

## STATISTICAL BRIEF #211

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### Variation in the Rate of Cesarean Section Across U.S. Hospitals, 2013

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#### Introduction

Although the overall cesarean section (C-section) rate in the United States has declined slightly in recent years, nearly a third of all births continue to be delivered by C-section<sup>1</sup>—higher than in many other industrialized countries.<sup>2</sup> A number of factors may contribute to high C-section rates, including medical conditions and complications that may necessitate the procedure, such as multiple gestations, older maternal age due to delayed childbearing, preterm labor, obesity, gestational diabetes, and hypertension.<sup>3</sup> Other factors unrelated to medical indication may also influence the decision to perform a C-section, including hospital policies regarding elective deliveries and patient preference, as well as physician concerns regarding liability related to a poor obstetrical outcome.<sup>4,5,6</sup>

C-section is the most common surgical procedure performed in the United States.<sup>7</sup> This operation carries additional risks compared with vaginal delivery, such as infection and postoperative pain.<sup>8,9</sup> A C-section also may make it more difficult for the mother to establish breastfeeding and may complicate

#### Highlights

- In 2013, there were 3.5 million total and 2.5 million low-risk deliveries across 2,719 hospitals in 43 States and the District of Columbia. These hospitals account for over 95 percent of hospital deliveries nationally. Among all deliveries, the rate of C-section was 33.1 per 100—twice the low-risk C-section rate (16.2 per 100 low-risk deliveries).
- The majority of all C-sections (65 percent) had a medical indication listed on the record and so were not considered to be low-risk. Among deliveries with a medical indication, the C-section rate was 76.1 per 100.
- Among hospitals with 1,000 or more deliveries—which accounted for over 80 percent of all deliveries and C-sections—the minimum and maximum low-risk C-section rate differed ten-fold (from 4.6 to 46.9 per 100 low-risk deliveries). In contrast, the total C-section rate differed only four-fold (from 15.4 to 63.5 per 100 total deliveries).
- The mean low-risk C-section rate was higher among private for-profit hospitals, hospitals in large metropolitan areas, and hospitals in the Northeast and South, compared with other hospitals. The total C-section rate showed a similar pattern by region but did not differ across other hospital characteristics.

<sup>1</sup> Osterman MJK, Martin JA. Trends in low-risk cesarean delivery in the United States, 1990–2013. *National Vital Statistics Reports*. 2014;63(6):1–15.

<sup>2</sup> Xie RH, Gaudet L, Krewski D, Graham ID, Walker MC, Wen SW. Higher cesarean delivery rates are associated with higher infant mortality rates in industrialized countries. *Birth*. 2015 Mar;42(1):62–9.

<sup>3</sup> Declercq E, Menacker F, MacDorman M. Maternal risk profiles and the primary cesarean rate in the United States, 1991–2002. *American Journal of Public Health*. 2006;96(5):867–2.

<sup>4</sup> Main E, Oshiro B, Chagolla B, Bingham D, Dang-Kilduff L, Kowalewski L. Elimination of Non-Medically Indicated (Elective) Deliveries Before 39 Weeks Gestational Age. Developed under contract #08-85012 with the California Department of Public Health, Maternal, Child and Adolescent Health Division. First edition published by March of Dimes; July 2010.

<sup>5</sup> The American College of Obstetricians and Gynecologists Womens Health Care Physicians. ACOG committee opinion no. 559: cesarean delivery on maternal request. *Obstetrics & Gynecology*. 2013;121(4):904–7.

<sup>6</sup> Sakala C, Yang YT, Corry MP. Maternity care and liability: pressing problems, substantive solutions. *Women's Health Issues*. 2013;23(1):e7–13.

<sup>7</sup> Podulka J, Stranges E, Steiner C. Hospitalizations Related to Childbirth, 2008. HCUP Statistical Brief #110. April 2011. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb110.pdf>. Accessed August 29, 2016.

<sup>8</sup> Burrows LJ, Meyn LA, Weber AM. Maternal morbidity associated with vaginal versus cesarean delivery. *Obstetrics & Gynecology*. 2004;103(5 Pt 1):907–12.

<sup>9</sup> Ecker JL, Frigoletto FD. Cesarean delivery and the risk-benefit calculus. *New England Journal of Medicine*. 2007;356:885–8.

subsequent pregnancies.<sup>10,11</sup> Given potential risks and associated costs—in 2011, the average cost of a hospital stay resulting in C-section was over 50 percent higher than a stay involving vaginal delivery<sup>12</sup>—reducing the C-section delivery rate continues to be an important focus of public health efforts nationwide, particularly for low-risk deliveries with no medical indication for the procedure.<sup>13</sup>

Consensus guidelines from the American Congress of Obstetricians and Gynecologists and other national efforts to improve perinatal care have shown promise in reducing nonmedically indicated C-sections.<sup>14</sup> However, recent research has found wide variation in hospital C-section rates even for low-risk deliveries.<sup>15</sup> This variation raises questions about the quality of maternal care and has important implications for maternal and neonatal outcomes and costs for hospitals, delivery systems, and insurers.

