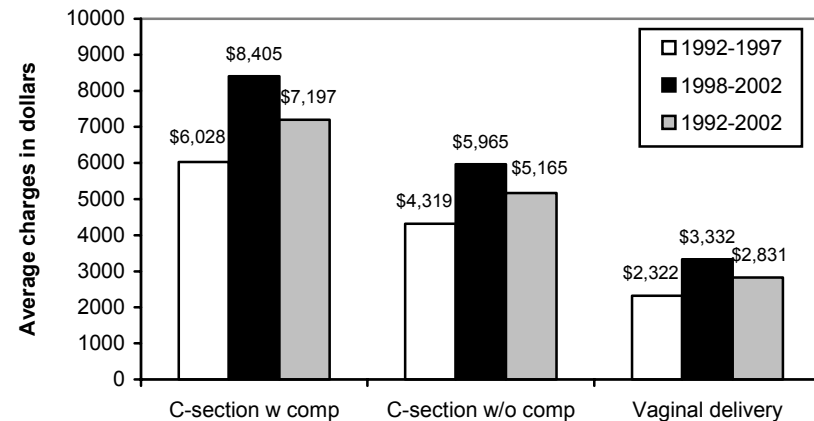
In addition to extended hospital stay, cesarean deliveries are associated with higher costs. During 1992-2002, the average hospital charge for cesarean deliveries with complications was \$7197 compared to \$2831 for a vaginal delivery (see Figure 10). The average hospital charges for cesarean with complications increased significantly each year from \$5181 in 1992 to \$9095 in 2002 (see Table G in Appendix). The average charges for cesarean deliveries without complication were 82% more than vaginal deliveries (\$5165 vs \$2381). In 2002, the total charges for cesarean deliveries were \$61,346,724.³⁹

Figure 9: Average Length of Stay by Method of Delivery, Utah, 1992-2002



Data Source: Utah Office of Health Care Statistics, Hospital Inpatient Discharge Database, 1992-2002

Figure 10: Average Hospital Charges by Method of Delivery, Utah, 1992-2002



Data Source: Utah Office of Health Care Statistics, Hospital Inpatient Discharge Database, 1992-2002

A recent study explored the association between method of delivery and the risk of maternal rehospitalization. Researchers compared cesareans, assisted vaginal delivery (forceps or vacuum extraction), and spontaneous vaginal delivery. They found that women with cesarean deliveries were 1.8 times more likely to be rehospitalized compared to women who had spontaneous vaginal delivery. They also found that women with assisted vaginal delivery were 1.3 times more likely to be rehospitalized than women with spontaneous vaginal delivery.⁴⁰



Section 8: Conclusions and Recommendations

Cesarean section delivery is considered a major surgical operation and due to the inherent dangers associated with the procedure, this type of delivery should only be undertaken in the event that the immediate health of the mother or infant is at risk.

Currently Utah is experiencing an upward trend in overall cesarean section rates. While Utah is still below the national level, the trend is nevertheless alarming.

Cesarean rates were observed to be higher for women 35 years and older. Utah has been experiencing a slight upward trend in the number of births among this age group. However, this trend is much less than the national trend, possibly due to the cultural practices of women in Utah.

Cesarean rates were also higher for Hispanic and African American women. While the proportion of births is small for these subgroups, the increasing rates should be addressed.

Attention should also be directed at the HP 2010 cesarean rates among low risk women, as they account for the majority of births. Utah met the HP 2010 goal of primary cesarean rate among low-risk women. However, the repeat cesarean rate has exceeded the HP 2010 target. A concerted effort needs to be

directed at the reduction of the repeat rate by promoting VBAC where appropriate in order to achieve the HP 2010 goals.

Strategies to Reduce Cesarean Rate

A number of strategies throughout the nation have been developed and implemented to reduce cesarean delivery rate. Strategies include: quality improvement and peer review programs, active management of labor (AMOL), and selecting appropriate VBAC candidates.

Quality improvement and peer review programs

Studies have shown that stressing the importance of physician practice pattern is key in reducing the cesarean rate. For example, Elliott Main described the approach of comprehensive data collection and intensive feedback of outcomes to providers in reducing the cesarean birth rate.¹⁸ He discussed how comparison statistics of cesareans ("report cards") by each provider were released and shared at departmental meetings in a San Francisco hospital. Recognition was provided to those providers with a low rate and assistance was offered to those providers with a high rate by creating an opportunity for improvement. Data without recognition, praise, and private admonishment are unlikely to change physician behavior.

Several states have begun to disseminate overall cesarean rates and risk-adjusted hospital specific rates to hospitals to educate



providers and encourage them to incorporate this information into their quality improvement activities.^{18,24,41} Some states have established ongoing peer review and feedback process.

These efforts encourage physicians to improve their individual profiles and cesarean delivery rates.

AMOL

Another strategy in reducing the cesarean rate is active management of labor (AMOL). This protocol is intended for patients with detailed labor criteria. While past studies have shown benefits of AMOL, recent studies show little or no effect on cesarean rate.¹⁸

Selecting appropriate VBAC candidates

Indication of previous cesarean section is a principal strategy in reducing the cesarean rate. Large prospective trials published in the late 1980s and early 1990s showed that VBAC was reasonably safe and effective. ACOG has formally endorsed VBAC when appropriate.

Utah's Effort in Reducing Cesarean Rate

The Utah Department of Health (UDOH) continues to partner with the University of Utah Department of Maternal and Fetal Medicine to better identify cesarean section practices in Utah. Specific recommendations are being developed with respect to current practices.

