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Trends and Disparities in Delivery Hospitalizations Involving Severe Maternal Morbidity, 2006–2015

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Introduction

Severe maternal morbidity is defined as including unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health.[1] Often called *near-misses,* deliveries involving severe maternal morbidity generally include life-threatening conditions, such as acute myocardial infarction, pulmonary embolism, or sepsis.[2] It has been found that rates of severe maternal morbidity are steadily increasing in the United States.[3] Furthermore, severe maternal morbidity disproportionately affects minority and low-income pregnant women, especially non-Hispanic Black women and those with Medicaid coverage.[4,5]

Recent studies have found that rising rates of severe maternal morbidity may be attributed to changes in the overall health of women, leading to increased complications including maternal mortality.[6,7,8] Among pregnancy-related deaths in the United States between 2011 and 2013, 15.1 percent were caused by cardiovascular disease, 14.5 percent by noncardiovascular diseases, 12.7 percent by infection and sepsis, and 11.4 percent

Highlights

- The rate of severe maternal morbidity at delivery—as defined by 21 conditions and procedures—increased 45 percent from 2006 through 2015, from 101.3 to 146.6 per 10,000 delivery hospitalizations.

- The most common indicators of severe maternal morbidity were blood transfusion, disseminated intravascular coagulation (DIC), and hysterectomy (in 2015, 121.1, 11.0, and 11.0 deliveries per 10,000, respectively.)

- Some conditions often involved procedural intervention. In 2015, over half of deliveries with shock, amniotic fluid embolism, sickle cell disease with crisis, and DIC had a blood transfusion; one-third of deliveries with shock had a hysterectomy.

- Severe maternal morbidity was highest among women aged 40+ years and lowest for those aged 20–29 years (248 and 136 per 10,000 deliveries, respectively).

- On average Black mothers were younger than White mothers. Yet the rate of severe maternal morbidity was 112–115 percent higher for Blacks than for Whites in 2006 (164 vs. 76) and 2015 (241 vs. 114), with no change in the Black-White disparity.

- Hispanics and Asian/Pacific Islanders also had higher rates of severe maternal morbidity than Whites in both years, but disparities decreased over time.

- Although deaths decreased for all races/ethnicities, in-hospital mortality was 3 times higher for Blacks than for Whites in 2015 (11 vs. 4 per 100,000 deliveries).

[1] American College of Obstetricians and Gynecologists and the Society for Maternal-Fetal Medicine, Kilpatrick SK, Ecker JL. Severe maternal morbidity: screening and review. American Journal of Obstetrics & Gynecology. 2016;215(3):B17–22.

[2] Geller SE, Rosenberg D, Cox SM, Kilpatrick S. Defining a conceptual framework for near-miss maternal morbidity. Journal of the American Medical Women's Association. 2002;57(3):135–9.

[3] Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. November 2017. www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html. Accessed April 24, 2018.

[4] Admon LK, Windelman TNA, Moniz MH, Davis MM, Heisler M, Dalton VK. Disparities in chronic conditions among women hospitalized for delivery in the United States, 2005-2014. Obstetrics & Gynecology. 2017;130(6):1319–26.

[5] Creanga AA, Bateman BT, Kuklina EV, Callaghan WM. Racial and ethnic disparities in severe maternal morbidity: a multistate analysis, 2008-2010. American Journal of Obstetrics & Gynecology. 2014;210(5):435.e1–8.

[6] Campbell KH, Savitz D, Werner EF, Pettker CM, Goffman D, Chazotte C, et al. Maternal morbidity and risk of death at delivery hospitalization. Obstetrics & Gynecology. 2013;122(3):627–33.

[7] Martin JA, Hamilton BE, Osterman MJK, Driscoll AK, Matthews TJ. Births: final data for 2015. Centers for Disease Control and Prevention. National Vital Statistics Reports. 2017;66(1):1–70.

[8] Small MJ, James AH, Kershaw T, Thames B, Gunatilake R, Brown H. Near-miss maternal mortality: cardiac dysfunction as the principal cause of obstetric intensive care unit admissions. Obstetrics & Gynecology. 2012;119(2):250–5.

by hemorrhage.[9] Disparities in mortality by race/ethnicity also are highest among non-Hispanic Black women at 43.5 deaths per 100,000 live births, compared with 12.7 among White women.[10]

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents trends and disparities in delivery hospitalizations involving severe maternal morbidity from 2006 through the third quarter of 2015. The fourth quarter of 2015 is excluded because of the transition of the International Classification of Diseases coding system from the 9th to the 10th revision.[11] This Statistical Brief defines severe maternal morbidity using a standardized measure containing 21 indicators that was developed by the Centers for Disease Control and Prevention.[12] These 21 indicators of severe maternal morbidity include conditions (e.g., renal failure, sepsis), as well as procedures performed during the hospital stay (e.g., blood transfusion, hysterectomy), that may or may not have resulted in in-hospital death.

First, trends in severe maternal morbidity overall and for each indicator of severe maternal morbidity are presented. Some conditions may be more likely to result in procedural intervention. Thus, the prevalence of the most common procedures indicating severe maternal morbidity—blood transfusion and hysterectomy—are examined among deliveries with a condition defined as a severe maternal morbidity. Second, patient and hospital characteristics are compared across deliveries with and without severe maternal morbidity in 2015. Finally, disparities in rates of severe maternal morbidity and in-hospital mortality are examined over time by race/ethnicity. All differences between estimates noted in the text are 10 percent or greater.

