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Delivery Hospitalizations Involving Preeclampsia and Eclampsia, 2005–2014

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Introduction

Preeclampsia is a disorder of new-onset high blood pressure occurring after 20 weeks of gestation. The diagnosis of preeclampsia is characterized by high blood pressure[1] and either excess protein in the urine[2] or, in the absence of proteinuria, other signs or symptoms, such as thrombocytopenia, renal insufficiency, impaired liver function, pulmonary edema, or cerebral or visual symptoms.[3]

Although rare, eclampsia occurs when women suffering from preeclampsia during pregnancy develop seizures, which may be followed by coma, posing a threat to the life of the mother and baby.[4]

Women with preexisting hypertension (high blood pressure before pregnancy or within the first 20 weeks of gestation) and gestational hypertension (onset of high blood pressure after 20 weeks of gestation) are at increased risk for preeclampsia/eclampsia, although many women who develop preeclampsia/eclampsia have no history of high blood pressure.[5] Other risk factors for preeclampsia/eclampsia include preexisting diabetes, renal disease, obesity, falling in the youngest or oldest categories of maternal age, multiple gestations, women giving birth for the first time, and race.[6,7]

Highlights

- In 2014, almost 5 percent of all inpatient deliveries involved preeclampsia/eclampsia—a 21 percent increase from 2005.
- Of the nearly 177,000 deliveries with the condition in 2014, 1 percent had eclampsia, 37 percent had severe preeclampsia, 47 percent had mild/unspecified preeclampsia, and 15 percent had preeclampsia/eclampsia with preexisting hypertension.
- For black women, the rate of preeclampsia/eclampsia was 70 per 1,000 deliveries in 2014—60 percent higher than for white women (43 per 1,000).
- The condition was less severe among white women than among black women. Over half of white women with the condition had mild/unspecified preeclampsia, compared with 37 percent of black women.
- Compared with other deliveries, a higher percentage of those with preeclampsia/eclampsia were among women who were the youngest, the oldest, black, and from the poorest areas and the South.
- Compared with other deliveries, mean length and cost of stays with preeclampsia/eclampsia were 70 percent higher.
- Procedural interventions (such as cesarean section, blood transfusion, hysterectomy, ventilation) were more common among deliveries with preeclampsia/eclampsia than among other deliveries, as were severe obstetric morbidities (such as renal failure) and poor infant outcomes.

[1] ≥140/90 mm Hg on two occasions 4 hours apart.
[2] ≥300 mg/dL on a 24-hour urine protein test, protein:creatinine ratio of ≥0.3 mg/mmol, or urine protein dipstick reading >1 if quantitative analysis is not available.
[3] American College of Obstetricians and Gynecologists. Hypertension in Pregnancy. Washington, DC: American College of Obstetricians and Gynecologists; 2013.
[4] Ibid.
[5] Mammaro A, Carrara S, Cavaliere A, Ermito S, Dinatale A, Pappalardo EM, et al. Hypertensive disorders of pregnancy. Journal of Prenatal Medicine. 2009;3(1):1–5.
[6] Ibid.
[7] Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. American Journal of Obstetrics & Gynecology. 2000;183:S1–S22.

Black women are more likely to develop preeclampsia and to experience poorer outcomes associated with the condition, including progression to eclampsia and in rare cases, death.[8,9]

In addition to increased risk of mortality, women with preeclampsia/eclampsia are more likely to experience cesarean section (C-section), placental abruption, disseminated intravascular coagulation, cerebral hemorrhage, pulmonary edema, and renal failure.[10,11,12] Infants born to mothers with preeclampsia/eclampsia are more likely to have intrauterine growth restriction, premature birth, and intrauterine death.[13]

In the United States, preeclampsia/eclampsia and other hypertensive disorders of pregnancy have increased over the last 2 decades.[14] Preeclampsia/eclampsia is estimated to complicate between 3 and 6 percent of all pregnancies and is considered one of the most preventable causes of maternal death.[15,16] However, there is little recent national population-based data on the prevalence of the condition and its associated coexisting conditions and complications that can inform efforts to prevent preeclampsia/eclampsia.[17,18]

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents data on the prevalence of preeclampsia/eclampsia among inpatient delivery hospitalizations in 2014. The Brief describes trends in the rate of preeclampsia/eclampsia from 2005 through 2014, overall and by patient and hospital characteristics. Characteristics of deliveries with preeclampsia/eclampsia are examined in 2014.

Deliveries with preeclampsia/eclampsia are compared with all other deliveries, with respect to patient and hospital characteristics, coexisting conditions, and infant and maternal outcomes.[19,20] These characteristics are also compared across type of diagnosis: eclampsia, severe preeclampsia, mild or unspecified preeclampsia, and preeclampsia/eclampsia with preexisting hypertension.[21]