The Institute for Healthcare Improvement of Boston and the Medical Leadership Council of Washington, D.C., offer information, reports, and programs to hospitals on how to reduce cesareans. In 1996, the Council published "Coming to Term: Innovations in Safely Reducing Cesarean Rates." The key eight practices for safely reducing cesarean rates are listed below.⁴²

- Physician profiling, wherein individual physicians receive report cards enabling them to compare their own cesarean rates with regional or national rates and standards.
- Aligning financial incentives, by which the choice of delivery method is made "revenue neutral."
- Trial of labor after prior cesarean for women meeting appropriate criteria.
- Guidelines for dystocia that give diagnostic criteria for cesareans indicated by failure to progress.
- Patient demand management, by which patient expectations and preferences for labor and delivery are discussed "well before labor starts."
- Appropriate epidural use, specifying dosage and timing, and promoting alternative pain relief measures.
- Dedicated inpatient obstetrician, who is on call for 24 hours inside the hospital.
- One-to-one coverage throughout labor, using a professional birth attendant, to provide continuous labor support.

The Institute for Healthcare Improvement has organized a "Breakthrough Series" which are collaborative projects with hospitals to reduce cesarean rates while maintaining maternal and fetal outcomes.⁴³ The main points of the project are shown below.

- Preventing cesareans for failed induction of labor
- Avoiding hospital admissions for false labor
- Managing pain more effectively to help women tolerate labor
- Expecting a trial of labor (after a previous cesarean)
- Enlisting nursing input in labor support



The Reproductive Health Program, Office of Health Care Statistics, and Health Data Committee recently developed a consumer and provider-oriented brochure "Utah Hospital Maternity and Newborn Guide" that lists hospital characteristics, cesarean rate, and charges for vaginal and cesarean delivery. Expectant mothers are encouraged to ask their health care provider questions about the appropriate birth methods.

The Maternal and Child Health Bureau at the UDOH is collaborating with the Utah Hospital Association regarding hospital specific VBAC rates and their policies.

Health care providers represented in the Cesarean Report Advisory Committee reported that in their respective facilities they continually evaluate cesarean rates at the departmental meetings. The results are used to formulate action plans to reduce cesarean delivery rates.

The UDOH continues to fulfill public health core functions of assessment by collecting, analyzing and disseminating information regarding the health status of the population. Ultimately these activities will lead to improved health for Utah residents.

References

1. Lagrew, D.C., & Adashek J.A. (1998). Lowering the cesarean section rate in a private hospital: Comparison of individual physicians' rates, risk factors, and outcomes. *American Journal of Obstetrics and Gynecology*, 178, 1207-1214.
2. Parrish, K.M., Holt, V.L., Connell, F.A., Williams, B., & LoGerfo, J.P. (1993). Variations in the accuracy of obstetric procedures and diagnoses on birth records in Washington state, 1989. *American Journal of Epidemiology*, 138, 119-127.
3. Gordon, D., Milberg, J., Daling, J., & Hickok, D. (1991). Advanced maternal age as a risk factor for cesarean delivery. *Obstetrics and Gynecology*, 77, 493-497.
4. Health Grades, Inc. (2003). First time preplanned and "patient choice" cesarean section rates in the United States. Retrieved from <http://www.healthgrades.com>.
5. Hannah, P., Adams, D., Lee, A., Glover, V., & Sandler, M. (1992). Links between early post-partum mood and post-natal depression. *The British Journal of Psychiatry*, 160, 777-780.
6. DiMatteo, M.R., Morton, S.C., Lepper, H.S., Damush, T.M., Carney, M.F., Pearson, M., & Kathn, K.L. (1996). Cesaerean childbirth and psychosocial outcomes: a meta-analysis. *Health Psychology*, 15, 303-314.
7. Martin, J.A., Hamilton, B.E., Sutton, P.D., Ventura, S.J., Menacker, F., & Munson, M.L. (2003). Births: Final Data for 2002. *National Vital Statistics Report*, 52, no.10, 1-114.
8. Arnot, R.B. (1993). Cesarean sections.Of the million done each year, fully half aren't needed. *Good Housekeeping*, 216, 120, 122-124.
9. Shelton, D.L. C-sections increasing as doctors, patients re-evaluate the risks. *American Medical News*. 9 Oct 2000. www.ama-assn.org/sci-pubs/amnews/pick_00/hll11009.htm.
10. Sachs, B.P., Kobelin, C., Castro, M.A., & Frigoletto, F. (1999). The risks of lowering the cesarean-delivery rate. *The New England Journal of Medicine*, 340, 54-57.
11. Anderson, G.M., & Lomas, J. (1984). Determinants of the increasing cesarean birth rate. *New England Journal of Medicine*, 311, 887-892.
12. Saisto, T., et al. (1999). Factors associated with fear of delivery in second pregnancies. *Obstetrics and Gynecology*, 94, 679-682.
13. American College of Obstetricians and Gynecologists. Evaluation of cesarean delivery. Task Force on Cesarean Delivery Rates. Washington, DC: American College of Obstetricians and Gynecologists, 2000.
14. Hueston, W.J., McClafflin, R.R., & Claire, E. (1996). Variations in cesarean delivery for fetal distress. *Journal of Family Practice*, 43, 461-467.
15. Menacker, F., & Curtin, S.C. (2001). Trends in cesarean birth and vaginal birth after previous cesarean, 1191-1999. *National Vital Statistics Report*, 49, 1-16.
16. Woolbright, L.A. (1996). Why is the cesarean delivery rate so high in Alabama? An examination of risk factors, 1991-1993. *Birth*, 23, 20-25.