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents information on variation in the rate of total and low-risk C-sections across U.S. hospitals in 2013. It expands on previous studies in two significant ways—by using the State Inpatient Databases (SID) rather than the Nationwide Inpatient Sample (NIS) and by using a new definition of low-risk C-section developed by the Society of Maternal-Fetal Medicine in 2016, which is more clinically comprehensive than other prior definitions available from the Joint Commission and Agency for Healthcare Research and Quality.<sup>16</sup> The SID are used because they contain data on a census, or near census, of hospitals in each State and include all discharges from each hospital, making it possible to generate accurate hospital-level statistics. Numbers presented here are not national estimates, but rather actual counts from all States included.

This Statistical Brief builds on prior work that examined variations in C-sections by hospital bed size, teaching status, and geographic location using the NIS, from which 593 hospitals were used for analysis.<sup>17</sup> In comparison, this Statistical Brief includes data from virtually all hospitals across 43 states and the District of Columbia—2,719 community, nonrehabilitation hospitals in total—accounting for about 95 percent of the U.S. population and deliveries nationwide. Although prior research excluded hospitals with fewer than 100 deliveries in order to ensure that the C-section rate across the sample was sufficiently stable,<sup>18</sup> this analysis draws on data from all hospitals except those with 1–9 deliveries (n=51 hospitals) to allow for the inclusion of small hospitals with lower delivery volumes. Deliveries relate to the stay of the mother rather than the newborn.

This Statistical Brief presents the rate of C-section per 100 total and low-risk deliveries among women aged 15–44 years. Variation in C-section rates is assessed by examining the distribution of C-section rates across hospitals. Data are presented on minimum and maximum values (i.e., outliers) and the mean C-section rate according to hospital delivery volume. The mean C-section rate is also examined by additional hospital characteristics. Differences of 10 percent or greater are noted in the text.

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<sup>10</sup> Ecker JL, Frigoletto FD. Cesarean delivery and the risk-benefit calculus. *New England Journal of Medicine*. 2007;356:885–8.

<sup>11</sup> Hobbs AJ, Mannion CA, McDonald SW, Brockway M, Tough SC. The impact of caesarean section on breastfeeding initiation, duration and difficulties in the first four months postpartum. *BMC Pregnancy and Childbirth*. 2016;16(1):90.

<sup>12</sup> Moore JE, Witt WP, Elixhauser A. Complicating Conditions Associated With Childbirth, by Delivery Method and Payer, 2011. HCUP Statistical Brief #173. May 2014. Agency for Healthcare Research and Quality, Rockville, MD. <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb173-Childbirth-Delivery-Complications.pdf>. Accessed August 29, 2016.

<sup>13</sup> U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. Healthy People 2020. Maternal, Infant, and Child Health. <https://www.healthypeople.gov/2020/topics-objectives/topic/maternal-infant-and-child-health/objectives>. Accessed August 1, 2016.

<sup>14</sup> American College of Obstetricians and Gynecologists, the Society for Maternal–Fetal Medicine, Caughey AB, Cahil AG, Guise J-M, Rouse DJ. ACOG/SMFM Obstetric Care Consensus: Safe prevention of the primary cesarean delivery. *Obstetrics & Gynecology* 2014;210(3):179–93.

<sup>15</sup> Kozhimannil KB, Law MR, Virnig BA: Cesarean delivery rates vary tenfold among US hospitals; reducing variation may address quality and cost issues. *Health Affairs (Milwood)*. 2013;32(3):527–35.

<sup>16</sup> Armstrong JC, Kozhimannil KB, McDermott P, Saade GR, Srinivas SK, Society for Maternal-Fetal Medicine Health Policy Committee. Comparing variation in hospital rates of cesarean delivery among low-risk women using 3 different measures. *American Journal of Obstetrics & Gynecology*. 2016;214(2):153–63.

<sup>17</sup> Kozhimannil KB, et al. 2013. Op cit.

