

STATISTICAL BRIEF #71

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Hospitalizations Related to Childbirth, 2006

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Introduction

Hospitalizations related to childbirth comprise a large portion of U.S. hospital care. In 2006, the delivery of infants was the most common reason for hospitalization in U.S. community hospitals. During a woman's hospital stay for childbirth, a variety of procedures may be performed. Over the last decade, there has been a dramatic shift in the utilization of certain obstetric procedures, in part due to increases in medically elective Cesarean sections (C-sections).¹ Moreover, vaginal births after C-section (VBAC), which are associated with rare but serious complications including uterine scar rupture², have also declined in recent years and further contribute to the growing number of repeat C-sections performed.

These changes in the use of certain childbirth-related procedures have garnered media attention and stimulated interest in research on the safety, clinical outcomes, and economic implications of shifts in mode of delivery and utilization of obstetric procedures. While some studies have highlighted the maternal benefits of elective C-sections³, other research indicates that C-sections generally tend to be more costly than vaginal deliveries⁴ and are associated with higher rates of maternal rehospitalization and postpartum medical care utilization.^{5,6} Additionally, while the present brief focuses on the maternal impact, some research indicates potentially worse neonatal outcomes for C-section deliveries, including elevated risk of mortality.⁷ In light of the importance of childbirth-related hospitalizations in the healthcare system, it is important to better quantify and understand the impact of changing trends in hospital procedures for childbirth.

¹ Macdorman MF, Menacker F, Declercq E. Cesarean birth in the United States: epidemiology, trends, and outcomes. *Clinical Perinatology*, 2008; 35:293-307.

² Guise J, Berlin M, McDonagh M, Osterweil P, Chan B, Helfand M. Safety of vaginal birth after Cesarean: A systematic review. *American College of Obstetricians and Gynecologists*, 2004; 103(3):420-29.

³ National Institutes of Health. State-of-the-Science Conference Statement. Cesarean delivery on maternal request. *Obstetrics and Gynecology*, 2006; 107: 1386-97.

⁴ Zupancic JAF. The economics of elective Cesarean section. *Clinical Perinatology*, 2008; 35:591-99.

⁵ Lui T, Chen C, Lin H. Does elective Cesarean section increase utilization of postpartum maternal medical care? *Medical Care*, 2008; 46(4):440-43.

⁶ Declercq E, Barger M, Cabral HJ, Evans SR, Kotelchuck M, Simon C, Weiss J, Heffner LJ. Maternal outcomes associated with planned primary Cesarean section births compared with planned vaginal births. *Obstetrics and Gynecology*, 2007; 109(3):669-77.

⁷ MacDorman MF, Declercq E, Menacker F, Malloy MH. Neonatal mortality for primary cesarean and vaginal births to low-risk women: application of an "intention-to-treat" model. *Birth*, 2008; 35(1):3-8.

Highlights

- In 2006, there were 4.3 million childbirth-related hospitalizations of women totaling \$14.8 billion in hospital costs.
- Half of all maternal childbirth-related hospital stays were billed to private insurance (\$7.5 billion), while 42 percent were billed to Medicaid (\$6.3 billion).
- In 2006, 31.6 percent of childbirths were by C-section—a 51 percent increase from 1997, when 21.0 percent were C-section deliveries. In fact, C-sections were, overall, the most commonly performed operating room procedures in U.S. hospitals.
- The increase in C-section delivery was coupled with a decrease in the rate of VBACs, which fell to less than 10 percent of all deliveries in 2006.
- C-sections accounted for 34 percent of all privately insured births, but only 25 percent of uninsured births.
- Reflecting changing practice patterns, there was also a 37 percent decrease in the use of forceps and a 55 percent decrease in episiotomies.

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on childbirths occurring in U.S. community hospitals in 2006. All data are reported from the maternal perspective (i.e., reflecting the experience of the mother, not the newborn). Variations in the utilization and costs associated with childbirth-related hospitalizations are illustrated with a focused look at differences across mode of delivery and payer type. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Findings

In 2006, women experienced 4.3 million childbirths in U.S. community hospitals, making the delivery of infants the most common reason for hospitalization. Childbirth-related hospitalizations totaled \$14.8 billion in hospital costs.