17. Kozinszky, Z., Orvos, H., Zoboki, T., Katona, M., Wayda, K., Pal, A., & Kovacs, L. (2002). Risk factors for cesarean section of primiparous women aged over 35 years. *Acta Obstetrica et Gynecologica Scandinavica*, 81, 313-316.
18. Main, E.K. (1999). Reducing cesarean birth rates with data-driven quality improvement activities. *Pediatrics*, 103, 374-383.
19. Poma, P.A. (1999). Correlation of birth weights with cesarean rates. *International Journal of Gynecology and Obstetrics*, 65, 117-123.
20. Castro, L.C., & Avina, R.L. (2002). Maternal obesity and pregnancy outcomes. *Current Opinion in Obstetrics & Gynecology*, 14, 601-606.
21. Belizan, J.M. (1999). Rates and implications of cesarean sections in Latin America: ecological study. *British Medical Journal*. Retrieved from http://www.findarticles.com/cf_dls/m0999/7222_319/58358818/print.jhtml.
22. Castro, A. (1999). Commentary: increase in cesarean sections may reflect medical control not woman's choice. *British Medical Journal*. Retrieved from http://www.findarticles.com/cf_dls/m0999/7222_319/58358818/print.jhtml.
23. Zhang, J., Bowes, W.A. Jr., & Fortney, J.A. (1993). Efficacy of external cephalic version: a review. *Obstetrics and Gynecology*, 82, 306-312.
24. Danielsen, B., & Castles, A.G. (1999). Risk-adjusted cesarean section rates for California hospitals 1995 to 1997. Pacific Business Group on Health, California Perinatal Quality of Care Collaborative.
25. Gregory, K.D., Korst, L.M., Gornbein, J.A., & Platt, L.D. (2002). Using administrative data to identify indicators for elective primary cesarean delivery. *Health Services Research*, 37, 1387-1401.
26. Gonen, R., Tamir, A., & Degani, S. (2002). Obstetricians' opinions regarding patient choice in cesarean delivery. *Obstetrics and Gynecology*, 99, 577-80.
27. Minkoff, H., & Chervenak, F.A. (2003). Elective primary cesarean delivery. *New England Journal of Medicine*, 348, 946-950.
28. Bernstein, P. (2003). Elective cesarean section: an acceptable alternative to vaginal delivery? *Medscape Ob/Gyn & Women's Health*, 7. Retrieved from ICAN, <http://www.ican-online.org>.
29. Cesarean Fact Sheet. Retrieved from <http://www.childbirth.org>.
30. Lieberman, E., Long, J.M., Heffner, L.J., & Cohen, A. (1998). Assessing the role of case mix in cesarean delivery rates. *Obstetrics and Gynecology*, 92, 1-7.
31. Roberts, R.G., Bell, H.S., Wall, E.M., Moy, J.G., Hess, G.H., & Bower, H.P.H. (1997). Trial of labor or repeated cesarean section. The woman's choice. *Archives of Family Medicine*, 6, 120-125.
32. Rosen, M.G., Dickinson, J.C., & Westhoff, C.L. (1991). Vaginal birth after cesarean: a meta-analysis of morbidity and mortality. *Journal of Obstetrics and Gynecology*, 77, 465-470.

33. Gregory, K.D., Korst, L.M., Cane, P., Platt, L.D., & Kahn, K. (1999). Vaginal birth after cesarean and uterine rupture rates in California, *Obstetrics and Gynecology*, 94, 985-989.
34. Caughey, A.B., & Mann, S. (2002). Vaginal birth after cesarean delivery. Retrieved from <http://www.emedicine.com>.
35. Chavez, G.F., Takahashi, E., & Gregory, K.D. (2002). Vaginal birth after cesarean birth, California, 1996-2000. *Morbidity and Mortality Weekly Report*, 51 (44), 996-998.
36. Dunsmoor-su, R., Sammel, M., Stevens, E., Peipert, J.L., & Macones, G. (2003). Impact of sociodemographic and hospital factors on attempts at vaginal birth after cesarean delivery. *Obstetrics and Gynecology*, 102, 1358-1365.
37. Robson, M.S. (2001). Classification of Cesarean Sections. *Fetal and Maternal Medicine Review*, 12, 23-39.
38. Varner, M. (2003). Toward optimal cesarean delivery rates. Unpublished grant application for 2003-2004 Warren H. Pearse/Wyeth Pharmaceuticals Women's Health Policy Research Award. University of Utah Medical Center.
39. Center for Health Data. (2002). Indicator-based information system (IBIS) for public health. Salt Lake City, UT: Utah Department of Health. Retrieved from <http://www.health.utah.gov/ibis-ph>.
40. Lydon-Rochelle, M., Holt, V.L., Martin, D.P., & Easterling, T.R. (2000). Association between method of delivery and maternal rehospitalization. *Journal of the American Medical Association*, 283, 2411-2416.
41. C-section deliveries in Pennsylvania, 1999. Pennsylvania Department of Health. Bureau of Health Statistics. 1999.
- Retrieved from:
<http://www.phc4.org/reports/csect99/Hospcom/adobe/csect99.pdf>.
42. Young, D. (1997). A new push to reduce cesareans in the United States. *Birth*, 24, 1-3.
43. Flamm, B.I., Berwick, D.M., & Katcenell, A. (1998). Reducing cesarean section rates safely: lessons from a "Breathtaking Series" collaborative. *Birth*, 25, 117-124.

APPENDIX

Table A: Cesarean Rates and Vaginal Births After Cesarean (VBAC) Rates, Utah, 1992-2002

Year	Total Births	Vaginal Births		Number of Births by Cesarean Delivery			Cesarean Delivery Rate			Rate of VBAC ⁴
		Total	VBAC	Total	Primary	Repeat	Total ¹	Primary ²	Repeat ³	
1992	37198	29859	918	6456	3724	2732	17.4	11.1	74.8	25.2
1993	37048	29500	1038	6460	3744	2716	17.4	11.3	72.3	27.7
1994	38271	30872	1083	6289	3640	2649	16.4	10.6	71.0	29.0
1995	39554	31960	1145	6478	3856	2623	16.4	10.8	69.6	30.4
1996	42033	33927	1433	6690	3979	2711	15.9	10.5	65.4	34.6
1997	43008	34811	1410	6773	3944	2829	15.8	10.2	66.7	33.3
1998	45129	36393	1516	7209	4235	2974	16.0	10.4	66.2	33.8
1999	46243	37170	1686	7377	4326	3051	16.0	10.4	64.4	35.6
2000	47331	37662	1702	7959	4627	3332	16.8	10.9	66.2	33.8
2001	47915	38195	1460	8252	4696	3556	17.2	10.9	71.0	29.1
2002	49140	38405	1299	9433	5316	4117	19.2	12.2	76.0	24.0