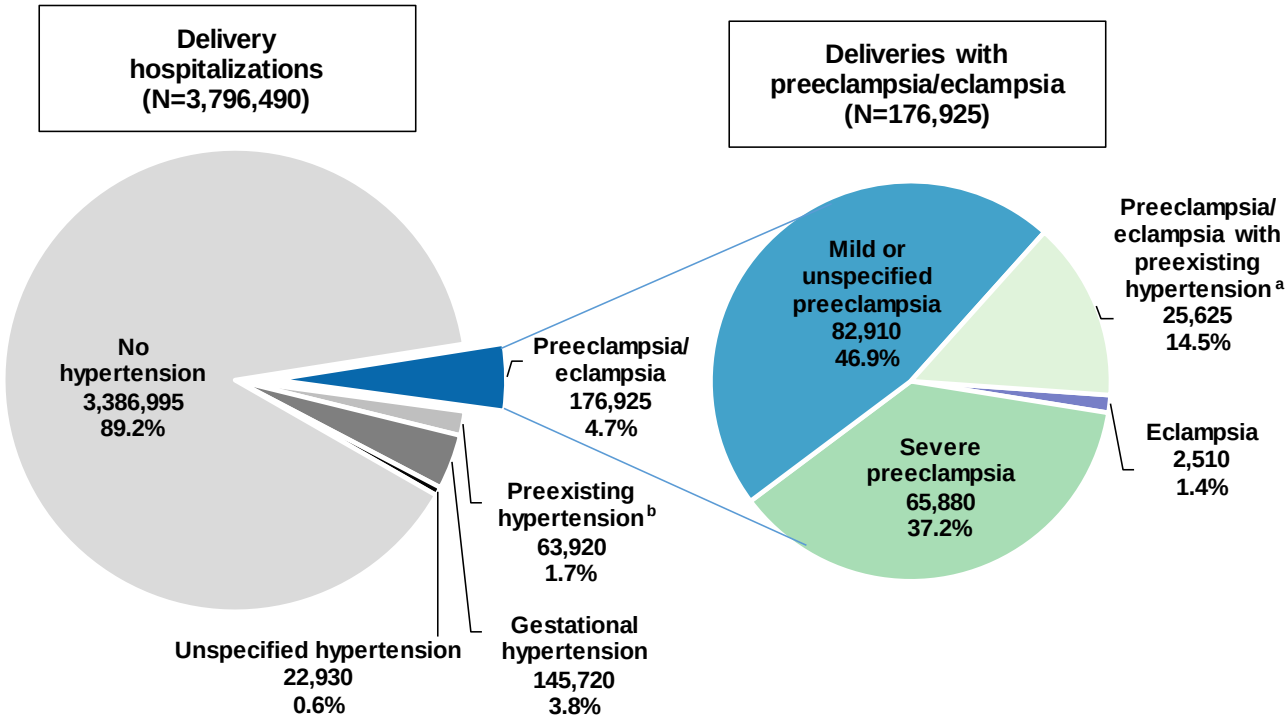
Delivery hospitalizations represent the hospital stay for the mother and not the infant. Descriptions of infant outcomes are those conditions that appear on the maternal record. All differences between estimates noted in the text are 10 percent or greater.

[8] Shahul S, Tung A, Minhaj M, Nizamuddin J, Wenger J, Mahmood E, et al. Racial disparities in comorbidities, complications, and maternal and fetal outcomes in women with preeclampsia/eclampsia. Hypertension in Pregnancy. 2015;34(4):506–15.
[9] Tanaka M, Jaamaa G, Kaiser M, Hills E, Soim A, Zhu M, et al. Racial disparity in hypertensive disorders of pregnancy in New York State: a 10-year longitudinal population-based study. American Journal of Public Health. 2007;97(1):163–70.
[10] Ibid.
[11] Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. American Journal of Obstetrics and Gynecology. 2000;183:S1–S22.
[12] Kuklina EV, Ayala C, Callaghan WM. Hypertensive disorders and severe obstetric morbidity in the United States. Obstetrics and Gynecology. 2009;113(6):1299–306.
[13] Mammaro A, Carrara S, Cavaliere A, Ermito S, Dinatale A, Pappalardo EM, et al. Hypertensive disorders of pregnancy. Journal of Prenatal Medicine. 2009;3(1):1–5.
[14] Centers for Disease Control and Prevention. Data on Selected Pregnancy Complications in the United States. October 2016. www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-complications-data.htm. Accessed March 29, 2017.
[15] Shahul et al., 2015. Op. cit.
[16] D'Alton ME, Main EK, Menard MK, Levy BS. The National Partnership for Maternal Safety. Obstetrics and Gynecology. 2014;123:973–7.
[17] Ananth CV, Keyes KM, Wapner RJ. Pre-eclampsia rates in the United States, 1980–2010: age-period-cohort analysis. BMJ. 2013;347:f6564.
[18] Wallis AB, Saftlas AF, Hsia J, Atrash HK. Secular trends in the rates of preeclampsia, eclampsia, and gestational hypertension, United States, 1987–2004. American Journal of Hypertension. 2008;21:521–6.
[19] Kuklina EV, Meikle SF, Jamieson DJ, Whiteman MK, Barfield WD, Hills SD, et al. Severe obstetric morbidity in the United States: 1998–2005. Obstetrics and Gynecology. 2009;113(2 Pt 1):293–9.
[20] Callaghan WM, Creanga AA, Kuklina EV. Severe maternal morbidity among delivery and postpartum hospitalizations in the United States. Obstetrics and Gynecology. 2012;120(5):1029–36.
[21] The first three categories are defined by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for mild or unspecified preeclampsia (642.4), severe preeclampsia (642.5), and eclampsia (642.6). These codes are used if preexisting hypertension was not present. The last category is defined by the code 642.7, which is used if preexisting hypertension was present with preeclampsia/eclampsia. However, records with this code lack detail on the severity of preeclampsia/eclampsia.

Findings

Prevalence of delivery hospitalizations involving preeclampsia/eclampsia, 2014
The left side of Figure 1 displays all delivery hospitalizations in 2014 by presence of preeclampsia/eclampsia as well as other hypertension-related diagnoses complicating pregnancy, childbirth, and the puerperium. The right side of Figure 1 displays the subset of delivery hospitalizations with a diagnosis of preeclampsia/eclampsia in 2014 by type of preeclampsia/eclampsia diagnosis.

Figure 1. Hypertension-related diagnoses among delivery hospitalizations, 2014



[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

[b] Preexisting hypertension without preeclampsia or eclampsia.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **In 2014, more than 1 in 10 delivery hospitalizations had a diagnosis of hypertension. Among these deliveries with any hypertension-related diagnosis, preeclampsia/eclampsia was the most common.**

  In 2014, 409,495 delivery hospitalizations had a diagnosis of hypertension complicating pregnancy, childbirth, and the puerperium, representing 10.8 percent of 3.8 million total deliveries. Preeclampsia/eclampsia was the most common type of hypertension-related diagnosis (4.7 percent), followed by gestational hypertension (3.8 percent), preexisting hypertension (1.7 percent), and unspecified hypertension (0.6 percent).