[9] Centers for Disease Control and Prevention. Pregnancy Mortality Surveillance System. November 2017. www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html. Accessed April 24, 2018.
[10] Ibid.
[11] Barrett ML, Heslin KC, Yoon F, Moore BJ. Case Study: National Healthcare Quality and Disparities Report (QDR) Sensitivity Analysis on Developing AHRQ Quality Indicator Estimates for 2015 Using Only ICD-9-CM Data. April 7, 2017. Agency for Healthcare Research and Quality. www.hcup-us.ahrq.gov/datainnovations/CaseStudy_QDRanalysis04072017.pdf. Accessed April 24, 2018.
[12] Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. November 2017. www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html. Accessed April 24, 2018.

Trends in and types of severe maternal morbidity, 2006–2015

Figure 1 displays the rate of deliveries involving severe maternal morbidity per 10,000 delivery hospitalizations from 2006 through 2015. Because blood transfusion represents the most common indicator of severe morbidity,[13] trends are presented for blood transfusions (with or without other indicators of severe maternal morbidity) and for other indicators of severe maternal morbidity (with or without blood transfusion). If a delivery involved blood transfusion and 1 of the other 20 indicators of severe maternal morbidity, the delivery was counted in both categories.

Figure 1. Trends in delivery hospitalizations involving severe maternal morbidity, 2006–2015

[a] If a delivery involved blood transfusion and 1 of the other 20 types of severe maternal morbidity, the delivery was counted in both categories.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2006–quarter 3, 2015, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

■ **Over the 10-year period from 2006 through the third quarter of 2015, there was a cumulative increase of 45 percent in delivery hospitalizations involving any severe maternal morbidity, part of which was driven by the increase in blood transfusion.**

From 2006 through 2015, the rate of deliveries involving any severe maternal morbidity increased 45 percent, from 101.3 to 146.6 per 10,000 delivery hospitalizations. The increase in the rate of deliveries involving blood transfusion was over twice the increase in the rate of deliveries involving all other 20 types of severe maternal morbidity (54 percent vs. 24 percent cumulative increase).

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[13] Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. November 2017. www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html. Accessed April 24, 2018.

Table 1 presents trends in delivery hospitalizations involving severe maternal morbidity, overall and for each of the 21 indicators of severe maternal morbidity, from 2006 through 2015. First, blood transfusion (with or without other indicators of severe maternal morbidity) and other indicators of severe maternal morbidity (with or without blood transfusion) are presented. Then the specific other indicators of severe maternal morbidity are presented and are sorted by the cumulative percentage change in rate (per 10,000 delivery hospitalizations) from 2006 through 2015.

Table 1. Trends in delivery hospitalizations involving severe maternal morbidity, overall and for each indicator of severe maternal morbidity, 2006 and 2015

Indicators of severe maternal morbidity	Deliveries involving any severe maternal morbidity, %		Rate per 10,000 deliveries		Cumulative percentage change in rate
	2006	2015	2006	2015	
Any severe maternal morbidity, considering and not considering blood transfusions					
Any severe maternal morbidity	100.0	100.0	101.3	146.6	45
Blood transfusion (with or without other indicators of severe maternal morbidity)[a]	77.9	82.6	78.9	121.1	54
Other indicators of severe maternal morbidity (with or without blood transfusion)[a]	33.4	28.6	33.8	41.9	24
Other indicators of severe maternal morbidity					
Acute renal failure	2.7	4.4	2.8	6.5	134
Shock	1.8	2.9	1.9	4.3	133
Ventilation	0.6	0.8	0.6	1.2	105
Sepsis	2.5	3.6	2.6	5.2	104
Aneurysm	0.1	0.1	0.1	0.1	99
Adult respiratory distress syndrome	4.1	4.0	4.2	5.9	42
Disseminated intravascular coagulation	7.8	7.5	7.9	11.0	39
Hysterectomy	8.2	7.5	8.3	11.0	32
Cardiac arrest/ventricular fibrillation	0.6	0.5	0.6	0.7	26
Temporary tracheostomy	0.1	0.1	0.1	0.1	14
Conversion of cardiac rhythm	0.7	0.5	0.7	0.7	13
Amniotic fluid embolism	0.3	0.2	0.3	0.3	11
Sickle cell disease with crisis	0.9	0.6	1.0	0.9	0
Pulmonary edema/acute heart failure	4.3	2.2	4.3	3.2	−25
Air and thrombotic embolism	1.3	0.7	1.3	1.0	−26
Eclampsia	4.3	2.1	4.3	3.1	−28
Puerperal cerebrovascular disorders	1.5	0.7	1.5	1.0	−32
Acute myocardial infarction	0.2	0.1	0.2	0.1	−36
Severe anesthesia complications	1.0	0.3	1.0	0.5	−51
Heart failure/arrest during surgery	0.9	0.3	0.9	0.4	−53

Notes: There were 44,000 deliveries with any severe maternal morbidity in 2006 and 43,800 deliveries with any severe maternal morbidity in the first 3 quarters of 2015 (rounded to the nearest hundred). Percentage change was calculated from unrounded rates; thus, the rounded rates may appear the same in 2006 and 2015 but still represent a cumulative change from 2006 through 2015 based on the unrounded rates. If a delivery involved multiple indicators of severe maternal morbidity, it was counted in each category.