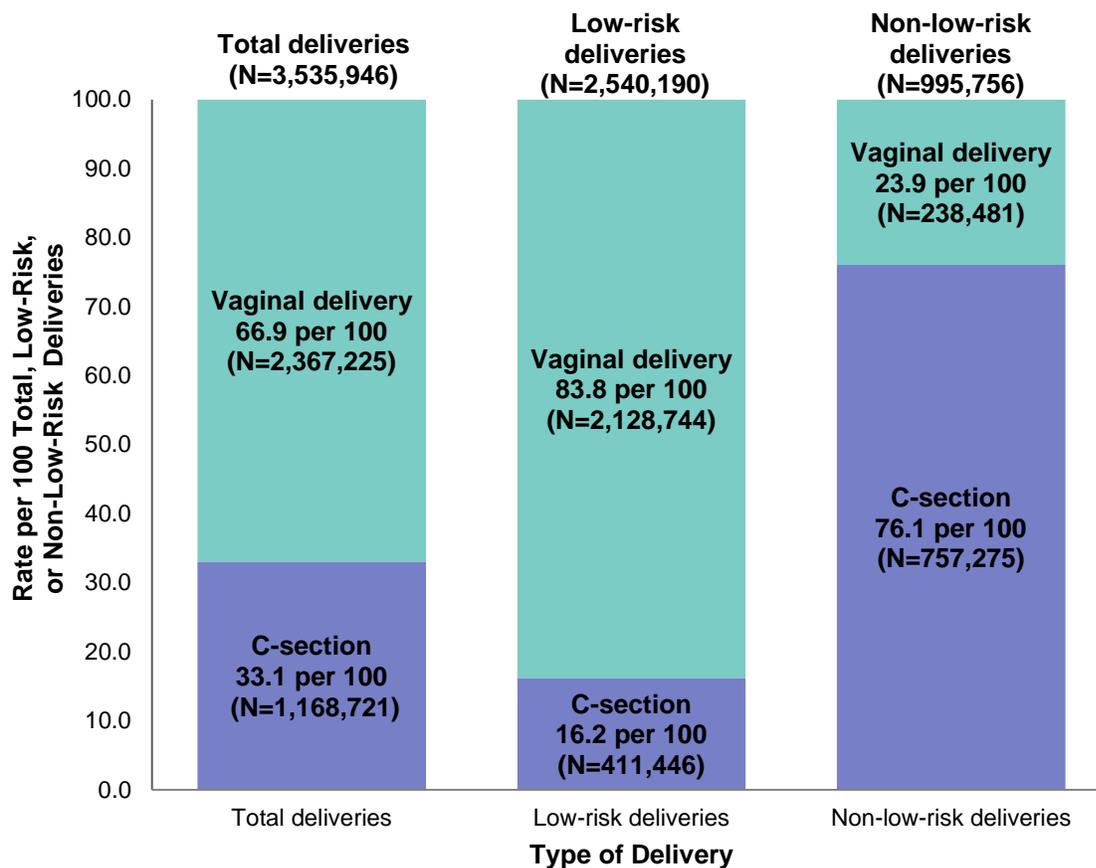
<sup>18</sup> Ibid.

## Findings

*The rate of C-section among total and low-risk deliveries, 2013*

Figure 1 displays the rate (per 100 deliveries) of vaginal deliveries and C-sections among total, low-risk, and non-low-risk childbirth stays at 2,719 hospitals in 43 States and the District of Columbia in 2013.

**Figure 1. Rate of total, low-risk, and non-low-risk vaginal deliveries and C-sections in 43 States and the District of Columbia, 2013**



Abbreviation: C-section, cesarean section

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 43 States and the District of Columbia, 2013

- **In 2013, across 43 States and the District of Columbia, there were a total of 1,168,721 million C-sections, 35 percent of which were low risk.**

Among the 1,168,721 C-sections in 43 States and the District of Columbia, 411,446 were low risk (35.2 percent). The remaining 757,275 C-sections (64.8 percent) had a medical indication that excluded them from the low-risk category.

- **The C-section rate among low-risk deliveries was nearly 5 times lower than the C-section rate among non-low-risk deliveries.**

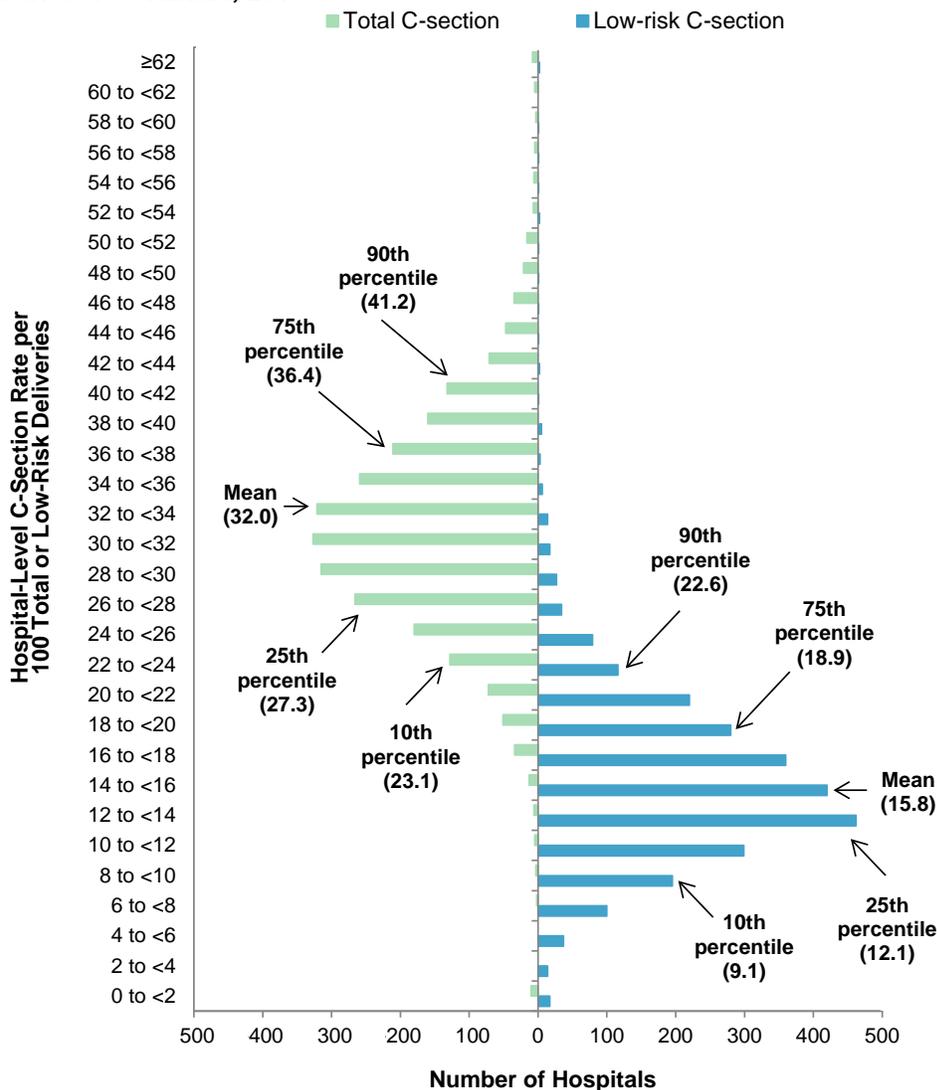
Among all deliveries, the C-section rate was 33.1 per 100 total deliveries. Over three-fourths (76.1 percent) of non-low-risk deliveries resulted in a C-section, which was 4.7 times the rate for low-risk deliveries (16.2 C-sections per 100 low-risk deliveries).