1 Rate per 100 live births.

2 Rate per 100 live births to women who have not had a previous cesarean.

3 Rate per 100 live births to women who have had a previous cesarean.

4 Rate per 100 live births to women with a previous cesarean delivery.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table B: Cesarean (overall, primary, and repeat) and VBAC Rates by Hospitals, Utah, 1992-2002

Hospital Name*	Total Number of Births	Total Number of Cesareans	Overall Cesarean Rate ¹	Total Number of Primary Cesareans	Primary Cesarean Rate ²	Total Number of Repeat Cesareans	Repeat Cesarean Rate ³	Total Number of VBAC	VBAC Rate ⁴
State Data	472870	79376	16.78	46087	10.85	33290	69.38	14690	30.6
Allen Memorial	877	150	17.10	100	12.48	50	65.79	26	34.21
Alta View	19085	3038	15.92	1615	9.40	1423	74.35	491	25.65
American Fork	23726	3050	12.86	1750	8.13	1300	59.22	895	40.77
Bear River	795	148	18.62	83	11.64	65	79.27	17	20.73
Beaver Valley	1026	254	24.76	139	15.90	115	75.66	37	24.34
Brigham City	4885	890	18.22	429	10.16	461	69.64	201	30.36
Castleview	4160	713	17.14	462	12.10	251	73.39	91	26.61
Central Valley	919	205	22.31	112	14.03	93	76.86	28	23.14
Columbia Ashley Valley	2757	384	13.93	201	8.12	183	65.12	98	34.88
Columbia Ogden Regional	20063	3445	17.17	2068	11.32	1377	76.50	423	23.50
Columbia St. Marks	29466	5895	20.01	3672	13.75	2223	80.34	544	19.66
Cottonwood	35450	6027	17.00	3155	10.04	2873	71.15	1165	28.85
Davis	19355	3769	19.47	2240	12.86	1499	77.35	439	22.65
Delta Community	1123	224	19.95	135	14.18	89	52.05	82	47.95
Dixie Regional	16156	3104	19.21	1737	12.25	1367	69.04	613	30.96
Fillmore Community	553	96	17.36	52	10.72	44	64.70	24	35.29
Garfield Memorial	432	99	22.92	54	14.36	45	80.36	11	19.64
Gunnison	2035	523	25.70	265	15.58	258	77.24	76	22.75
Kane County	381	80	21.00	46	13.77	34	72.34	13	27.66
Lakeview	7764	1650	21.25	826	12.27	824	79.77	209	20.23
LDS	44239	7918	17.90	4673	11.84	3245	68.00	1527	32.00
Logan Regional	22155	2854	12.88	1767	8.61	1087	66.16	556	33.84
McKay Dee	31369	5911	18.84	3327	12.05	2584	68.52	1187	31.48
Milford Valley	292	49	16.78	37	14.07	12	41.38	17	58.62
Mountain View	12098	1693	13.99	873	8.00	820	69.02	368	30.98
Orem Community	11479	1816	15.82	1063	10.22	753	69.59	329	30.41
PHC Jordan Valley	14810	1883	12.71	1000	7.48	883	61.32	557	38.68
Pioneer Valley	8830	1580	17.89	861	10.93	719	75.45	234	24.55
Salt Lake Regional	20257	3011	14.86	1877	10.15	1134	63.99	638	36.00
San Juan	550	145	26.36	84	17.83	61	77.21	18	22.78
Sanpete Valley	1355	247	18.23	160	13.03	87	68.50	40	31.50
Sevier Valley	2478	454	18.32	271	12.11	183	76.25	57	23.75
Timpanogos Regional	4627	576	12.45	316	7.43	260	68.96	117	31.03
Tooele Valley	1566	288	18.39	185	13.05	103	69.13	46	30.87
University of Utah	30024	6116	20.37	3990	14.98	2126	62.55	1273	37.45
Uintah Basin	4408	1140	25.86	640	17.08	500	75.53	162	24.47
Utah Valley Regional	45124	7205	15.97	4184	10.24	3021	70.95	1237	29.05
Valley View	5796	959	16.55	521	10.13	438	69.97	188	30.03
Wasatch County	1736	381	21.95	231	15.02	150	75.76	48	24.24

1 Rate per 100 live births.

2 Rate per 100 live births to women who have not had a previous cesarean.

3 Rate per 100 live births to women who have had a previous cesarean.

4 Rate per 100 live births to women with a previous cesarean.

* Not all hospitals are listed due to closure and lack of adequate data. Also does not include births that took place in birthing centers, home or other government facilities.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-200

Table C: Overall Cesarean Rates by Maternal County of Residence, Utah, 1992-2002

County	Total Number of Births	Total Number of Cesareans	Overall Cesarean Rate*
Beaver	1206	279	23.13
Box Elder	8127	1495	18.40
Cache	22219	2978	13.40
Carbon	3372	625	18.54
Daggett	108	15	13.89
Davis	49117	9129	18.59
Duchesne	2933	385	13.13
Emery	1853	294	15.87
Garfield	738	160	21.68
Grand	1221	228	18.67
Iron	7163	1255	17.52
Juab	1691	272	16.09
Kane	917	190	20.72
Millard	2129	421	19.77
Morgan	1075	168	15.63
Piute	204	60	29.41
Rich	266	32	12.03
Salt Lake	184868	31211	16.88
San Juan	2965	440	14.84
Sanpete	3872	821	21.20
Sevier	3339	711	21.29
Summit	4373	821	18.77
Tooele	7879	1293	16.41
Uintah	4821	973	20.18
Utah	96451	13950	14.46
Wasatch	2836	581	20.49
Washington	16870	2882	17.08
Wayne	428	98	22.90
Weber	39852	7309	18.34