[a] If a delivery involved blood transfusion and 1 of the other 20 indicators of severe maternal morbidity, the delivery was counted in both categories.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2006 and 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

- **Blood transfusion represented the most common indicator of severe maternal morbidity—it was performed in approximately 80 percent of all cases.**

  Blood transfusion was performed in 78 percent of all cases of severe maternal morbidity at delivery in 2006 and 83 percent of cases in 2015.

  Following blood transfusion, disseminated intravascular coagulation and hysterectomy were the next most common indicators of severe maternal morbidity in both 2006 and 2015—each involved in approximately 8 percent of cases.

- **Rates of acute renal failure, shock, ventilation, and sepsis at delivery more than doubled between 2006 and 2015.**

  The rate of acute renal failure more than doubled between 2006 and 2015 (an increase of 134 percent, from 2.8 to 6.5 per 10,000 delivery hospitalizations), as did rates of shock (133 percent increase, from 1.9 to 4.3), ventilation (105 percent increase, from 0.6 to 1.2), and sepsis (104 percent increase, from 2.6 to 5.2).

- **Although rare, rates of heart failure/arrest during surgery and severe anesthesia complications decreased by about half between 2006 and 2015.**

  Between 2006 and 2015, the rate of heart failure/arrest during surgery decreased by 53 percent, from 0.9 to 0.4 per 10,000 delivery hospitalizations. The rate of severe anesthesia complications, which also was rare, decreased by 51 percent, from 1.0 to 0.5 per 10,000 deliveries.

- **Eclampsia and pulmonary edema/acute heart failure were the fourth and fifth most common indicators of severe maternal morbidity in 2006, respectively, but did not rank in the top five indicators in 2015.**

  Eclampsia and pulmonary edema/acute heart failure each were involved in approximately 4 percent of all deliveries involving severe maternal morbidity in 2006, making them the fourth and fifth most common indicators of severe morbidity. By 2015, they each were involved in only 2 percent of cases and did not rank in the top five most common indicators of severe maternal morbidity.

Figure 2 displays the percentage of deliveries involving blood transfusion or hysterectomy (two of the most common types of *procedures* indicating severe maternal morbidity) among deliveries with a *condition* indicating severe maternal morbidity in 2015.

Figure 2. Percentage of deliveries involving blood transfusion or hysterectomy among deliveries with a condition indicating severe maternal morbidity, 2015

Percentage of Deliveries Involving Blood Transfusion

Condition Indicating Severe Maternal Morbidity[a]

Condition	Percentage
Any delivery with a severe condition	36.8
Shock	72.0
Amniotic fluid embolism	63.1
Sickle cell disease with crisis	54.0
Disseminated intravascular coagulation	50.5
Cardiac arrest/ventricular fibrillation	46.9
Adult respiratory distress syndrome	45.6
Heart failure/arrest during surgery	43.7
Acute renal failure	39.0
Air and thrombotic embolism	37.0
Acute myocardial infarction	30.9
Sepsis	25.9
Severe anesthesia complications	24.1
Pulmonary edema/acute heart failure	21.6
Eclampsia	15.7
Puerperal cerebrovascular disorders	14.6

Percentage of Deliveries Involving Hysterectomy

Condition Indicating Severe Maternal Morbidity[a]

Condition	Percentage
Any delivery with a severe condition	9.5
Shock	33.3
Adult respiratory distress syndrome	23.3
Cardiac arrest/ventricular fibrillation	21.7
Disseminated intravascular coagulation	16.9
Amniotic fluid embolism	12.5
Air and thrombotic embolism	8.0
Acute renal failure	6.4
Sepsis	2.7
Pulmonary edema/acute heart failure	2.4

[a] Conditions are not shown if there were fewer than 11 deliveries with the condition that involved blood transfusion or hysterectomy in 2015; however; these conditions are included in the category of *Any delivery with a severe condition*.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2006 and 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

- **In 2015, over half of deliveries involving shock, amniotic fluid embolism, sickle cell disease with crisis, and disseminated intravascular coagulation also had a blood transfusion.**

  In 2015, over half of deliveries involving the following types of severe maternal conditions had a blood transfusion: shock (72.0 percent), amniotic fluid embolism (63.1 percent), sickle cell disease with crisis (54.0 percent), and disseminated intravascular coagulation (50.5 percent).

- **One-third of deliveries involving shock also involved hysterectomy.**

  In 2015, 33.3 percent of deliveries involving shock also involved a hysterectomy. Furthermore, over 1 in 5 deliveries involving adult respiratory distress syndrome or cardiac arrest/ventricular fibrillation also involved a hysterectomy.

Characteristics of deliveries with and without severe maternal morbidity, 2015
Table 2 presents characteristics of deliveries with and without a severe maternal morbidity during the first 3 quarters of 2015. The rate of severe maternal morbidity per 10,000 total delivery hospitalizations also is presented. Hereinafter, this Statistical Brief presents data on any severe maternal morbidity, involving any of the 21 indicators discussed above.