The remainder of this Statistical Brief focuses on hospital variation in the low-risk C-section rate, following the approach used in prior reports that present information on the low-risk C-section rate in the context of all C-sections.<sup>19,20</sup> For comparison, the total C-section rate also is presented. These results represent a hospital-level, not a discharge-level, analysis. The C-section rate was calculated for each hospital, and these hospital-level rates form the basis of the results presented. As a result, the mean hospital-level C-section rates (calculated across all hospitals) reported below differ slightly from those in Figure 1, which reports discharge-level C-section rates (calculated across all deliveries).

*Variation in the C-section rate across hospitals, 2013*

Figure 2 displays the distribution of hospital-level C-section rates among total and low-risk deliveries. In addition to the mean, the 10<sup>th</sup>, 25<sup>th</sup>, 75<sup>th</sup>, and 90<sup>th</sup> percentiles are noted.

**Figure 2. Variation across hospitals in total and low-risk C-section rate in 43 States and the District of Columbia, 2013**



Abbreviation: C-section, cesarean section

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 43 States and the District of Columbia, 2013

<sup>19</sup> Kozhimannil KB, Law MR, Virnig BA. Cesarean delivery rates vary tenfold among US hospitals; reducing variation may address quality and cost issues. *Health Affairs (Millwood)*. 2013;2(3):527–35.

<sup>20</sup> Osterman MJK, Martin JA. Trends in low-risk cesarean delivery in the United States, 1990–2013. *National Vital Statistics Reports*. 2014;63(6):1–15.

- **Across all hospitals, the average total C-section rate was 32.0 C-sections per 100 total deliveries. For 80 percent of hospitals, the C-section rate was between 23.1 and 41.2.**

In 2013, the mean total C-section rate across hospitals was 32.0 per 100 total deliveries. For 80 percent of hospitals (those between the 10<sup>th</sup> and 90<sup>th</sup> percentiles), the C-section rate was between 23.1 and 41.2.

- **The average low-risk C-section rate was 15.8 C-sections per 100 low-risk deliveries. For 80 percent of hospitals, the low-risk C-section rate was between 9.1 and 22.6.**

The mean low-risk C-section rate across hospitals was 15.8 per 100 low-risk deliveries. For 80 percent of hospitals (those between the 10<sup>th</sup> and 90<sup>th</sup> percentiles), the low-risk C-section rate was between 9.1 and 22.6.

Table 1 presents statistics on the hospital-level C-section rate for total and low-risk deliveries in 2013, based on hospital delivery volume.

**Table 1. C-section rate by volume of total and low-risk deliveries at the hospital in 43 States and the District of Columbia, 2013**