Utilization characteristics of childbirth-related hospitalizations

Table 1 presents utilization, length of stay (LOS), and cost information for maternal hospitalizations associated with the delivery of infants in U.S. community hospitals by mode of delivery. The mean LOS for all deliveries was 2.6 days and ranged considerably from 2.1 days for vaginal deliveries without complications to 4.4 days for C-sections with complications.

On average, hospital deliveries cost \$3,500 per stay, but the mean cost per stay was highly variable depending on the mode of delivery. C-sections tended to be more costly than vaginal deliveries (\$4,500 versus \$2,600 without complications, and \$6,100 versus \$3,500 with complications, respectively). However, vaginal delivery with an operating room procedure had the highest average cost (\$6,900)—nearly double the cost per stay for all types of delivery (\$3,500). In total, vaginal deliveries accounted for 55 percent of annual hospital delivery costs (\$8.2 billion), and C-sections accounted for the remaining 45 percent (\$6.6 billion).

Utilization differences by payer

Table 2 displays the number of hospital stays, average LOS, and cost information for maternal hospitalizations associated with the delivery of infants by expected primary payer. Half of all maternal childbirth-related hospital stays were billed to private insurance (\$7.5 billion), while 42 percent were billed to Medicaid (\$6.3 billion). The remaining 8 percent was billed to uninsured individuals, “other” insurance plans, or Medicare.⁸ The duration and average cost were similar across all payer groups (LOS range 2.4–2.7 days; cost per stay range \$3,400–\$3,500), with the exception of Medicare, which averaged longer stays (3.1 days) and higher costs per stay (\$4,100).

Procedures commonly associated with childbirth-related hospitalizations

In 2006, the most common procedures performed in U.S. hospitals among females were related to childbirth and included those that assisted with the delivery of infants and C-sections, representing more than 3 million procedures combined. Table 3 lists the procedures commonly associated with hospital stays for childbirth. More than half of childbirth-related hospitalizations involved medical induction, manually assisted delivery, and other procedures to assist delivery. The second and third most common procedures overall were repair of current obstetric laceration and C-section, which were performed in 32.2 percent and 31.6 percent of childbirth-related hospitalizations, respectively. In fact, C-sections were, overall, the most commonly performed operating room procedures in U.S. hospitals in 2006. Other frequent procedures included artificial rupture of membranes to assist delivery (performed in 23.7 percent of all childbirths) and fetal monitoring (performed in 22.5 percent of all childbirths).

Utilization of specific obstetrical procedures: C-sections, vaginal birth after C-section (VBAC), episiotomies, and use of forceps

Of the 4.3 million childbirths that occurred in U.S. hospitals in 2006, nearly a third of cases (31.6 percent) were delivered via C-section—a 51 percent increase from 1997, when about a fifth of deliveries were performed via C-section (figure 1). However, as shown in figure 2, the rate of C-sections varied by payer.

⁸ Medicare provides health insurance for a limited number of individuals under the age of 65 who are disabled.

Private insurance had the highest percentage of C-sections (33.7 percent), while uninsured individuals had the lowest percentage (25.4 percent). C-sections accounted for 29.8 percent of childbirth-related hospitalizations billed to Medicaid.

Vaginal birth after C-section (VBAC) is the delivery of a newborn vaginally by a woman who has previously given birth via C-section. Figure 3 illustrates the changes in rates of VBACs compared with repeat C-sections from 1997 to 2006. In 2006, only 9.7 percent of childbirth-related hospitalizations among females with a previous C-section were VBACs, as compared with 35.3 percent in 1997—a 73 percent decline. In contrast, there was a 40 percent rise in the rate of repeat C-sections among females with a previous C-section, from 64.7 percent in 1997 to 90.3 percent in 2006.

Because of changing practice patterns⁹ and fewer vaginal births, the past decade has also seen a decline in certain procedures associated with vaginal births, such as episiotomies and use of forceps (figure 4). Episiotomy is a surgical incision made into the perineum—the region between the vagina and the anus—to widen the vaginal opening for delivery. Forceps are used to aid in the delivery of the fetus by applying traction to the fetal head. From 1996 to 2006, the use of forceps decreased by 37 percent, and there were 55 percent fewer episiotomies.