Table 2. Characteristics of deliveries with and without any severe maternal morbidity, 2015

Characteristic	Deliveries with any severe maternal morbidity, %	Deliveries with no severe maternal morbidity, %	Rate of any severe maternal morbidity per 10,000 total delivery hospitalizations
Patient characteristic			
Age group, years			
<20	8.5	6.0	206.3
20–29	46.6	50.2	136.3
30–39	39.7	40.8	143.0
40+	5.1	3.0	248.0
Primary expected payer			
Medicaid	51.4	42.9	175.0
Private insurance	42.1	51.3	120.8
Uninsured	3.1	2.6	176.5
Other (including Medicare)	3.4	3.2	153.9
Community income			
Quartile 1 (poorest)	36.4	29.9	177.7
Quartile 2	22.8	23.0	145.6
Quartile 3	22.1	24.6	131.9
Quartile 4 (wealthiest)	18.7	22.5	122.2
Location of residence			
Large metropolitan	63.4	60.3	154.0
Small metropolitan	24.0	26.4	133.5
Micropolitan	7.6	8.0	140.0
Rural (noncore)	4.9	5.2	138.1
Hospital characteristic			
Safety-net hospital			
Yes	43.6	35.1	181.8
No	56.4	64.9	127.5
Minority-serving hospital			
Yes	53.4	44.3	176.3
No	46.6	55.7	123.0
Teaching status			
Teaching hospital	70.6	66.7	155.1
Nonteaching hospital	29.4	33.3	129.7
Ownership			
Private for-profit	14.6	14.5	147.8
Private nonprofit	69.7	73.2	139.6
Public	15.7	12.3	187.1
Region			
Northeast	17.9	15.8	165.4
Midwest	16.7	21.1	116.3
South	44.4	39.7	163.6
West	21.1	23.4	132.4

Notes: In the first 3 quarters of 2015, there were 2.9 million deliveries without severe maternal morbidity and 43,800 deliveries with any severe maternal morbidity (rounded to the nearest hundred). Percentages add to 100 percent within the column and were calculated from unrounded counts of observations with nonmissing values.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

- **Compared with other deliveries, those involving severe maternal morbidity were more likely to be in the youngest and oldest age groups, paid by Medicaid, and from lower-income communities.**

  Deliveries involving severe maternal morbidity were more likely than deliveries that did not involve severe maternal morbidity to be in the youngest (aged <20 years, 8.5 vs. 6.0 percent) and oldest (aged 40+ years, 5.1 vs. 3.0 percent) age groups. They also were more likely to be paid by Medicaid (51.4 vs.42.9 percent) and to have a Zip Code with the lowest median household income (quartile 1, 36.4 vs. 29.9 percent).

  Rates of severe maternal morbidity generally followed a similar pattern as these percentage distributions. For instance, the rate of deliveries involving severe maternal morbidity per 10,000 total delivery hospitalizations generally increased with age (from 136.3 among women aged 20–29 years to 248.0 among those aged 40+ years); the rate also was elevated among women aged <20 years (206.3).

  Rates of severe maternal morbidity also were higher for mothers who were uninsured or whose delivery was paid by Medicaid compared with private insurance (176.5 and 175.0, respectively, vs. 120.8). Rates decreased as levels of community income increased (from 177.7 in quartile 1 to 122.2 in quartile 4) and were higher in large metropolitan areas (154.0) compared with other areas (140 or less).

- **Deliveries involving severe maternal morbidity also were more likely to occur at hospitals that typically have a mission to serve vulnerable populations and at hospitals in the Northeast and the South, as compared with all other deliveries.**

  Compared with deliveries that did not involve severe maternal morbidity, those that did were more likely to occur at hospitals that typically have a mission to serve vulnerable populations—including safety-net (43.6 vs. 35.1 percent), minority-serving (53.4 vs. 44.3 percent), teaching (70.6 vs. 66.7 percent), and public (15.7 vs. 12.3 percent) hospitals. They also were more likely to occur at hospitals located in the Northeast (17.9 vs. 15.8 percent) and the South (44.4 vs. 39.7 percent) than at hospitals in the Midwest (16.7 vs. 21.1 percent) and the West (21.1 vs. 23.4 percent).

  Again, rates of severe maternal morbidity generally followed a similar pattern as these percentage distributions. The rate of severe maternal morbidity per 10,000 total deliveries was higher at hospitals that typically serve vulnerable populations, such as teaching versus nonteaching hospitals (155.1 vs. 129.7) and at hospitals in the Northeast and the South compared with those in the Midwest and the West (165.4 and 163.6 vs. 116.3 and 132.4, respectively).

Racial/ethnic disparities in severe maternal morbidity at delivery, 2006 and 2015
Figure 3 displays the distribution of race/ethnicity among deliveries with any severe maternal morbidity compared with all other deliveries, in the first 3 quarters of 2015.

Figure 3. The distribution of race/ethnicity among delivery hospitalizations, according to whether the delivery involved any severe maternal morbidity, 2015

Notes: In the first 3 quarters of 2015, there were 2.9 million deliveries without severe maternal morbidity and 43,800 deliveries with any severe maternal morbidity (rounded to the nearest hundred). Percentages in the figure are based on unrounded counts.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

■ **Black women, Hispanic women, and women of Other races/ethnicities were overrepresented among deliveries involving severe maternal morbidity, as compared with White women.**

White women constituted a lower percentage of deliveries with any severe maternal morbidity than they did other deliveries (23 percent lower). Indeed, White women constituted 41.0 percent of deliveries with any severe maternal morbidity versus 53.0 percent of those without any severe morbidity.