Delivery type and characteristics	All hospitals	Delivery volume			
		10–99	100–499	500–999	≥1,000
<b>Total hospitals</b>					
Number of hospitals	2,719	217	794	549	1,159
Hospitals, %	100.0	8.0	29.2	20.2	42.6
<b>Total deliveries</b>					
Number of deliveries	3,535,946	12,265	233,611	401,425	2,888,645
Deliveries, %	100.0	0.3	6.6	11.4	81.7
Number of C-sections	1,168,721	3,760	73,612	126,050	965,299
C-sections, %	100.0	0.3	6.3	10.8	82.6
Total C-section rate per 100 deliveries					
Mean	32.0	30.7	31.5	31.3	33.0
Minimum	0.0	0.0	0.0	0.0	15.4
10 <sup>th</sup> percentile	23.1	16.2	22.1	23.6	25.2
25 <sup>th</sup> percentile	27.3	23.1	26.3	27.1	28.8
50 <sup>th</sup> percentile	31.7	29.8	31.2	30.8	32.4
75 <sup>th</sup> percentile	36.4	38.1	35.8	35.0	37.1
90 <sup>th</sup> percentile	41.2	46.0	41.2	40.0	40.9
Maximum	100.0	100.0	77.2	60.0	63.5
<b>Low-risk deliveries</b>					
Number of low-risk deliveries	2,540,190	9,221	174,085	296,925	2,059,959
Low-risk deliveries, %	100.0	0.4	6.9	11.7	81.1
Number of low-risk C-sections	411,446	1,354	26,423	44,748	338,921
Low-risk C-sections, %	100.0	0.3	6.4	10.9	82.4
Low-risk C-section rate per 100 deliveries					
Mean	15.8	15.7	15.5	15.2	16.3
Minimum	0.0	0.0	0.0	0.0	4.6
10 <sup>th</sup> percentile	9.1	5.2	8.2	9.3	10.9
25 <sup>th</sup> percentile	12.1	9.2	11.3	11.7	13.0
50 <sup>th</sup> percentile	15.0	13.3	14.6	14.5	15.8
75 <sup>th</sup> percentile	18.9	20.0	18.7	18.1	19.2
90 <sup>th</sup> percentile	22.6	27.5	23.4	21.7	22.0
Maximum	100.0	100.0	58.8	38.4	46.9

Abbreviation: C-section, cesarean section

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 43 States and the District of Columbia, 2013

■ **Mean C-section rates did not vary substantially by delivery volume.**

The mean total C-section rate ranged from 30.7 among hospitals with 10–99 deliveries to 33.0 among hospitals with 1,000 or more deliveries. The mean low-risk C-section rate ranged from 15.2 among hospitals with 500–999 deliveries to 16.3 among hospitals with 1,000 or more deliveries. However, these differences were not larger than 10 percent.

- **Among hospitals with an annual volume of 1,000 or more deliveries, the total C-section rate varied four-fold, and the low-risk C-section rate varied ten-fold.**

In these 43 States and the District of Columbia, there were 1,159 hospitals (42.6 percent of all hospitals) with 1,000 or more deliveries in 2013. These hospitals accounted for over 80 percent of all deliveries.

Among these high-volume hospitals, the total C-section rate varied from a minimum of 15.4 to a maximum of 63.5 per 100 deliveries (a four-fold difference). For the low-risk C-section rate, the difference between outliers was even greater—the minimum rate was 4.6, and the maximum was 46.9 per 100 low-risk deliveries (a ten-fold difference).

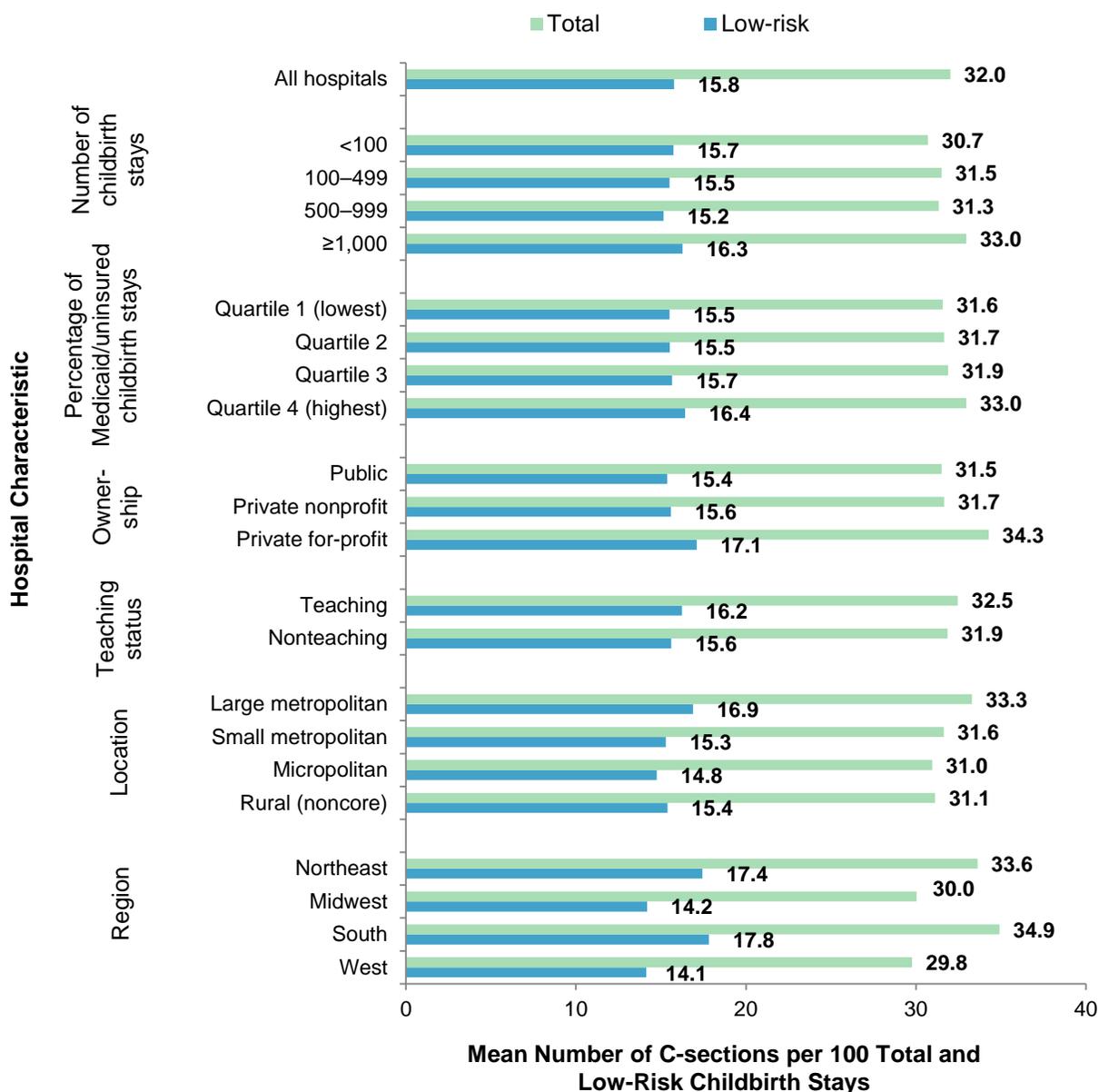
- **The variation in C-section rates was greatest among low-delivery-volume hospitals.**