- **In 2014, of all delivery hospitalizations with a diagnosis of preeclampsia/eclampsia, over one-third had severe preeclampsia.**

  In 2014, 176,925 delivery hospitalizations had a diagnosis of preeclampsia/eclampsia, representing 4.7 percent of 3.8 million total deliveries. Although the most severe form of the condition (eclampsia) was rare (1.4 percent), an additional 37.2 percent of deliveries with any diagnosis of preeclampsia/eclampsia had severe preeclampsia. Nearly half of deliveries with

preeclampsia/eclampsia had mild or unspecified preeclampsia (46.9 percent), and 14.5 percent had preeclampsia/eclampsia with preexisting hypertension but lacked detail on the severity of the condition.

In addition to the deliveries shown in Figure 1, in 2014 there were 21,180 hospitalizations during or after pregnancy involving preeclampsia/eclampsia, in which the hospital stay did not result in delivery (data not shown). Although this Brief focuses on delivery hospitalizations, these antepartum and postpartum stays contribute to the total burden of preeclampsia/eclampsia in the inpatient hospital setting.

Characteristics of delivery hospitalizations involving preeclampsia/eclampsia, 2014

Table 1 compares patient and hospital characteristics among deliveries with preeclampsia/eclampsia with all other deliveries in 2014.

Table 1. Characteristics of deliveries with and without preeclampsia/eclampsia, 2014

Patient and hospital characteristics	Preeclampsia/ eclampsia, total	All other deliveries	Type of preeclampsia/eclampsia			
			Eclampsia	Severe preeclampsia	Mild or unspecified preeclampsia	Preeclampsia/ eclampsia with preexisting hypertension[a]
Total, N	176,925	3,619,565	2,510	65,880	82,910	25,625
Patient age, mean, years	28.5	28.3	25.8	28.3	27.8	31.3
Patient age, years, %						
<20	8.2	6.4	21.3	8.9	9.1	1.9
20–24	21.9	22.1	25.9	22.4	24.2	12.8
25–29	26.2	28.8	23.3	26.3	27.0	23.5
30–34	24.8	27.3	15.9	23.8	24.2	29.9
35–39	14.3	12.6	10.2	14.1	11.9	22.9
40+	4.6	2.8	3.4	4.4	3.5	8.9
Race/ethnicity, %						
White	46.6	50.3	44.8	42.9	51.6	39.7
Black	20.1	13.1	23.5	20.8	16.0	31.3
Hispanic	19.5	19.4	19.1	21.1	19.1	16.7
Asian/Pacific Islander	3.4	5.5	2.2	3.7	3.2	3.2
Other	4.9	5.2	4.8	5.3	4.9	4.0
Missing	5.6	6.5	5.6	6.3	5.2	5.1
Expected payer, %						
Medicare	1.0	0.7	1.2	1.0	0.7	1.8
Medicaid	45.2	42.9	56.8	45.9	43.1	49.5
Private insurance	49.2	50.8	37.0	48.5	51.5	44.6
Uninsured	2.1	2.8	2.6	2.3	2.1	1.8
Other	2.5	2.8	2.4	2.4	2.5	2.4
Community income, %						
Quartile 1 (poorest)	31.9	27.7	39.6	32.1	30.3	36.1
Quartile 2	26.7	26.5	24.3	25.8	27.3	27.3
Quartile 3	22.9	24.0	21.9	23.2	23.4	20.7
Quartile 4 (wealthiest)	18.4	21.9	14.2	18.9	19.0	15.8
Location of residence, %						
Large metropolitan	57.1	57.1	53.2	60.0	54.9	57.2
Small metropolitan	29.1	29.6	30.5	28.1	29.7	29.4
Micropolitan	8.2	8.0	8.8	6.9	9.3	7.8
Rural (noncore)	5.6	5.3	7.6	4.9	6.1	5.6
Hospital region, %						
Northeast	15.5	16.0	12.7	16.4	15.0	14.9
Midwest	20.3	21.3	18.5	20.3	20.5	19.4
South	42.6	38.3	48.6	40.8	42.5	46.9
West	21.7	24.3	20.1	22.5	22.0	18.7
Length of stay, mean, days	4.4	2.6	4.4	4.8	3.7	5.4
Cost per stay, mean, $	7,500	4,400	9,000	8,500	6,300	8,900

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **Compared with all other deliveries, those with preeclampsia/eclampsia were more likely to be among women in the youngest and oldest age categories, black women, women from the poorest areas, and women who delivered in the South.**

  Overall, deliveries with preeclampsia/eclampsia were more likely than all other deliveries to be among women in the youngest and oldest age groups (8.2 vs. 6.4 percent among patients aged less than 20 years; 18.9 vs. 15.4 percent among women aged 35 years or older) and to be among black women (20.1 vs. 13.1 percent). In addition, preeclampsia/eclampsia was more common among women who resided in the poorest areas (31.9 vs. 27.7 percent in income quartile 1) and those who delivered in the South (42.6 vs. 38.3 percent).

- **The mean length of stay and hospital costs were over 70 percent higher for deliveries with preeclampsia/eclampsia, compared with all other deliveries.**

  The mean length of stay was 71 percent higher for deliveries with preeclampsia/eclampsia compared with all other deliveries (4.4 vs. 2.6 days). The average hospital cost per stay was 70 percent higher for deliveries with preeclampsia/eclampsia compared with all other deliveries ($7,500 vs. $4,400).

- **There were differences in patient age and race/ethnicity across the types of preeclampsia/eclampsia.**

  - Of deliveries with eclampsia, 21.3 percent were among teens. In comparison, less than 10 percent of deliveries with other diagnoses for severe preeclampsia or mild preeclampsia were among teens. Only 6.4 percent of all other deliveries without a diagnosis of preeclampsia/eclampsia were in this age group.

  - Nearly 1 in 3 deliveries (31.3 percent) with a diagnosis of preeclampsia/eclampsia with preexisting hypertension were among black women. In comparison, only 13.1 percent of all other deliveries were among black women.