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2006 Nationwide Inpatient Sample (NIS). Historical data were drawn from the 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, and 2005 NIS.

Definitions

Procedures, ICD-9-CM, Clinical Classifications Software (CCS), and Diagnosis-Related Groups (DRGs)

The principal procedure is the procedure that was performed for definitive treatment rather than one performed for diagnostic or exploratory purposes (i.e., the procedure that was necessary to take care of a complication). If two procedures appear to meet this definition, the procedure most related to the principal diagnosis was selected as the principal procedure. All-listed procedures include all procedures performed during the hospital stay.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses and procedures. There are about 13,600 ICD-9-CM diagnosis codes and 3,500 ICD-9-CM procedure codes.

CCS categorizes ICD-9-CM procedure codes into a manageable number of clinically meaningful categories.¹⁰ This "clinical grouper" makes it easier to quickly understand patterns of procedure use.

DRGs comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. DRGs group patients according to diagnosis, type of treatment (procedures), age, and other relevant criteria. Each hospital stay has one DRG assigned to it.

Case Definition

For this report, the following codes were used to identify childbirth-related diagnoses and procedures:

- Childbirth-related hospitalization: DRG codes 370-375.
- Vaginal birth: DRG codes 372-375.
- C-section: CCS all-listed procedure code of 134 or DRG codes 370-371.

⁹ Recent practice guidelines from the American College of Obstetrics and Gynecology (ACOG) suggest that the best available data do not support the liberal or routine use of episiotomy (Practice Bulletin #71, April 2006).

¹⁰ HCUP CCS. Healthcare Cost and Utilization Project (HCUP). August 2006. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp.

- Previous C-section: ICD-9-CM all-listed diagnosis code of 654.20, 654.21, or 654.23.
- Episiotomy: CCS all-listed procedure code of 133.
- Use of forceps: CCS all-listed procedure code of 135.
- Artificial rupture of membranes to assist delivery: CCS all-listed procedure code of 136.
- Medical induction, manually assisted delivery, and other procedures to assist delivery: CCS all-listed procedure code of 137.
- Fetal monitoring: CCS all-listed procedure code of 139.
- Repair of current obstetric laceration: CCS all-listed procedure code of 140.

Types of hospitals included in HCUP

HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

Unit of analysis

The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate "discharge" from the hospital.

Costs and charges

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare and Medicaid Services (CMS).¹¹ Costs will tend to reflect the actual costs of production, while charges represent what the hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used because detailed charges are not available across all HCUP States. Hospital charges reflect the amount the hospital charged for the entire hospital stay and does not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Payer

Payer is the expected primary payer for the hospital stay. To make coding uniform across all HCUP data sources, payer combines detailed categories into more general groups:

- Medicare includes fee-for-service and managed care Medicare patients.
- Medicaid includes fee-for-service and managed care Medicaid patients. Patients covered by the State Children's Health Insurance Program (SCHIP) may be included here. Because most state data do not identify SCHIP patients specifically, it is not possible to present this information separately.
- Private insurance includes Blue Cross, commercial carriers, and private HMOs and PPOs.
- Other includes Worker's Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.
- Uninsured includes an insurance status of "self-pay" and "no charge."

When more than one payer is listed for a hospital discharge, the first-listed payer is used.

About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry

¹¹ HCUP Cost-to-Charge Ratio Files (CCR). Healthcare Cost and Utilization Project (HCUP). 2001–2005. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp.

Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning & Development
Colorado Hospital Association
Connecticut Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health
Indiana Health Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health and Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health and Family Services

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 90 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

For More Information

For more information about HCUP, visit www.hcup-us.ahrq.gov.

For additional HCUP statistics, visit HCUPnet, our interactive query system, at www.hcup.ahrq.gov.

For information on other hospitalizations in the U.S., download *HCUP Facts and Figures: Statistics on Hospital-based Care in the United States in 2006*, located at <http://www.hcup-us.ahrq.gov/reports.jsp>.