In contrast, racial/ethnic minorities constituted a higher percentage of deliveries with any severe maternal morbidity than they did of other deliveries. The distribution of Blacks, Hispanics, and Other races/ethnicities among deliveries with any severe maternal morbidity was 66 percent, 10 percent, and 15 percent higher, respectively, than the distribution of these racial/ethnic groups among deliveries with no severe maternal morbidity. Indeed, 24.2 percent of deliveries involving severe maternal morbidity were among patients who were Black compared with 14.6 percent of deliveries with no severe maternal morbidity. Among deliveries involving severe maternal morbidity, patients also were more likely to be Hispanic (23.4 vs. 21.3 percent) or Other races/ethnicities (5.3 vs. 4.6 percent) compared with deliveries without any severe maternal morbidity.

Women in the youngest and oldest age groups have greater risk of severe maternal morbidity.[14] Because maternal age may differ across racial/ethnic groups, the next Figure is included to provide additional context when examining racial/ethnic disparities in severe maternal morbidity and in-hospital mortality. Specifically, Figure 4 shows the age distribution of all delivery hospitalizations (combining those with and without any severe maternal morbidity) in the first 3 quarters of 2015, by patient's race/ethnicity.

Figure 4. The distribution of age of all delivery hospitalizations, by patient race/ethnicity, 2015

Notes: In the first 3 quarters of 2015, there were 440,900 deliveries among Blacks, 636,400 deliveries among Hispanics, 192,800 deliveries among Asian/Pacific/Islanders, and 1.6 million deliveries among Whites (rounded to the nearest hundred). Percentages in the figure are based on unrounded counts. Other races/ethnicities are not shown.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

■ **Among delivery hospitalizations, Black and Hispanic women were younger than White and Asian/Pacific Islander women.**

A large percentage of Black and Hispanic women with a delivery hospitalization were in the youngest age groups: <20 years (8.9 and 8.8 percent, respectively) or 20–29 years (57.8 and 53.0 percent, respectively). By comparison, fewer White women with a delivery hospitalization were in these younger age groups (4.7 percent aged <20 and 49.0 percent aged 20–29 years). Compared with White women, Asian/Pacific Islander women with a delivery hospitalization were more likely to be older (63.6 vs. 46.3 percent were aged 30 years or older).

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[14] Creanga AA, Bateman BT, Kuklina EV, Callaghan WM. Racial and ethnic disparities in severe maternal morbidity: a multistate analysis, 2008-2010. American Journal of Obstetrics & Gynecology. 2014;210(5):435.e1–8.

Figure 5 displays the rate of any severe maternal morbidity (per 10,000 delivery hospitalizations) and the rate of in-hospital mortality (per 100,000 delivery hospitalizations) by patient race/ethnicity in 2006 and 2015. Deliveries involving severe maternal morbidity include women who may or may not have died in the hospital. In-hospital deaths during the delivery stay include women who may or may not have had 1 of the 21 indicators of severe maternal morbidity. Thus, if a woman with an indicator of severe maternal morbidity died in the hospital, the delivery was counted as both a morbidity and a mortality. The difference in rates between each racial/ethnic group and White women is noted for 2006 and 2015.

Figure 5. Rates of severe maternal morbidity and in-hospital deaths among delivery hospitalizations, by patient race/ethnicity, 2006 and 2015

Abbreviation: N/A, not applicable

Note: Other races/ethnicities are not shown.

[a] Suppressed because of cell size <11. Rounded to the nearest 10, in 2006 there were 43,650 delivery hospitalizations with any severe maternal morbidity that did not result in in-hospital death, 300 delivery hospitalizations with any severe maternal morbidity that did result in in-hospital death, and 70 delivery hospitalizations that resulted in in-hospital death that did not have an indicator of severe maternal morbidity; during the first 3 quarters of 2015, the number of deliveries falling in these categories was 43,700, 130, and 30, respectively.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 2006 and 2015 quarters 1–3, weighted to provide national estimates using the same methodology as the Nationwide Inpatient Sample (NIS), 2011 and prior years

- **Compared with other racial/ethnic groups, rates of severe maternal morbidity and death during the delivery hospitalization were highest among Black women in both 2006 and 2015.**

  In 2015, the rate of severe maternal morbidity per 10,000 delivery hospitalizations was 240.7 for Blacks—49 percent higher than the rate among Hispanics (161.3), 74 percent higher than the rate among Asian/Pacific Islanders (138.7), and 112 percent higher than the rate among Whites (113.6).

Similarly, the rate of in-hospital death per 100,000 delivery hospitalizations in 2015 was 10.9 for Blacks—123 percent higher than the rate among Hispanics (4.9), and 193 percent higher than the rate among Whites (3.7).