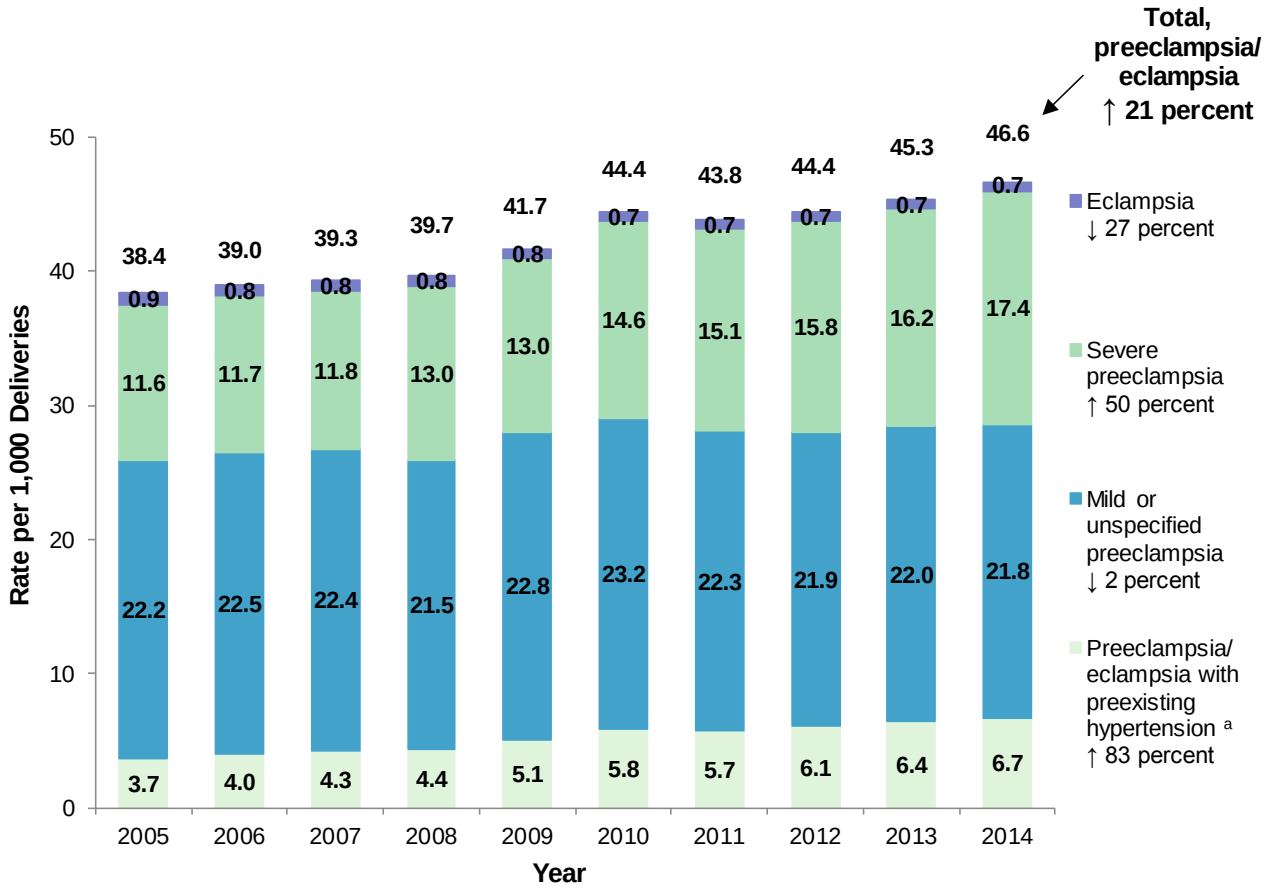
- **Deliveries involving preeclampsia/eclampsia with preexisting hypertension were associated with longer hospital stays. Hospital stays for more severe forms of preeclampsia/eclampsia were more expensive than the mild or unspecified type.**

  The mean length of stay was highest for deliveries with a diagnosis of preeclampsia/eclampsia with preexisting hypertension (5.4 days compared with 4.8 days or fewer among deliveries with other preeclampsia/eclampsia diagnoses). The average hospital cost per stay was lower for deliveries with mild or unspecified preeclampsia ($6,300) than for deliveries with the other preeclampsia/eclampsia diagnoses ($8,500–$9,000).

Rate of preeclampsia/eclampsia among delivery hospitalizations, 2005–2014

Figure 2 displays the rate of preeclampsia/eclampsia per 1,000 deliveries by type of diagnosis from 2005 through 2014.

Figure 2. Rate of preeclampsia/eclampsia among delivery hospitalizations, 2005–2014



[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2005–2014

- **From 2005 through 2014, the total rate of preeclampsia/eclampsia among delivery hospitalizations increased by 21 percent.**

  The total rate of preeclampsia/eclampsia increased from 38.4 per 1,000 deliveries in 2005 to 46.6 per 1,000 deliveries in 2014, an increase of 21 percent. The largest increases were for deliveries with preeclampsia/eclampsia with preexisting hypertension (which increased by 83 percent, from 3.7 to 6.7 per 1,000 deliveries) and deliveries with severe preeclampsia (which increased by 50 percent over the 10-year span, from 11.6 to 17.4 per 1,000 deliveries).

- **Although rare, the rate of eclampsia decreased by 27 percent from 2005 through 2014.**

  From 2005 through 2014, the rate of eclampsia decreased from 0.9 to 0.7 per 1,000 deliveries, a decrease of 27 percent. Deliveries with mild or unspecified preeclampsia remained stable at around 22 per 1,000 deliveries.

Table 2 presents the total rate of preeclampsia/eclampsia per 1,000 deliveries in 2005 and 2014, by patient and hospital characteristics.