For a detailed description of HCUP, more information on the design of the NIS, and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

Introduction to the HCUP Nationwide Inpatient Sample, 2006. Online. May 14, 2008. U.S. Agency for Healthcare Research and Quality.

http://www.hcup-us.ahrq.gov/db/nation/nis/2006NIS_INTRODUCTION.pdf

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001*. HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality.

<http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf>

Houchens R.L., Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988–2004)*. HCUP Methods Series Report #2006-05. Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality.

http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.pdf

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

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Table 1. Utilization, length of stay, and cost information for maternal hospitalizations associated with the delivery of infants in U.S. community hospitals, by mode of delivery, 2006*

Type of delivery	Number of hospital stays	Mean length of stay	Mean cost per stay	Total cost
All types of delivery	4,258,800	2.6	\$3,500	\$14.8 billion
Vaginal delivery without complication	2,443,400	2.1	\$2,600	\$6.4 billion
Vaginal delivery with complication	346,000	2.7	\$3,500	\$1.2 billion
Vaginal delivery with sterilization &/or dilation and curettage (D&C)	122,300	2.4	\$4,400	\$536 million
Vaginal delivery with operating room procedure except sterilization and/or D&C	1,800	3.4	\$6,900	\$12 million
C-section without complication	1,012,400	3.3	\$4,500	\$4.6 billion
C-section with complication	332,800	4.4	\$6,100	\$2.0 billion

*Hospitalization for childbirth and delivery type identified by DRGs 370–375

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006

Table 2. Utilization, length of stay, and cost information for maternal hospitalizations associated with the delivery of infants in U.S. community hospitals, by payer type, 2006*

Payer	Number of hospital stays for childbirth	Mean length of stay	Mean cost per stay	Total cost
Medicare [†]	18,000	3.1	\$4,100	\$74 million
Medicaid	1,804,900	2.6	\$3,500	\$6.3 billion
Private insurance	2,139,600	2.7	\$3,500	\$7.5 billion
Uninsured	186,000	2.4	\$3,400	\$626 million
Other insurance	102,800	2.7	\$3,500	\$358 million

*Hospitalization for childbirth determined by DRGs 370-375. A small number of hospitalizations are missing corresponding payer data.

[†]Medicare provides health insurance for a limited number of individuals under the age of 65 who are disabled
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006

Table 3. Procedures commonly associated with maternal hospitalizations for childbirth, 2006*

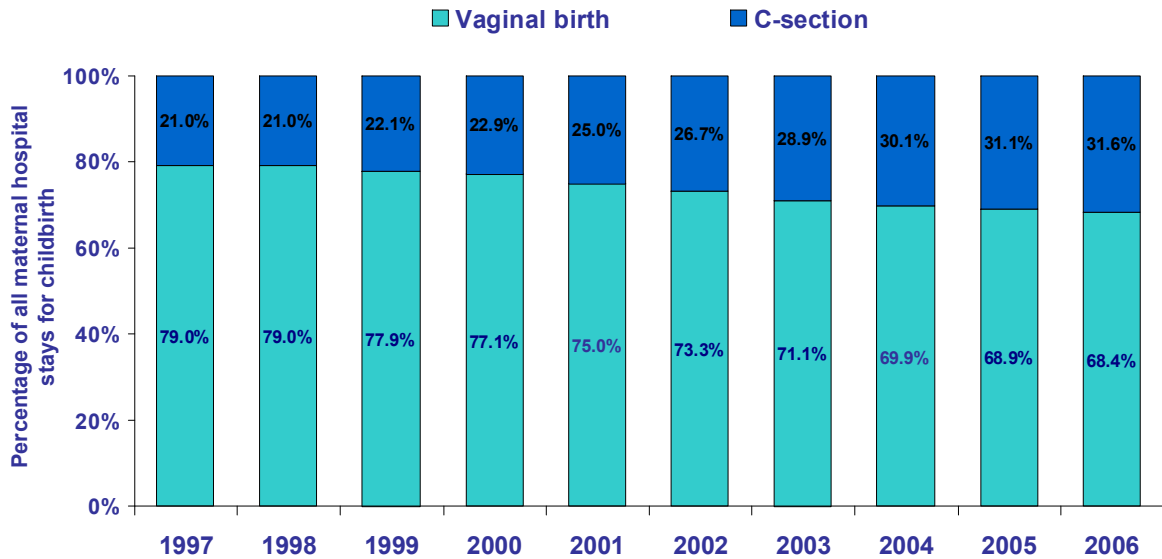
All-listed procedures	Number of hospital stays with this procedure	Percentage of childbirths with this procedure
Medical induction, manually assisted delivery, and other procedures to assist delivery	2,189,500	51.4%
Repair of current obstetric laceration	1,373,400	32.2%
Cesarean section	1,346,200	31.6%
Artificial rupture of membranes to assist delivery	1,007,500	23.7%
Fetal monitoring	957,900	22.5%
Episiotomy	392,700	9.2%
Forceps, vacuum, and breech delivery	283,600	6.7%