As the delivery volume of hospitals increased, the variation in total C-section rates decreased. Among hospitals with the lowest delivery volume (10–99 deliveries in 2013), the total C-section rate ranged between 16.2 and 46.0 per 100 deliveries for 80 percent of the hospitals, with an overall range in rate from 0.0 to 100.0. In contrast, among hospitals with the highest delivery volume (1,000 or more deliveries in 2013), the total C-section rate ranged from 25.2 to 40.9 per 100 deliveries for 80 percent of the hospitals, with an overall range in rate from 15.4 to 63.5.

The low-risk C-section rate followed a similar pattern across delivery volume. Among hospitals with the lowest delivery volume (10–99 deliveries in 2013), the low-risk C-section rate ranged between 5.2 and 27.5 per 100 deliveries for 80 percent of the hospitals, with an overall range in rate from 0.0 to 100.0. In contrast, among hospitals with the highest delivery volume (1,000 or more deliveries in 2013), the low-risk C-section rate ranged from 10.9 to 22.0 per 100 deliveries for 80 percent of the hospitals, with an overall range in rate from 4.6 to 46.9.

Figure 3 presents the mean hospital-level C-section rate per 100 total and low-risk deliveries in 2013, by hospital characteristics.

**Figure 3. Mean C-section rate for total and low-risk deliveries by hospital characteristics in 43 States and the District of Columbia, 2013**



Abbreviation: C-section, cesarean section

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 43 States and the District of Columbia, 2013

- **The mean rate of C-section among total and low-risk deliveries was higher for hospitals in the Northeast and South compared with those in the Midwest and West.**

The mean total C-section rate was higher among hospitals in the Northeast (33.6 per 100 total deliveries) and South (34.9) compared with those in the Midwest (30.0) and West (29.8). The mean low-risk C-section rate followed a similar pattern—the rate was 17.4 and 17.8 C-sections per 100 low-

risk deliveries in the Northeast and South, respectively, compared with 14.2 in the Midwest and 14.1 in the West.

- **The mean low-risk C-section rate was higher among private for-profit hospitals compared with public hospitals and among hospitals in large metropolitan areas compared with those in small metropolitan and micropolitan areas.**

The mean low-risk C-section rate was higher among private for-profit hospitals (17.1 per 100 low-risk deliveries) than for public hospitals (15.4). The mean low-risk C-section rate was also higher for hospitals in large metropolitan areas (16.9 per 100 low-risk deliveries) compared with those in small metropolitan (15.3) and micropolitan (14.8) areas.

The mean total C-section rate did not differ by more than 10 percent according to ownership or urban/rural location. All other differences shown in Figure 3, including those by delivery volume, percentage of deliveries billed to Medicaid or uninsured, and teaching status, were not greater than 10 percent.

## Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2013 State Inpatient Databases (SID) for 2,719 community nonrehabilitation hospitals with 10 or more hospital stays for childbirth in 43 States and the District of Columbia: Arkansas, Arizona, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Iowa, Illinois, Indiana, Kansas, Kentucky, Louisiana, Massachusetts, Maryland, Michigan, Minnesota, Missouri, Montana, North Carolina, North Dakota, Nebraska, New Jersey, New Mexico, Nevada, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Vermont, Washington, Wisconsin, West Virginia, Wyoming. Deliveries outside of hospitals included in the SID are not captured in this Statistical Brief (e.g., military hospitals, home births).

## Definitions

### *Diagnoses, ICD-9-CM, diagnosis-related groups (DRGs)*

The *principal diagnosis* is that condition established after study to be chiefly responsible for the patient's admission to the hospital. *Secondary diagnoses* are concomitant conditions that coexist at the time of admission or develop during the stay. *All-listed diagnoses* include the principal diagnosis plus these additional secondary conditions.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are approximately 14,000 ICD-9-CM diagnosis codes.