Table 2. Number and rate of preeclampsia/eclampsia deliveries by patient and hospital characteristics, 2005 and 2014

Patient and hospital characteristics	2005		2014		Percent change in rate, 2005–2014
	Number of deliveries with preeclampsia/ eclampsia, N	Rate of preeclampsia/ eclampsia per 1,000 deliveries	Number of deliveries with preeclampsia/ eclampsia, N	Rate of preeclampsia/ eclampsia per 1,000 deliveries	
Total	155,839	38.4	176,925	46.6	21
Patient age, years					
<20	21,520	52.0	14,495	59.3	14
20–24	39,355	39.3	38,795	46.2	18
25–29	37,933	34.5	46,285	42.5	23
30–34	32,240	34.2	43,860	42.6	25
35–39	18,708	38.7	25,320	52.5	36
40+	6,068	54.1	8,170	73.5	36
Expected payer[a]					
Medicare	1,117	53.4	1,740	63.9	20
Medicaid	69,766	41.2	79,805	49.0	19
Private insurance	75,169	35.8	86,770	45.1	26
Uninsured	5,224	35.9	3,770	36.2	1
Community income					
Quartile 1 (poorest)	46,904	44.3	55,360	53.2	20
Quartile 2	39,444	40.1	46,325	46.8	17
Quartile 3	36,939	36.7	39,765	44.5	21
Quartile 4 (wealthiest)	28,354	30.8	31,915	39.4	28
Location of residence					
Large metropolitan	85,752	37.8	100,810	46.7	23
Small metropolitan	43,582	37.2	51,325	45.8	23
Micropolitan	15,808	42.6	14,420	47.6	12
Rural (noncore)	10,206	43.7	9,880	48.7	12
Hospital region					
Northeast	25,572	34.6	27,350	45.0	30
Midwest	32,663	38.6	35,845	44.4	15
South	66,200	43.1	75,365	51.6	20
West	31,405	33.6	38,365	41.7	24

[a] Other payers are not shown.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2005 and 2014

- **The rate of preeclampsia/eclampsia was highest among women in the oldest and youngest age groups in both 2005 and 2014, but the rate increased most rapidly among women aged 35 years or older.**

  In 2005 and 2014, the rate of preeclampsia/eclampsia was highest among women younger than 20 years and women aged 40 years or older (59.3 and 73.5 per 1,000 deliveries, respectively, in 2014). From 2005 to 2014, the rate increased the most among women aged 35–39 years and 40 years and older (each with a 36 percent increase). The rate among women younger than 20 years increased by only 14 percent, the smallest increase of any age group.

- **The rate of preeclampsia/eclampsia was higher among deliveries paid by Medicaid than among those paid by private insurance, but the rate increased more over time among deliveries paid by private insurance.**

  Medicaid and private insurance paid for the vast majority of deliveries. In 2005, the rate of preeclampsia/eclampsia was 15 percent higher among deliveries paid by Medicaid than among those paid by private insurance (41.2 vs. 35.8 per 1,000 deliveries). In 2014, this difference decreased (49.0 vs. 45.1 per 1,000 deliveries), reflecting a 19 percent increase in the rate of preeclampsia/eclampsia among deliveries with Medicaid versus a 26 percent increase in the rate among deliveries with private insurance.

  Although Medicare paid for relatively fewer deliveries compared with the other payers, the rate of preeclampsia/eclampsia was highest among women with Medicare (53.4 per 1,000 deliveries in 2005 and 63.9 per 1,000 deliveries in 2014).

- **The rate of preeclampsia/eclampsia was highest among women who resided in the poorest areas, but the rate rose more among those from the wealthiest areas.**

  In both 2005 and 2014, the rate of preeclampsia/eclampsia was highest among women who resided in the poorest ZIP Codes (income quartile 1). During this time period, the rate increased from 44.3 to 53.2 per 1,000 deliveries among women in these areas—an increase of 20 percent. In comparison, the rate was 30.8 per 1,000 deliveries among women who resided in the wealthiest ZIP Codes (income quartile 4) in 2005 but increased by 28 percent to 39.4 per 1,000 deliveries in 2014.

- **The rate of preeclampsia/eclampsia was highest among women who resided in nonmetropolitan areas, but the rate rose more among those from metropolitan areas.**

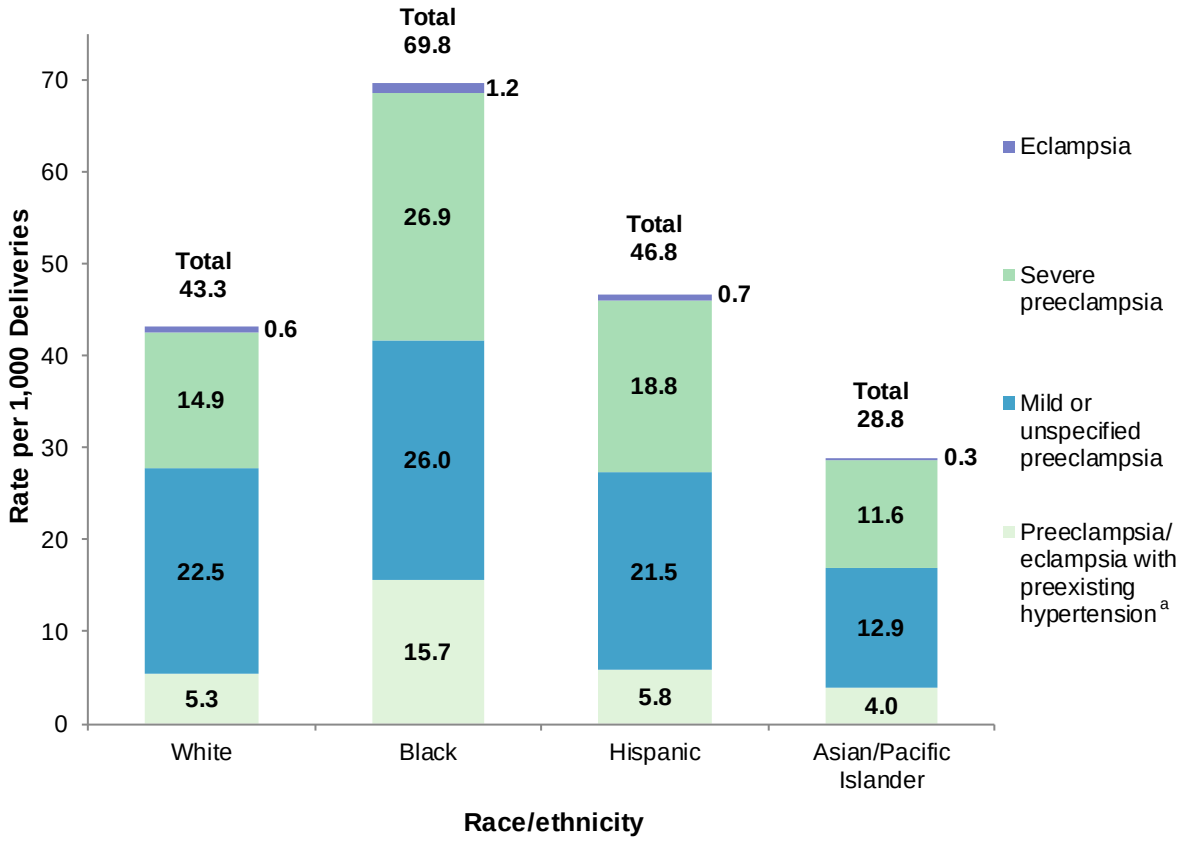
  The rate of preeclampsia/eclampsia was highest among women who resided in micropolitan and rural areas in 2005 (43–44 per 1,000 deliveries) and rose by 12 percent (to 48–49 per 1,000 deliveries in 2014). In comparison, in large and small metropolitan areas, the rate of preeclampsia/eclampsia was 37–38 per 1,000 deliveries in 2005 and increased by 23 percent to 46–47 per 1,000 deliveries in 2014.