*Hospitalization for childbirth determined by DRGs 370–375

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample, 2006



Figure 1. During the last decade, the rate of C-sections grew 51 percent from 21.0 percent to 31.6 percent of all deliveries, 1997–2006*

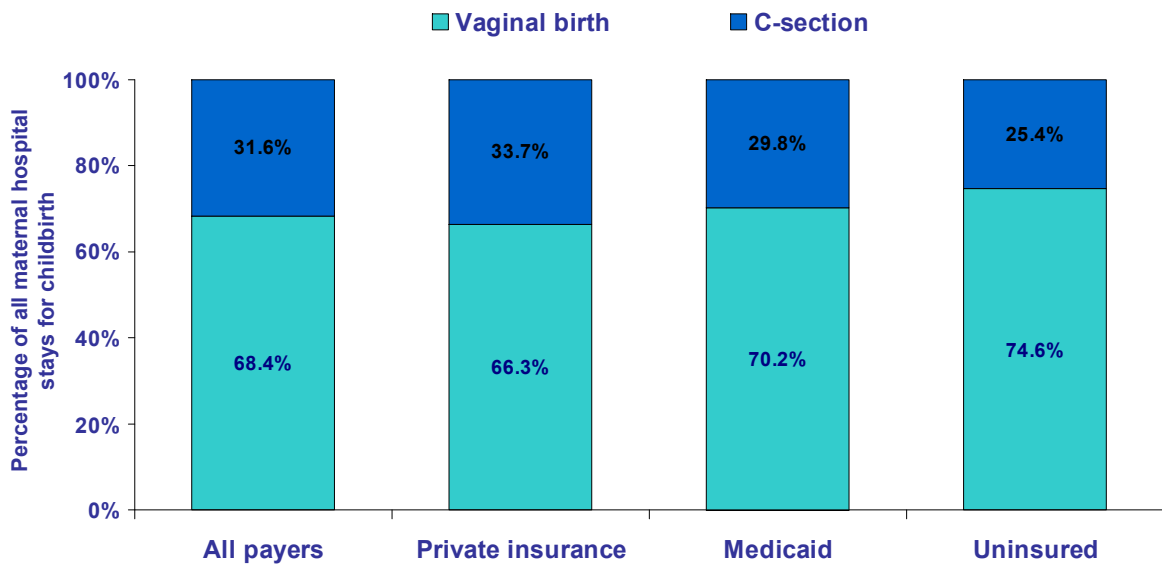


* Based on DRGs 370-375

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 1997-2006



Figure 2. C-sections accounted for 34 percent of privately insured deliveries, but only 25 percent of uninsured deliveries, 2006*