* Rate per 100 live births.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table D: Overall and Primary Cesarean Rates by Maternal Age Category, Utah, 1992-2002

	Year										
Maternal Age (yrs)											
Overall Cesarean *	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
< 20	14.1	13.6	12.8	12.3	12.3	12.1	12.4	12.0	12.7	14.3	15.4
20-24	15.3	15.5	14.4	14.4	13.7	13.8	13.7	13.2	14.2	14.6	16.4
25-29	17.6	17.7	16.9	16.5	16.1	15.3	15.6	15.9	16.8	16.8	18.4
30-34	19.9	20.2	18.5	19.4	18.3	19.0	18.8	19.4	20.0	19.8	22.9
≥ 35	21.5	22.0	21.6	21.3	22.5	22.0	23.6	23.4	24.2	25.5	28.0
Primary Cesarean**											
< 20	12.6	12.4	12.0	11.4	11.4	10.8	11.3	11.0	11.8	12.8	13.9
20-24	11.3	11.5	10.9	10.9	10.6	10.7	10.5	10.0	10.8	11.1	12.2
25-29	10.2	10.5	9.6	10.0	10.1	9.2	9.5	10.1	10.5	9.8	10.7
30-34	10.4	11.0	9.6	10.6	9.2	9.6	10.1	10.1	10.3	10.4	12.1
≥ 35	12.5	11.8	12.3	12.1	13.0	11.8	13.1	13.5	13.5	13.9	16.3

* Rate per 100 live births.

** Rate per 100 live births to women who have not had a previous cesarean.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table E: Overall and Primary Cesarean Rates by Maternal Race and Ethnicity, Utah, 1992-2002

	Year										
Overall Cesarean Rate*	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Race											
White	17.4	17.5	16.4	16.3	15.9	15.7	15.9	15.9	16.7	17.1	19.0
African American/Black	21.0	22.4	21.2	20.1	23.1	19.0	23.7	20.9	20.8	19.6	27.5
Native American	18.4	17.7	14.7	17.8	17.8	15.9	18.1	16.8	18.2	18.9	23.0
Asian/Pacific Islander	16.6	14.8	16.0	15.9	14.5	15.5	15.0	15.8	17.3	18.5	20.5
Other/Unknown	13.2	10.0	14.4	13.7	15.4	12.5	15.0	14.7	16.5	15.6	19.8
Ethnicity											
Hispanic	19.3	19.2	18.7	17.4	17.4	17.1	16.4	17.7	19.0	20.5	22.3
Non-Hispanic	17.2	17.3	16.3	16.3	15.7	15.6	15.9	15.7	16.5	16.7	18.7
Primary Cesarean Rate**											
Race											
White	11.0	11.2	10.5	10.7	10.4	10.1	10.4	10.4	10.9	10.9	12.0
African American/Black	15.7	16.2	13.9	12.5	17.4	12.6	15.9	14.6	15.9	11.9	18.8
Native American	10.9	10.7	8.4	11.0	12.2	9.6	12.4	11.9	11.5	12.3	15.5
Asian/Pacific Islander	12.0	11.1	11.3	11.2	9.5	10.8	10.5	10.7	11.4	11.6	12.9
Other/Unknown	12.2	5.8	11.7	9.3	10.9	8.3	9.7	9.4	10.0	9.6	11.0
Ethnicity											
Hispanic	12.5	13.2	11.6	11.2	11.8	10.8	10.6	11.1	12.2	12.6	13.0
Non-Hispanic	11.0	11.1	10.5	10.7	10.3	10.1	10.4	10.3	10.8	10.7	12.0

* Rate per 100 live births.

** Rate per 100 live births to women who have not had a previous cesarean.

Shaded rates indicate unstable rates due to small numbers present in the specific category. Care should be utilized when applying these specific rates.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table F: Cesarean Rates by Selected Medical Risk Factors and Labor Complications by Each Year, Utah, 1992-2002

	Year of birth											Percent Change between 1992-1997	Percent Change between 1997-2002
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002		
Overall State Cesarean Rate*	17.4	17.4	16.4	16.4	15.9	15.7	16.0	16.0	16.8	17.2	19.2		
Medical Risk Factors													
Anemia	22.4	16.8	19.8	19.1	20.5	17.1	16.4	16.9	19.9	19.1	22.2	-24	30
Cardiac Disease	19.5	18.9	15.1	17.5	23.1	20.1	20.9	23.1	21.8	17.7	24.5	3	22
Chronic or acute lung disease	25.9	27.7	30.2	22.9	20.3	20.5	17.8	17.1	22.1	22.8	22.9	-21	12
Diabetes	32.0	31.7	30.9	30.1	35.6	28.2	33.7	32.0	31.0	32.2	36.3	-12	29
Eclampsia	47.6	40.5	36.9	51.1	52.2	45.5	38.3	50.0	45.6	43.6	49.6	-4	9
Genital Herpes	43.9	41.3	34.7	42.6	29.6	32.9	34.7	33.6	32.5	29.4	35.4	-25	8
Hypertension, chronic	35.6	44.6	29.9	38.0	34.8	34.9	34.3	36.6	37.9	37.1	39.7	-2	14
Hypertension, pregnancy assoc.	34.4	33.6	31.4	31.3	29.0	28.7	30.1	27.5	30.8	30.0	34.8	-17	21
Incompetent cervix	37.8	48.7	41.1	34.9	34.1	35.3	32.9	35.1	35.9	40.6	35.7	-7	1
Polyhydramnios/Oligohydramnios	39.9	42.0	40.0	34.3	32.7	33.2	33.8	32.4	33.3	31.8	34.0	-17	2
Renal disease	27.8	30.6	23.1	16.0	24.1	20.6	19.3	21.4	22.0	21.8	22.2	-26	8
Rh sensitization	19.9	17.5	18.0	18.8	17.2	13.6	16.7	17.5	17.1	16.9	38.7	-32	185
Uterine bleeding	27.9	26.4	26.5	26.5	25.8	24.2	21.2	24.7	22.7	22.4	28.0	-13	16
Complications of Labor/Delivery													
Abruptio placenta	41.2	42.3	45.6	41.7	39.8	40.0	41.0	40.3	37.4	32.8	41.4	-3	4
Breech/Malpresentation	76.9	77.2	76.2	83.7	80.2	74.4	75.7	69.9	68.8	66.5	69.2	-3	-7
Cephalopelvic disproportion	98.6	97.5	96.7	97.6	96.8	95.3	96.8	96.2	95.2	96.7	95.3	-3	0
Cord prolapsed	70.0	66.3	48.4	51.8	46.8	79.2	67.0	65.4	68.1	68.1	72.9	13	-8
Dysfunctional labor	54.1	52.2	56.9	64.1	56.1	57.3	58.5	45.3	67.7	69.0	76.0	6	33
Febrile	27.3	22.5	24.2	23.8	20.8	18.1	20.6	19.7	20.4	19.8	19.5	-34	8
Fetal distress	53.8	55.0	47.5	47.7	47.4	52.3	53.2	40.4	40.4	53.3	58.6	-3	12
Meconium, moderate/heavy	17.8	17.8	17.3	18.0	14.1	14.5	16.0	14.2	15.3	16.4	17.9	-19	23
Placenta previa	78.5	86.8	78.2	63.3	67.4	71.0	70.5	72.2	70.2	65.1	73.9	-10	4
Premature rupture of membrane	26.5	27.2	25.0	24.9	25.9	27.4	29.0	27.6	33.7	29.0	35.3	3	29
Prolonged labor (>20hours)	44.3	31.0	25.3	29.5	24.7	22.1	25.8	29.4	29.4	26.3	31.6	-50	43