- **The rate of preeclampsia/eclampsia was highest among women in the South, but the rate rose most rapidly in the Northeast.**

  In both 2005 and 2014, the rate of preeclampsia/eclampsia was highest among deliveries in the South (43.1 and 51.6 per 1,000 deliveries, respectively). The rate of preeclampsia/eclampsia rose across all regions from 2005 through 2014. However, the increase was largest among deliveries in the Northeast, where the rate rose by 30 percent from 34.6 to 45.0 per 1,000 deliveries.

Figure 3 presents the rate of preeclampsia/eclampsia per 1,000 deliveries in 2014, by race/ethnicity and type of diagnosis.

Figure 3. Rate of preeclampsia/eclampsia per 1,000 deliveries, by race/ethnicity and type of diagnosis, 2014



Notes: Trends by race/ethnicity are not shown because in 2005 a number of States did not contribute data on race/ethnicity, resulting in 26 percent of records with missing data. By 2014, the percentage of delivery records with missing data on race/ethnicity was only 6 percent. "Other" and missing races/ethnicities are not shown.

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **In 2014, the rate of preeclampsia/eclampsia was at least 50 percent higher among black women than among women of any other racial/ethnic group.**

  In 2014, the total rate of preeclampsia/eclampsia was higher among black women than among women of other racial/ethnic groups. The total rate of preeclampsia/eclampsia was 69.8 per 1,000 deliveries among black women—about 60 percent higher than the rate among white women (43.3 per 1,000 deliveries).

  In 2014, there was no substantial difference in the total rate of preeclampsia/eclampsia between white women and Hispanic women (43.3 vs. 46.8 per 1,000 deliveries). Asian/Pacific Islanders had the lowest total rate of preeclampsia/eclampsia of any racial/ethnic group (28.8 per 1,000 deliveries).

Table 3 examines each type of preeclampsia/eclampsia as a percentage of total deliveries with any preeclampsia/eclampsia by race/ethnicity.

Table 3. Percentage of each type of preeclampsia/eclampsia, by race/ethnicity, 2014

Type of preeclampsia/eclampsia	White, %	Black, %	Hispanic, %	Asian/Pacific Islander, %
Total	100.0	100.0	100.0	100.0
Eclampsia	1.4	1.7	1.4	0.9
Severe preeclampsia	34.3	38.5	40.3	40.4
Mild or unspecified preeclampsia	51.9	37.3	45.9	44.9
Preeclampsia/eclampsia with preexisting hypertension[a]	12.3	22.5	12.4	13.8