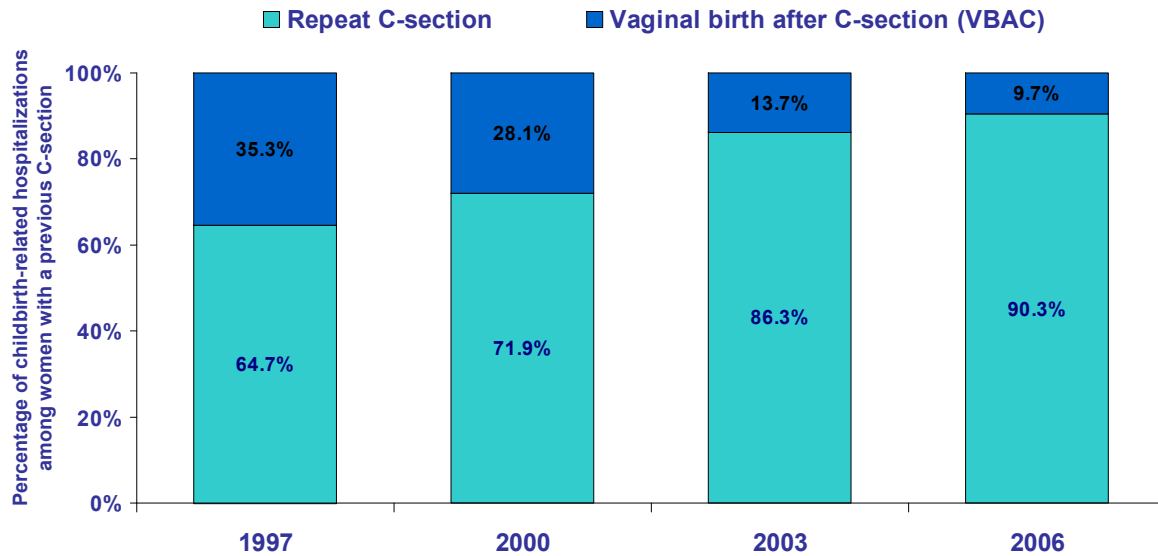


* Based on DRGs 370-375

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 2006



Figure 3. The rate of repeat C-sections increased 40 percent, while the VBAC rate decreased 73 percent, 1997–2006*

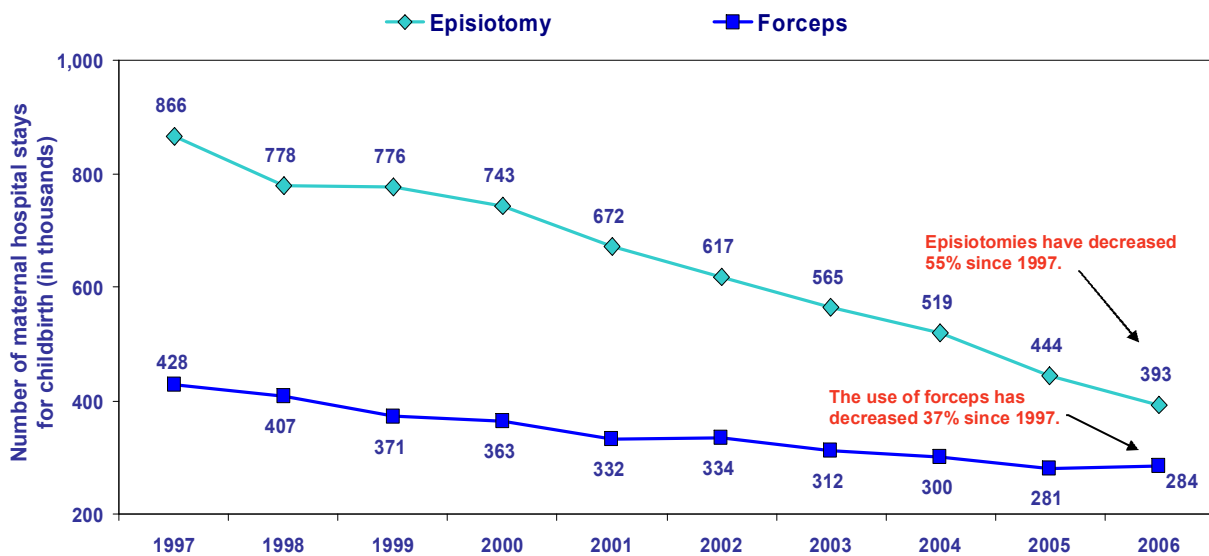


* Based on all-listed diagnoses and DRGs

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 1997-2006



Figure 4. The number of episiotomies and use of forceps decreased, reflecting changing practice patterns, 1997–2006*



* Based on all-listed procedures

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, HCUPnet, Nationwide Inpatient Sample, 1997-2006