- **Whereas rates of severe maternal morbidity increased from 2006 through 2015 across all racial/ethnic groups, rates of in-hospital mortality decreased for each group.**

  Although rates of severe maternal morbidity increased from 2006 through 2015 (e.g., from 164.0 to 240.7 per 10,000 deliveries among Black women), rates of in-hospital mortality declined by as much as nearly half (e.g., from 19.0 to 10.9 per 100,000 deliveries among Black women). Increases in severe maternal morbidity and decreases in in-hospital mortality occurred for each of the other racial/ethnic groups as well.

- **Disparities in severe maternal morbidity between Hispanic and Asian/Pacific Islander women and White women decreased, yet the disparity between Black women and White women remained stable.**

  In 2006, the rate of severe maternal morbidity was 115 percent higher among Blacks than among Whites (164.0 vs. 76.3 per 10,000 delivery hospitalizations). This disparity was similar in 2015, with a 112 percent higher rate for Black than for White women.

  In contrast, disparities in severe maternal morbidity decreased for Hispanic and Asian/Pacific Islander women, as compared with White women. Between 2006 and 2015, the percentage difference in rate between Hispanics and Whites decreased from 55 to 42 percent. The disparity between Asian/Pacific Islanders and Whites also decreased (from 29 to 22 percent).

- **Racial/ethnic disparities in in-hospital maternal mortality decreased between 2006 and 2015.**

  In 2006 the rate of in-hospital death was 248 percent higher for Black women, 50 percent higher for Hispanic women, and 69 percent higher for Asian/Pacific Islander women than for White women. In 2015, disparities generally remained but decreased—the rate for Blacks was 193 percent higher and the rate for Hispanics was 31 percent higher than the rate for Whites.

About Statistical Briefs

Healthcare Cost and Utilization Project (HCUP) Statistical Briefs provide basic descriptive statistics on a variety of topics using HCUP administrative health care data. Topics include hospital inpatient, ambulatory surgery, and emergency department use and costs, quality of care, access to care, medical conditions, procedures, and patient populations, among other topics. The reports are intended to generate hypotheses that can be further explored in other research; the reports are not designed to answer in-depth research questions using multivariate methods.

Data Source

The estimates in this Statistical Brief are based upon data from HCUP. An analysis file was used that was derived from the HCUP State Inpatient Databases (SID) from 2006 through the third quarter of 2015. This file was weighted to provide national estimates calculated with the same methodology as the Nationwide Inpatient Sample (NIS) in 2011 and prior years. This is the same file used for the Agency for Research and Quality (AHRQ) National Healthcare Quality and Disparities Report (QDR). The fourth quarter of 2015 is excluded because of the transition of the International Classification of Diseases coding system from the 9th to the 10th revision.[15]

Definitions

Diagnoses, procedures, ICD-9-CM, and 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.

All-listed procedures include all procedures performed during the hospital stay, whether for definitive treatment or for diagnostic or exploratory purposes. The *first-listed procedure* is the procedure that is listed first on the discharge record. Inpatient data define this as the *principal procedure*—the procedure that is performed for definitive treatment rather than for diagnostic or exploratory purposes (i.e., the procedure that was necessary to take care of a complication).

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses and procedures. There are approximately 14,000 ICD-9-CM diagnosis codes. There are approximately 4,000 ICD-9-CM procedure 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
The ICD-9-CM codes defining severe maternal morbidity (with or without in-hospital death) include the diagnosis and procedure codes listed in Table 3. The definition was based on all-listed codes on the delivery hospitalization record, using methods developed by the Centers for Disease Control and Prevention.[16]

[15] Barrett ML, Heslin KC, Yoon F, Moore BJ. Case Study: National Healthcare Quality and Disparities Report (QDR) Sensitivity Analysis on Developing AHRQ Quality Indicator Estimates for 2015 Using Only ICD-9-CM Data. April 7, 2017. Agency for Healthcare Research and Quality. www.hcup-us.ahrq.gov/datainnovations/CaseStudy_QDRanalysis04072017.pdf. Accessed April 24, 2018.
[16] Centers for Disease Control and Prevention. Severe Maternal Morbidity in the United States. November 2017. www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html. Accessed April 24, 2018.

Table 3. Diagnosis and procedure codes used to define 21 indicators of maternal morbidity as specified by the Centers for Disease Control and Prevention

Severe maternal morbidity indicator	Diagnosis or procedure	ICD-9-CM code
Acute myocardial infarction	Diagnosis	410.xx
Aneurysm	Diagnosis	441.xx
Acute renal failure	Diagnosis	584.5, 584.6, 584.7, 584.8, 584.9, 669.3x
Adult respiratory distress syndrome	Diagnosis	518.5x, 518.81 518.82 518.84, 799.1
Amniotic fluid embolism	Diagnosis	673.1x
Cardiac arrest/ventricular fibrillation	Diagnosis	427.41, 427.42, 427.5
Disseminated intravascular coagulation	Diagnosis	286.6, 286.9, 666.3x
Eclampsia	Diagnosis	642.6x
Heart failure/arrest during surgery or procedure	Diagnosis	997.1
Puerperal cerebrovascular disorders	Diagnosis	430.xx, 431.xx, 432.xx, 433.xx, 434.xx, 436.xx, 437.xx, 671.5x, 674.0x, 997.02
Pulmonary edema/acute heart failure	Diagnosis	518.4, 428.1, 428.0, 428.21, 428.23, 428.31, 428.33, 428.41, 428.43
Severe anesthesia complications	Diagnosis	668.0x, 668.1x, 668.2x
Sepsis	Diagnosis	038.xx, 995.91, 995.92, 670.2x
Shock	Diagnosis	669.1x, 785.5x, 995.0, 995.4, 998.0x
Sickle cell disease with crisis	Diagnosis	282.42, 282.62, 282.64, 282.69
Air and thrombotic embolism	Diagnosis	415.1x, 673.0x, 673.2x, 673.3x, 673.8x
Blood transfusion	Procedure	99.0x
Conversion of cardiac rhythm	Procedure	99.6x
Hysterectomy	Procedure	68.3x–68.9x
Temporary tracheostomy	Procedure	31.1
Ventilation	Procedure	93.90, 96.01, 96.02, 96.03, 96.05