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

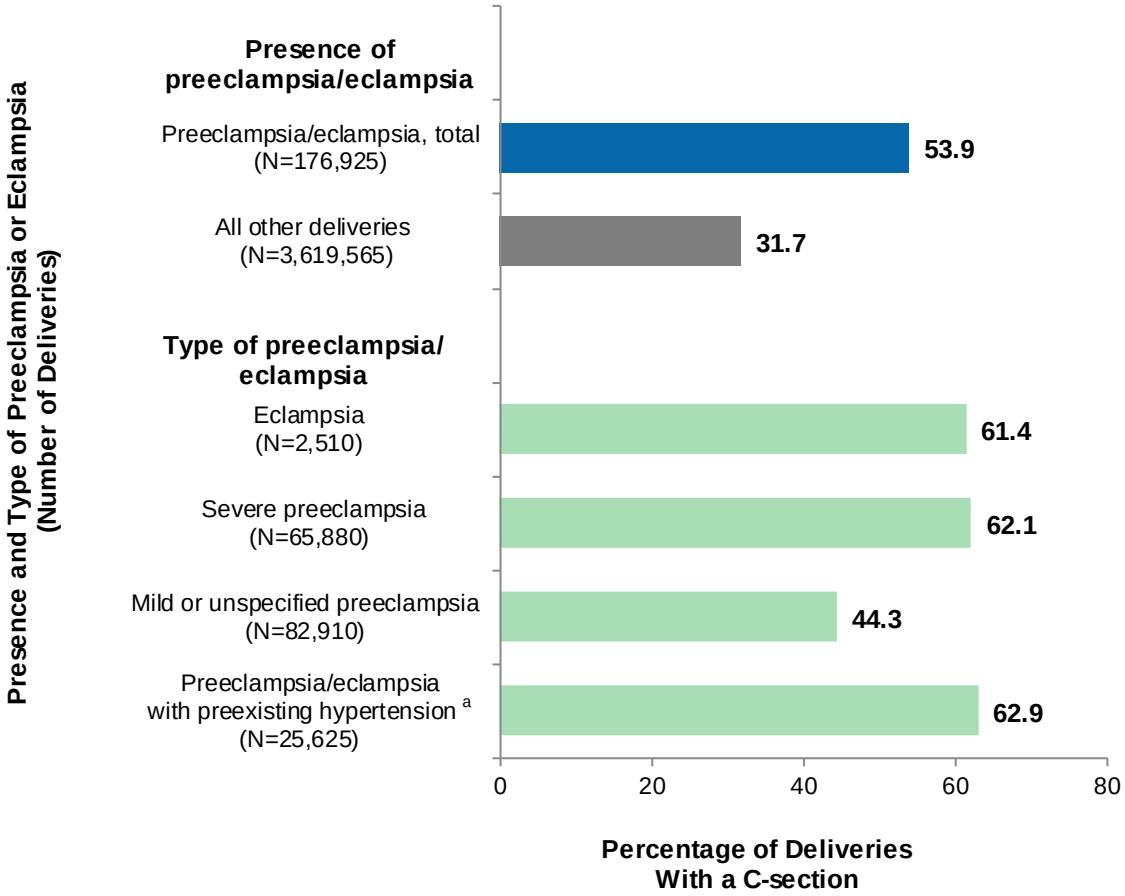
Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **Among women with preeclampsia/eclampsia, black women were more likely than women of other races/ethnicities to have a more severe diagnosis.**

  The rate of each type of preeclampsia/eclampsia diagnosis was higher among black women than among women of other races/ethnicities (Figure 3). When the rate for each type of preeclampsia/eclampsia was examined as a percentage of the total rate for any preeclampsia/eclampsia, black women were more likely than other women to have a more severe diagnosis. Among women with preeclampsia/eclampsia, the percentage with a diagnosis of preeclampsia/eclampsia with preexisting hypertension (which does not distinguish between severe and mild cases of the condition) was much greater for black women than for white women (22.5 vs. 12.3 percent), as was the percentage with eclampsia (1.7 vs. 1.4 percent) and severe preeclampsia (38.5 vs. 34.3 percent). At the same time, the percentage with mild or unspecified preeclampsia was much lower among black women than among white women (37.3 vs. 51.9 percent). The percentage of women with mild or unspecified preeclampsia was also lower for Hispanic and Asian/Pacific Islander women compared with white women (45–46 percent vs. 51.9 percent).

Coexisting conditions and outcomes among deliveries with preeclampsia/eclampsia, 2014
Figure 4 displays the percentage of deliveries that resulted in C-section in 2014, according to the presence and type of preeclampsia/eclampsia.

Figure 4. Prevalence of C-section among deliveries with preeclampsia/eclampsia, compared with all other deliveries, 2014



Abbreviation: C-section, cesarean section

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **Over half of all deliveries with preeclampsia/eclampsia involved C-section.**

  Among all deliveries with preeclampsia/eclampsia, 53.9 percent were by C-section, compared with 31.7 percent of deliveries not involving preeclampsia/eclampsia. The rate of C-section was over 60 percent for deliveries with a diagnosis of eclampsia, severe preeclampsia, and preeclampsia/eclampsia with preexisting hypertension. In comparison, the rate was 44.3 percent among deliveries with mild or unspecified preeclampsia.

Table 4 presents selected coexisting conditions for deliveries with preeclampsia/eclampsia, compared with all other deliveries, in 2014. The conditions displayed were chosen on the basis of prior literature and sorted according to their prevalence among deliveries with preeclampsia/eclampsia.

Table 4. Coexisting conditions among deliveries with preeclampsia/eclampsia, compared with all other deliveries, 2014

Coexisting condition	Preeclampsia/ eclampsia, total	All other deliveries	Type of preeclampsia/eclampsia			
			Eclampsia	Severe preeclampsia	Mild or unspecified preeclampsia	Preeclampsia/ eclampsia with preexisting hypertension[a]
Total, N	176,925	3,619,565	2,510	65,880	82,910	25,625
Coexisting condition, %						
Anemia	20.6	13.7	26.7	22.5	18.7	21.1
Obesity	17.3	6.7	7.8	15.5	14.1	33.2
Gestational diabetes	11.5	6.7	9.6	10.2	10.9	17.1
Multiple gestations	6.0	1.7	4.8	7.4	5.3	4.6
Thyroid dysfunction	4.9	3.6	3.2	5.4	4.1	6.4
Preexisting diabetes	4.7	1.0	2.2	4.4	3.0	11.4
Cardiovascular disorders	2.2	0.8	3.4	2.4	1.4	3.8

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **Compared with all other deliveries, those with preeclampsia/eclampsia had a higher proportion of coexisting conditions.**

  Coexisting conditions were more common among deliveries with preeclampsia/eclampsia than among all other deliveries. For example, obesity was a coexisting condition among 17.3 percent of deliveries with preeclampsia/eclampsia but among only 6.7 percent of all other deliveries.

  Among deliveries with preeclampsia/eclampsia, those with preexisting hypertension were more likely than those with other types of preeclampsia/eclampsia to have obesity (33.2 percent), gestational diabetes (17.1 percent), thyroid dysfunction (6.4 percent), preexisting diabetes (11.4 percent), and cardiovascular disorders (3.8 percent).

  Anemia occurred more frequently among deliveries with eclampsia (26.7 percent) than among deliveries with other types of preeclampsia/eclampsia (18.7 to 22.5 percent). Similarly, multiple gestations were more common among deliveries with severe preeclampsia (7.4 percent) than among deliveries with other types of preeclampsia/eclampsia (4.6 to 5.3 percent).