* Rate per 100 live births.

Shaded rates indicate unstable rates due to small numbers present in the specific category. Care should be utilized when applying these specific rates.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table G: Cesarean Rates among Low-Risk Women (HP 2010) by Hospitals, Utah, 1998-2002

Hospital Name***	Total Number of Primary Cesareans among Low-Risk Women	Primary Cesarean Rate among Low-Risk Women*	Total Number of Repeat Cesareans among Low-Risk Women	Repeat Cesarean Rate among Low-Risk Women**
Allen Memorial	21	13.82	29	59.18
Alta View	311	11.10	554	73.18
American Fork	448	11.77	590	52.77
Bear River	31	26.50	27	75.00
Beaver Valley	34	24.64	48	71.64
Brigham City	84	14.12	156	68.72
Castleview	127	18.98	110	78.01
Central Valley	24	20.69	45	72.58
Columbia Ashley Valley	28	8.48	63	49.22
Columbia Ogden Regional	325	12.15	633	73.86
Columbia St. Marks	1003	19.39	938	79.76
Cottonwood	732	14.26	1172	69.64
Davis	545	16.84	673	70.62
Delta Community	22	20.18	40	51.28
Dixie Regional	253	11.27	593	65.74
Fillmore Community	8	13.33	15	62.50
Garfield Memorial	4	11.43	13	100.00
Gunnison	52	17.45	115	78.23
Kane County	9	19.57	9	69.23
Lakeview	128	15.31	255	76.12
LDS	748	11.21	1176	63.95
Logan Regional	406	10.76	506	69.22
McKay Dee	715	15.40	1131	71.49
Milford Valley	10	19.61	9	40.91
Mountain View	140	10.83	259	65.40
Orem Community	305	13.70	378	71.46
PHC Jordan Valley	238	9.15	472	65.10
Pioneer Valley	125	11.50	291	75.39
Salt Lake Regional	437	13.98	419	60.20
San Juan	13	33.33	11	61.11
Sanpete Valley	34	18.89	46	63.01
Sevier Valley	36	10.98	75	65.22
Timpanogos Regional	138	9.01	230	68.86
Tooele Valley	51	19.47	41	61.19
U of U	778	15.50	899	59.97
Uintah Basin	119	20.70	180	68.44
Utah Valley Regional	634	9.00	1082	63.28
Valley View	84	7.99	153	60.47
Wasatch County	77	23.91	81	72.97

* Rate per 100 births to low-risk women who have not had a previous cesarean. Low-risk women are defined by DHHS HP 2010 as nulliparous women (giving birth for the first time) having singleton babies at 37 weeks or more with a vertex fetus.

** Rate per 100 births to low-risk women with a previous cesarean. Low-risk women in this group are defined by DHHS HP 2010 as multiparous women having singleton babies at 37 weeks or more with a vertex fetus.

*** Not all hospitals are listed due to closure and lack of adequate data.

Shaded rates indicate unstable rates due to small numbers present in the specific category. Care should be utilized when applying these specific rates.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1998-2002

Table H: VBAC Rates by Maternal Characteristics, Utah, 1992-2002

Maternal Characteristics	VBAC Rate*										
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Age Group (yrs)											
< 20	28.6	30.1	37.1	42.2	37.9	34.3	43.6	39.8	39.5	27.3	13.2
20-24	27.6	29.5	31.3	31.2	36.1	37.6	36.3	37.0	34.7	26.9	21.5
25-29	26.0	29.4	27.3	31.2	37.0	35.9	35.0	36.6	34.6	30.1	24.0
30-34	23.8	26.2	29.2	29.7	33.0	30.0	30.9	35.1	32.6	30.8	19.6
≥ 35	21.2	23.0	28.8	26.8	29.5	27.9	31.5	31.9	32.9	26.7	26.4
Race											
White	24.8	27.3	29.0	30.1	34.3	33.1	33.6	35.6	33.7	29.1	24.3
African American/Black	37.0	12.5	25.7	35.3	27.3	24.0	33.3	30.0	34.4	21.1	19.1
Native American	28.3	33.3	28.1	27.9	44.3	41.2	40.0	39.7	40.0	30.6	21.5
Asian/Pacific Islander	31.9	41.3	30.0	36.7	38.4	35.5	35.6	35.2	34.2	31.0	16.2
Other/Unknown	83.3	84.2	50.0	50.0	39.3	36.6	34.2	41.7	30.0	28.8	21.3
Ethnicity											
Hispanic	23.9	31.3	27.8	32.6	34.3	36.4	37.3	35.8	37.5	29.6	23.9
Non-Hispanic	25.2	27.4	29.1	30.2	37.1	32.8	33.3	34.5	33.1	29.0	24.0

* Rate per 100 live births to women with a previous cesarean delivery.