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 (procedure), age, and other relevant criteria. Each hospital stay has one assigned DRG.

### *Case definition*

For this report, the ICD-9-CM diagnosis codes and DRGs listed in Table 2 were used to identify maternal hospitalizations related to childbirth and to assess delivery method. Hospital stays for childbirth were categorized as low-risk and high-risk based on definitions laid out by Armstrong et al. (2016).<sup>21</sup>

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<sup>21</sup> Armstrong JC, Kozhimannil KB, McDermott P, Saade GR, Srinivas SK. Society for Maternal-Fetal Medicine Health Policy Committee. Comparing variation in hospital rates of cesarean delivery among low-risk women using 3 different measures. *American Journal of Obstetrics & Gynecology*. 2016;214(2):153–63.

**Table 2. Study inclusion criteria and codes used to define maternal deliveries, delivery method, and non-low-risk deliveries**

Maternal deliveries	DRG 370–375 (2004–September 2007) DRG 765–768, 774–775 (October 2007–2013)
C-section	DRG 370-371 (2004–September 2007) DRG 765-766 (October 2007–2013)
Non-low-risk deliveries	All-listed ICD-9-CM diagnosis codes: 042, 641.01, 641.11, 642.6, 642.60, 642.61, 642.62, 642.63, 644.2, 644.20, 644.21, 646, 646.0, 646.00, 646.01, 646.03, 648.51, 648.52, 648.53, 648.54, 648.6, 648.60, 648.61, 648.62, 648.63, 648.64, 651, 651.0, 651.00, 651.01, 651.03, 651.1, 651.10, 651.11, 651.13, 651.2, 651.20, 651.21, 651.23, 651.3, 651.30, 651.31, 651.33, 651.4, 651.40, 651.41, 651.43, 651.5, 651.50, 651.51, 651.53, 651.6, 651.60, 651.61, 651.63, 651.7, 651.70, 651.71, 651.73, 651.8, 651.80, 651.81, 651.83, 651.9, 651.90, 651.91, 651.93, 652.21, 652.31, 652.41, 652.6, 652.60, 652.61, 652.63, 652.70, 652.71, 653.6, 653.60, 653.61, 653.63, 653.71, 654.2, 654.20, 654.21, 654.23, 654.3, 654.30, 654.31, 654.32, 654.33, 654.34, 655.01, 656.4, 656.40, 656.41, 656.43, 660.3, 660.30, 660.31, 660.5, 660.50, 660.51, 660.53, 660.7, 660.70, 660.71, 660.73, 662.3, 662.30, 662.31, 662.33, 663, 663.0, 663.00, 663.01, 663.03, 663.5, 663.50, 663.51, 663.53, 665, 665.0, 665.00, 665.01, 665.03, 665.1, 665.10, 665.11, 665.12, 665.14, 669.6, 669.60, 669.61, 678.10, 678.11, 678.13, 761.5, V08, V27.1, V27.2, V27.3, V27.4, V27.5, V27.6, V27.7, V91.00, V91.01, V91.02, V91.03, V91.09, V91.10, V91.11, V91.12, V91.19, V91.20, V91.21, V91.22, V91.29, V91.90, V91.91, V91.92, V91.99

Abbreviation: C-section, cesarean section

The results in this Statistical Brief may differ from two prior studies—one on low-risk C-sections<sup>22</sup> and one on hospital variation in C-section rates<sup>23</sup>—because those prior studies used the Nationwide Inpatient Sample (NIS), which prior to 2012 was based on only a 20 percent sample of community nonrehabilitation hospitals from the SID. In comparison, this Statistical Brief is based on data from all community nonrehabilitation hospitals with 10 or more deliveries among women aged 15–44 years in the 2013 SID, which constitute approximately 95 percent of all deliveries in U.S. hospitals.

#### *Unit of analysis*

The unit of analysis is the hospital. The number of deliveries at a given hospital is based on the number of hospital discharges (i.e., hospital stays), not persons or patients. This means that a person who is admitted to the hospital multiple times in 1 year will be counted each time as a separate discharge from the hospital.

#### *Hospital location*

Hospital location is based on the 2003 Urban Influence Codes:

- Large Metropolitan: metropolitan areas with 1 million or more residents
- Small Metropolitan: metropolitan areas with fewer than 1 million residents
- Micropolitan: nonmetropolitan areas delineated as micropolitan areas
- Rural (noncore): nonmetropolitan and nonmicropolitan areas

#### *Payer*

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

- Medicare: includes patients covered by fee-for-service and managed care Medicare
- Medicaid: includes patients covered by fee-for-service and managed care Medicaid

<sup>22</sup> Armstrong JC, Kozhimannil KB, McDermott P, Saade GR, Srinivas SK. Society for Maternal-Fetal Medicine Health Policy Committee. Comparing variation in hospital rates of cesarean delivery among low-risk women using 3 different measures. *American Journal of Obstetrics & Gynecology*. 2016;214(2):153–63.