Abbreviation: ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification

If the delivery involving severe maternal morbidity did not involve a procedure listed in Table 3 or did not result in death during the delivery hospitalization, it was counted as involving severe maternal morbidity only if the length of stay was—

- Greater than or equal to 4 days, if the delivery was vaginal or by cesarean section
- Greater than or equal to 5 days, if the delivery was a secondary cesarean section

Additionally, deliveries were counted as involving severe maternal morbidity only if the woman was not transferred into the hospital from another hospital, and only if the woman was not transferred out of the hospital into another hospital.

In-hospital deaths (with or without severe maternal morbidity) were defined as delivery records with a disposition indicating that the woman died.

Delivery hospitalizations were defined using an expanded definition developed by Kuklina et al. (2008), as shown in Table 4.[17]

Table 4. Enhanced delivery hospitalization identification method

Description	Codes
Outcome of delivery diagnosis	ICD-9-CM = V27.x
Normal delivery diagnosis	ICD-9-CM = 650
DRG delivery codes	Before October 1, 2007: DRG = 370 (complicated cesarean section) DRG = 371 (uncomplicated cesarean section) DRG = 372 (complicated vaginal delivery) DRG = 373 (uncomplicated vaginal delivery) DRG = 374 (uncomplicated vaginal delivery with sterilization and/or dilation and curettage) DRG = 375 (vaginal delivery with operation room procedure except sterilization and/or dilation and curettage) On or after October 1, 2007: MS-DRG = 765 (complicated cesarean section) MS-DRG = 766 (uncomplicated cesarean section) MS-DRG = 767 (uncomplicated vaginal delivery with sterilization and/or dilation and curettage) MS-DRG = 768 (vaginal delivery with operation room procedure except sterilization and/or dilation and curettage) MS-DRG = 774 (complicated vaginal delivery) MS-DRG = 775 (uncomplicated vaginal delivery)
Selected delivery related procedures	ICD-9-CM = 72.0, 72.1, 72.21, 72.29, 72.31, 72.39, 72.4, 72.6 (forceps) ICD-9-CM = 72.51, 72.52, 72.53, 72.54 (breech extraction) ICD-9-CM = 72.71, 72.79 (vacuum extraction) ICD-9-CM = 72.8, 72.9 (other specified and unspecified delivery) ICD-9-CM = 73.22 (internal and combined version and extraction) ICD-9-CM = 73.59 (other manually assisted deliveries) ICD-9-CM = 73.6 (episiotomy) ICD-9-CM = 74.0, 74.1, 74.2, 74.4, 74.99 (cesarean section)
Exclusions	ICD-9-CM = 630 (hydatidiform mole diagnosis) ICD-9-CM = 631 (other abnormal product of conception diagnosis) ICD-9-CM = 633.x (ectopic pregnancy diagnosis) ICD-9-CM = 632, 634.xx, 635.xx, 636.xx, 637.xx, 638.x, 639.x (abortion diagnosis) ICD-9-CM = 69.01, 69.51, 74.91, 75.0 (abortion procedure)

Abbreviations: DRG, diagnosis-related group; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; MS-DRG, Medicare severity diagnosis-related group

Additionally, both the denominator and numerator were limited to deliveries at community, nonrehabiliation hospitals, to women aged 12–55 years, and to records with sex equal to female.

Types of hospitals included in the HCUP National (Nationwide) Inpatient Sample
The National (Nationwide) Inpatient Sample (NIS) is based on data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). The NIS includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Beginning in 2012, long-term acute care hospitals are also excluded. However, if a patient received long-term care, rehabilitation,

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[17] Kuklina EV, Whiteman MK, Hillis SD, Jamieson DJ, Meikle SF, Posner SF, et al. An enhanced method for identifying obstetric deliveries: implications for estimating maternal morbidity. Maternal Child Health Journal. 2008;12(4):469–77.

or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay will be included in the NIS.

Types of hospitals included in HCUP State Inpatient Databases
This analysis used State Inpatient Databases (SID) limited to data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay was included in the analysis.

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 woman who delivers multiple times in 1 year will be counted each time as a separate discharge from the hospital.

Location of patients' residence
Place of residence is based on a simplified adaptation of the Urban Influence Codes (UIC) developed by the United States Department of Agriculture (USDA) Economic Research Service (ERS). Starting with 2014 data, the county-level designation is based on the 2013 version of the UIC. Prior to 2014, the categorization was based on the 2003 version of the UIC. The 12 categories of the UIC are combined into 4 broader categories that differentiate between large metropolitan counties (include one or more urbanized areas with at least 1 million residents), small metropolitan counties (include one or more urbanized areas with 50,000–999,999 residents), micropolitan counties (include at least one urbanized area with 10,000–49,999 residents), and nonurban residual counties (rural).