Shaded rates indicate unstable rates due to small numbers present in the specific category. Care should be utilized when applying these specific rates.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

Table I: Cesarean Rates by Robson Criteria by Year, Utah, 1998-2001

Category	Description	Cesarean Rate*			
		1998	1999	2000	2001
1	Nullipara, ≥ 37 weeks, vertex presentation, spontaneous labor	12.1	12.7	13.3	14.4
2	Nullipara, ≥ 37 weeks, vertex presentation, induced labor	14.0	13.2	13.7	14.6
3	Multipara, NO previous cesarean, ≥ 37 weeks, vertex presentation, spontaneous labor	3.3	4.0	3.9	4.1
4	Multipara, NO previous cesarean, ≥ 37 weeks, vertex presentation, induced labor	1.9	1.5	1.8	1.6
5	Multipara, previous cesarean, vertex presentation	59.3	59.1	63.6	68.9
6	Nullipara, term singleton breech presentation	94.0	95.9	96.1	96.3
7	Multipara, term singleton breech presentation	93.0	88.7	92.1	93.0
8	Multiple gestation (with or without previous cesarean)	55.1	55.8	59.5	52.6
9	Singleton pregnancy, oblique or transverse lie (excluding breech)	32.4	36.3	36.4	53.2
10	Singleton cephalic pregnancy, < 37 weeks (including previous cesarean)	18.9	23.2	24.1	22.4

* Rate per 100 live births

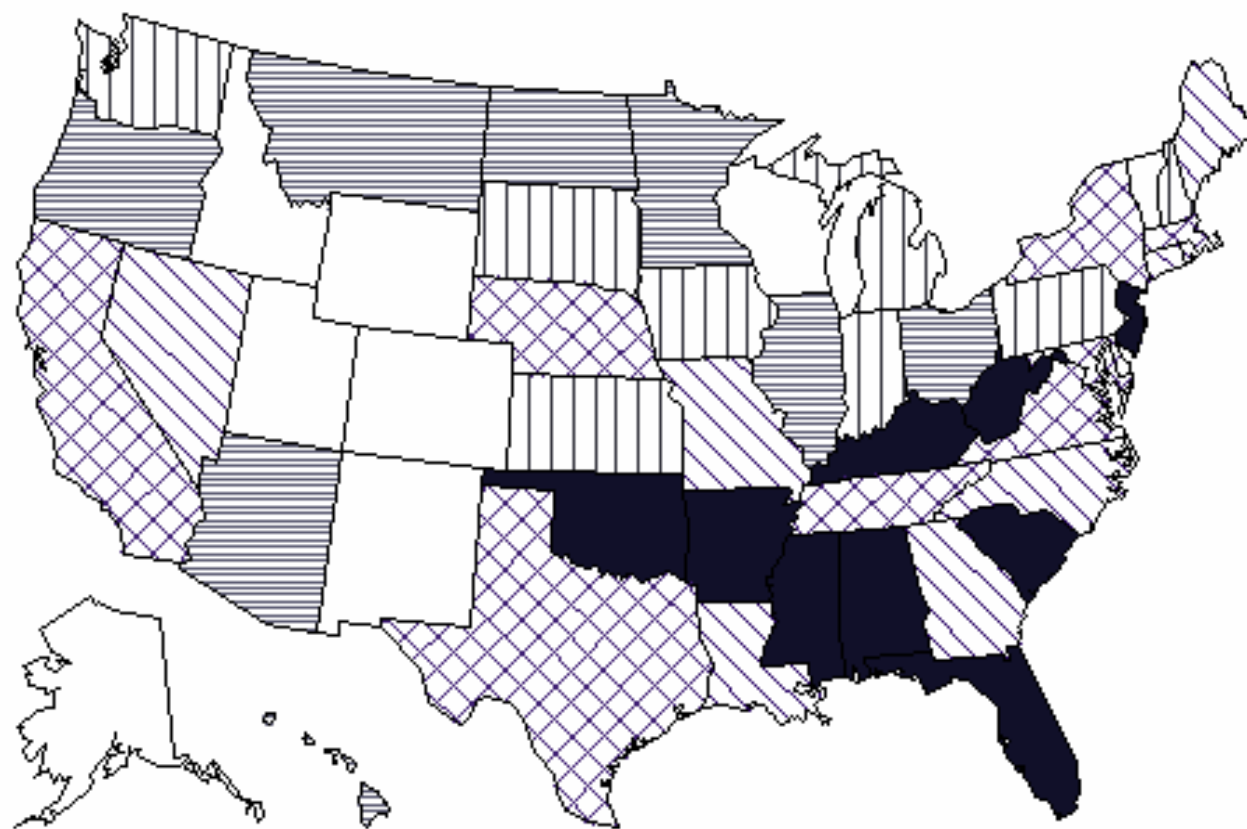
Data Source: Linked Utah Birth and Hospital Discharge Data, 1998-2001, Utah Office of Health Care Statistics