<sup>23</sup> Kozhimannil KB, Law MR, Virnig BA. Cesarean delivery rates vary 10-fold among US hospitals; reducing variation may address quality, cost issues. *Health Affairs (Millwood)*. 2013;32(3):527–35.

- Private Insurance: includes Blue Cross, commercial carriers, and private health maintenance organizations (HMOs) and preferred provider organizations (PPOs)
- Uninsured: includes an insurance status of *self-pay* and *no charge*
- Other: includes Workers' Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs

Hospital stays billed to the State Children's Health Insurance Program (SCHIP) may be classified as Medicaid, Private Insurance, or Other, depending on the structure of the State program. Because most State data do not identify patients in SCHIP specifically, it is not possible to present this information separately.

For this Statistical Brief, when more than one payer is listed for a hospital discharge, the first-listed payer is used.

#### *Ownership*

The hospital's ownership/control category was obtained from the American Hospital Association (AHA) Annual Survey of Hospitals and includes categories for government non-Federal (public), private not-for-profit (voluntary), and private investor-owned (proprietary).

#### *Teaching status*

The hospital's teaching status was obtained from the AHA Annual Survey of Hospitals. A hospital is considered to be a teaching hospital if it has an American Medical Association–approved residency program, is a member of the Council of Teaching Hospitals, or has a ratio of full-time equivalent interns and residents to beds of 0.25 or higher.

#### *Region*

Region is one of the four regions defined by the U.S. Census Bureau:

- Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
- Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
- South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
- West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii

### **About HCUP**

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of health care databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) and the Federal government to create a national information resource of encounter-level health care data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to health care programs, and outcomes of treatments at the national, State, and local market levels.

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

**Alaska** State Hospital and Nursing Home Association  
**Arizona** Department of Health Services  
**Arkansas** Department of Health

**California** Office of Statewide Health Planning and Development  
**Colorado** Hospital Association  
**Connecticut** Hospital Association  
**District of Columbia** Hospital Association  
**Florida** Agency for Health Care Administration  
**Georgia** Hospital Association  
**Hawaii** Health Information Corporation  
**Illinois** Department of Public Health  
**Indiana** Hospital Association  
**Iowa** Hospital Association  
**Kansas** Hospital Association  
**Kentucky** Cabinet for Health and Family Services  
**Louisiana** Department of Health and Hospitals  
**Maine** Health Data Organization  
**Maryland** Health Services Cost Review Commission  
**Massachusetts** Center for Health Information and Analysis  
**Michigan** Health & Hospital Association  
**Minnesota** Hospital Association  
**Mississippi** Department of Health  
**Missouri** Hospital Industry Data Institute  
**Montana** MHA - An Association of Montana Health Care Providers  
**Nebraska** Hospital Association  
**Nevada** Department of Health and Human Services  
**New Hampshire** Department of Health & Human Services  
**New Jersey** Department of Health  
**New Mexico** Department of Health  
**New York** State Department of Health  
**North Carolina** Department of Health and Human Services  
**North Dakota** (data provided by the Minnesota Hospital Association)  
**Ohio** Hospital Association  
**Oklahoma** State Department of Health  
**Oregon** Association of Hospitals and Health Systems  
**Oregon** Office of Health Analytics  
**Pennsylvania** Health Care Cost Containment Council  
**Rhode Island** Department of Health  
**South Carolina** Revenue and Fiscal Affairs Office  
**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 Services  
**Wyoming** Hospital Association

### About Statistical Briefs

HCUP Statistical Briefs are descriptive summary reports presenting statistics on hospital inpatient and emergency department use and costs, quality of care, access to care, medical conditions, procedures, patient populations, and other topics. The reports use HCUP administrative health care data.

### About the SID

The HCUP State Inpatient Databases (SID) are hospital inpatient databases from data organizations participating in HCUP. The SID contain the universe of the inpatient discharge abstracts in the

participating HCUP States, translated into a uniform format to facilitate multistate comparisons and analyses. Together, the SID encompass more than 95 percent of all U.S. community hospital discharges. The SID can be used to investigate questions unique to one State, to compare data from two or more States, to conduct market-area variation analyses, and to identify State-specific trends in inpatient care utilization, access, charges, and outcomes.

## For More Information

For other information on pregnancy and childbirth, including Cesarean section, refer to the HCUP Statistical Briefs located at [http://www.hcup-us.ahrq.gov/reports/statbriefs/sb\\_pregnancy.jsp](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb_pregnancy.jsp).

For additional HCUP statistics, visit:

- HCUP Fast Stats at <http://www.hcup-us.ahrq.gov/faststats/landing.jsp> for easy access to the latest HCUP-based statistics for health information topics
- HCUPnet, HCUP's interactive query system, at <http://hcupnet.ahrq.gov/>

For more information about HCUP, visit <http://www.hcup-us.ahrq.gov/>.

For a detailed description of HCUP and more information on the design of the State Inpatient Databases (SID), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2014. <http://www.hcup-us.ahrq.gov/sidoverview.jsp>. Accessed January 7, 2015.

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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](mailto:hcup@ahrq.gov) or send a letter to the address below:

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