Community-level income
Community-level income is based on the median household income of the patient's ZIP Code of residence. Quartiles are defined so that the total U.S. population is evenly distributed. Cut-offs for the quartiles are determined annually using ZIP Code demographic data obtained from Claritas, a vendor that adds value to data from the U.S. Census Bureau.[18] The income quartile is missing for patients who are homeless or foreign.

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
- 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.

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[18] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed June 6, 2018.

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

Reporting of race and ethnicity
Data on Hispanic ethnicity are collected differently among the States and also can differ from the census methodology of collecting information on race (White, Black, Asian/Pacific Islander, American Indian/Alaska Native, Other [including mixed race]) separately from ethnicity (Hispanic, non-Hispanic). State data organizations often collect Hispanic ethnicity as one of several categories that include race. Therefore, for multistate analyses, HCUP creates the combined categorization of race and ethnicity for data from States that report ethnicity separately. When a State data organization collects Hispanic ethnicity separately from race, HCUP uses Hispanic ethnicity to override any other race category to create a Hispanic category for the uniformly coded race/ethnicity data element, while also retaining the original race and ethnicity data. This Statistical Brief reports race/ethnicity for the following categories: Hispanic, non-Hispanic White, non-Hispanic Black, non-Hispanic Asian/Pacific Islander, and non-Hispanic Other.

Safety-net hospital
Using data from all community, nonrehabilitation hospitals in the State Inpatient Databases (SID), the number of discharges paid by Medicaid or that were uninsured was divided by the total number of discharges at each hospital. Hospitals were ranked by this percentage, and those hospitals falling in the top 25 percent were defined as safety-net hospitals. Remaining hospitals were defined as nonsafety-net hospitals.

Minority-serving hospital
Using data from all community, nonrehabilitation hospitals in the State Inpatient Databases (SID) with reliable reporting of race/ethnicity, the number of discharges among patients that were not White was divided by the total number of discharges at each hospital. Hospitals were ranked by this percentage, and those hospitals falling in the top 25 percent were defined as minority-serving hospitals. Remaining hospitals were defined as nonminority-serving hospitals.

Teaching hospital
Teaching hospitals are hospitals that are members of the University HealthSystem Consortium or the Council of Teaching Hospitals.

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 Department of Health and Social Services
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
Delaware Division of Public Health
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
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 State Department of Health
Missouri Hospital Industry Data Institute
Montana Hospital Association
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 Department of Health and Human Resources, West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the NIS

The HCUP National (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, nonrehabilitation hospitals). The NIS includes all payers. It is drawn from a sampling frame that contains hospitals comprising more than 95 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use. Over time, the sampling frame for the NIS has changed; thus, the number of States contributing to the NIS varies from year to year. The NIS is intended for national estimates only; no State-level estimates can be produced.

The 2012 NIS was redesigned to optimize national estimates. The redesign incorporates two critical changes:

- Revisions to the sample design—starting with 2012, the NIS is now a *sample of discharge records from all HCUP-participating hospitals*, rather than a sample of hospitals from which all discharges were retained (as is the case for NIS years before 2012).

- Revisions to how hospitals are defined—the NIS now uses the *definition of hospitals and discharges supplied by the statewide data organizations* that contribute to HCUP, rather than the definitions used by the American Hospital Association (AHA) Annual Survey of Hospitals.

The new sampling strategy is expected to result in more precise estimates than those that resulted from the previous NIS design by reducing sampling error: for many estimates, confidence intervals under the new design are about half the length of confidence intervals under the previous design. The change in sample design for 2012 necessitates recomputation of prior years' NIS data to enable analyses of trends that use the same definitions of discharges and hospitals.

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.

About the QDR

The *National Healthcare Quality and Disparities Report* (QDR) measures and tracks trends in quality and disparities in seven key areas of health care: patient safety, person-centered care, care coordination, effective treatment, healthy living, care affordability, and access to health care. The QDR is an annual report that was commissioned by Congress in 1999 and first published in 2003. Beginning with the 2014 report, findings that previously appeared in two separate reports (the *National Healthcare Quality Report* and the *National Healthcare Disparities Report*) have been integrated into a single document that provides a comprehensive overview of the quality of health care received by the general population and disparities in care experienced by different racial, ethnic, and socioeconomic groups. Information on individual measures are available through chartbooks, which are posted periodically. The QDR is designed and produced by AHRQ, with support from the Department of Health and Human Services (HHS) and private sector partners.

For More Information

For other information on pregnancy and childbirth, refer to the HCUP Statistical Briefs located at www.hcup-us.ahrq.gov/reports/statbriefs/sb_pregnancy.jsp.

For additional HCUP statistics, visit:

- HCUP Fast Stats at 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 www.hcupnet.ahrq.gov/

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

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

Agency for Healthcare Research and Quality. Overview of the National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated February 2018. www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed February 12, 2018.

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 April 2017. www.hcup-us.ahrq.gov/sidoverview.jsp. Accessed January 18, 2018.

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Acknowledgments

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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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