Table J: Average Hospital Length of Stay and Hospital Charges, Utah, 1992-2002

Year	Number of Deliveries			Average Length of Stay (days)			Average Hospital Charges (dollars)		
	Cesarean w/comp	Cesarean w/o comp	Other deliveries	Cesarean w/comp	Cesarean w/o comp	Other deliveries	Cesarean w/comp	Cesarean w/o comp	Other deliveries
1992	1241	4804	28276	4.6	3.4	1.7	5181	3835	2015
1993	1316	4832	28612	4.5	3.3	1.6	5459	4050	2136
1994	1250	4524	29982	4.3	3.1	1.5	5739	4135	2208
1995	1358	4932	31335	4.0	3.0	1.4	6117	4296	2377
1996	1465	4943	33495	4.3	3.0	1.4	6678	4597	2477
1997	1608	4795	33818	4.1	3.1	1.5	6703	4985	2631
1998	1518	5321	36046	4.4	3.3	1.8	7289	5314	2923
1999	1520	5561	37258	4.6	3.4	1.8	8233	5852	3182
2000	1539	5980	37883	4.6	3.4	1.8	8460	5973	3273
2001	1508	6344	38138	4.5	3.5	1.8	8553	6097	3466
2002	1885	7282	39238	4.6	3.4	1.8	9095	6313	3692
1992-2002	16208	59318	374081	4.4	3.3	1.7	7197	5165	2831

Data Source: Utah Hospital Inpatient Discharge Database, 1992-2002, Utah Office of Health Care Statistics

Figure A: Total Cesarean Rates by State, United States, 2002

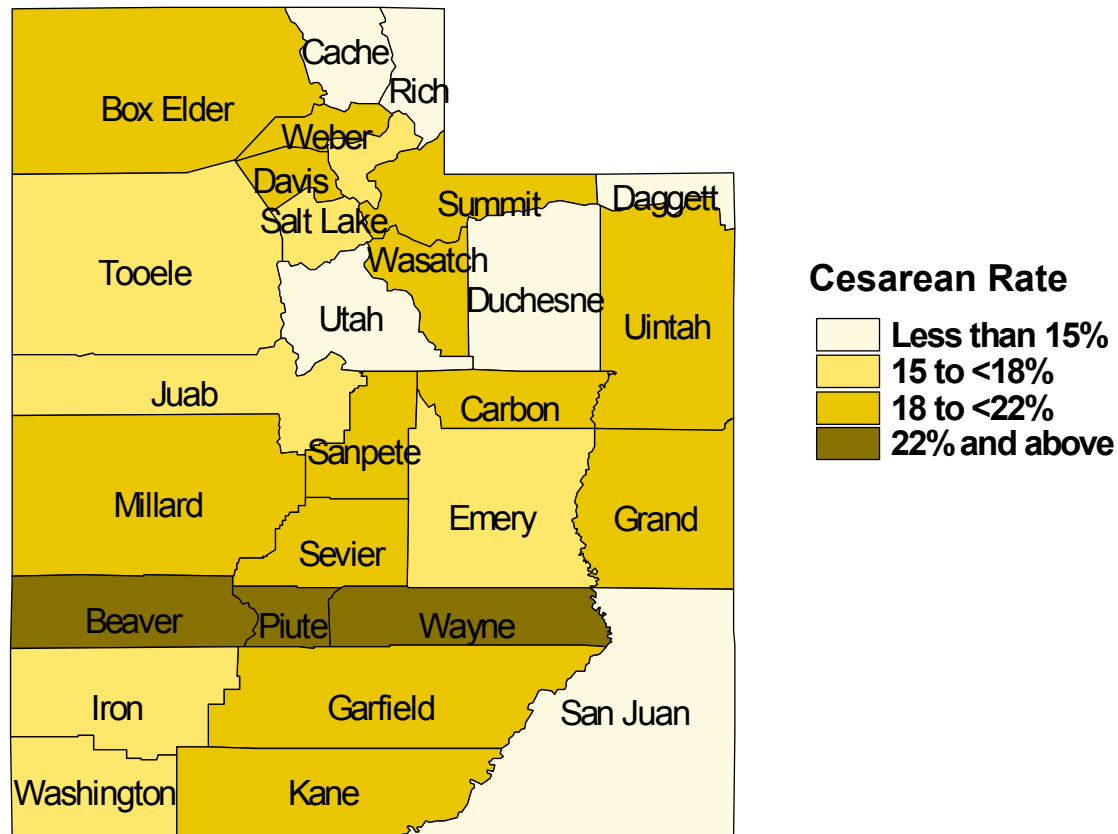


U.S. rate is 28.1 per 100 live births

Rate per 100	19.1 - 21.1	21.3 - 23.9	24.0 - 24.9
	25.7 - 26.5	26.7 - 28.0	28.1 - 31.1

Data Source: 2002 US Vital Statistics

Figure B: Utah Cesarean Rates by Maternal County of Residence, 1992-2002



Statewide cesarean rate for 1992-2002 was 16.9%.

Data Source: Utah Office of Vital Records and Statistics, Birth Certificate Data, 1992-2002

For more information regarding this report, you may contact:

Data Resources Program, Maternal and Child Health Bureau

Division of Community and Family Health Services

Utah Department of Health

P.O. Box 142001

Salt Lake City, Utah, 84114-2001

Phone: (801) 538-6916

Fax: (801) 538-6510

Office of Health Care Statistics

Center for Health Data

Utah Department of Health

P.O. Box 144004

Salt Lake City, Utah, 84114-4004

Phone: (801) 538-7048

Fax: (801) 538-9916

Other Resources Available

Healthy People 2010

www.healthypeople.gov

National Center for Health Statistics

www.cdc.gov/nchs

American College of Obstetricians
and Gynecologists (ACOG)

www.acog.org

International Cesarean Awareness
Network, Inc.

www.ican-online.org

Utah Department of Health

www.health.utah.gov

Utah Maternal and Child Health
Bureau

www.health.utah.gov/cfhs/mch

Utah Office of Health Care Statistics

www.health.utah.gov/hda

Utah Office of Public Health
Assessment

www.health.utah.gov/ibis-ph

Office of Vital Records and
Statistics

www.health.utah.gov/bvr/

This report is also available on the Internet at URL:

www.health.utah.gov/cfhs/mch/publications.html