Table 5 presents select outcomes for deliveries with preeclampsia/eclampsia, compared with all other deliveries, in 2014. The conditions displayed were chosen on the basis of prior literature, grouped according to whether they were identified using procedure codes or diagnosis codes pertaining to the mother or infant, and sorted according to their prevalence among deliveries with preeclampsia/eclampsia.

Table 5. Outcomes among deliveries with preeclampsia/eclampsia, compared with all other deliveries, 2014

Delivery outcomes	Preeclampsia/ eclampsia, total	All other deliveries	Type of preeclampsia/eclampsia			
			Eclampsia	Severe preeclampsia	Mild or unspecified preeclampsia	Preeclampsia/ eclampsia with preexisting hypertension[a]
Total, N	176,925	3,619,565	2,510	65,880	82,910	25,625
Delivery outcomes, number per 1,000 total deliveries						
Procedures						
Red blood cell or platelet transfusion	42.7	10.5	79.7	63.5	26.9	36.9
Ventilation	5.3	0.5	69.7	6.1	1.6	8.6
Hysterectomy	1.6	1.0	6.0	1.7	0.9	2.9
Maternal diagnoses						
Early onset of labor	160.5	54.5	167.3	234.5	87.3	206.2
Placental abruption	23.8	9.9	57.8	32.9	14.7	26.3
Disseminated intravascular coagulation	9.9	2.6	33.9	15.3	5.7	7.8
Renal failure	9.3	0.4	31.9	14.5	2.8	14.6
Heart failure	5.4	1.6	—[b]	7.2	3.1	8.2
Adult respiratory distress syndrome	4.1	0.4	39.8	5.5	1.3	5.9
Peripartum cardiomyopathy	2.9	0.4	6.0	3.0	1.1	8.4
Pulmonary edema	1.4	0.1	—[b]	2.2	0.5	2.1
Shock	1.2	0.5	8.0	2.0	0.3	1.6
Puerperal cerebrovascular disorders	1.2	0.3	12.0	1.4	0.5	1.8
Deep venous thrombosis	1.1	0.6	—[b]	1.5	0.7	1.2
Sepsis	1.0	0.4	—[b]	1.4	0.5	1.6
Pulmonary embolism	0.8	0.2	—[b]	1.2	0.5	1.0
Severe anesthesia complications	0.4	0.1	—[b]	0.8	—[b]	—[b]
In-hospital death	0.3	0.0	—[b]	0.4	—[b]	—[b]
Infant-related diagnoses on the maternal record						
Poor fetal growth	74.6	25.9	53.8	101.5	44.9	103.2
Intrauterine death	11.6	6.2	27.9	15.5	6.1	18.0
Fetal distress	1.8	1.2	—[b]	1.7	1.8	1.6

[a] Records with ICD-9-CM diagnosis code 642.7, which indicates that preeclampsia or eclampsia was present with preexisting hypertension but does not specify the severity of the condition.

[b] Suppressed because of cell size <11 records.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2014

- **The rates of procedural interventions and adverse maternal outcomes were higher among deliveries with preeclampsia/eclampsia than among all other deliveries.**

  Procedural interventions were more common among deliveries with preeclampsia/eclampsia than among other types of deliveries: blood transfusion was 4 times more common (42.7 vs. 10.5 per 1,000 deliveries), ventilation was 10 times more common (5.3 vs. 0.5 per 1,000 deliveries), and hysterectomy was 50 percent more common (1.6 vs. 1.0 per 1,000 deliveries).

  Although rare, all the adverse maternal outcomes considered were more common among deliveries with preeclampsia/eclampsia than among other types of deliveries. This included renal failure, heart failure, and peripartum cardiomyopathy. These outcomes were also more common for each type of preeclampsia/eclampsia compared with all other deliveries, even for those with the least severe form of the condition, mild or unspecified preeclampsia.

- **Compared with all other deliveries, those with preeclampsia/eclampsia were more likely to have adverse infant outcomes.**

  Adverse infant outcomes were more common among deliveries with preeclampsia/eclampsia than among other types of deliveries: poor fetal growth (74.6 vs. 25.9 per 1,000 deliveries), intrauterine death (11.6 vs. 6.2 per 1,000 deliveries), and fetal distress (1.8 vs. 1.2 per 1,000 deliveries).

  Among deliveries with preeclampsia/eclampsia, those with preexisting hypertension or severe preeclampsia had the highest proportion of poor fetal growth (over 100 per 1,000 deliveries). Intrauterine death was most prevalent among deliveries with eclampsia (27.9 per 1,000 deliveries).

Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS), 2014. Historical data were drawn from the 2005–2013 National (Nationwide) Inpatient Sample (NIS).

Definitions

Diagnoses, procedures, ICD-9-CM, Clinical Classifications Software (CCS), 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.

CCS categorizes ICD-9-CM diagnosis codes into a manageable number of clinically meaningful categories.[22] This clinical grouper makes it easier to quickly understand patterns of diagnoses. CCS categories identified as Other typically are not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses that may be difficult to interpret as a group.

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 DRG and ICD-9-CM diagnosis codes used to identify delivery hospitalizations—overall and those with preeclampsia, eclampsia, and other types of hypertension complicating pregnancy, childbirth, and the puerperium—are shown in Tables 6 through 8.

[22] Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software (CCS) for ICD-9-CM. Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated October 2016. www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed January 31, 2017.

Table 6. DRG codes defining delivery hospitalizations and delivery method

DRG January 2005–September 2007	DRG October 2007–December 2013	Description
370	765	C-section w/ CC/MCC
371	766	C-section w/o CC/MCC
374	767	Vaginal delivery w/ sterilization and/or D&C
375	768	Vaginal delivery w/ other OR procedure
372	774	Vaginal delivery w/ CC/MCC
373	775	Vaginal delivery w/o CC/MCC

Abbreviations: CC, complications or comorbidities; MCC, major complications or comorbidities; D&C, dilation and curettage; OR, operating room

Table 7. ICD-9-CM diagnosis codes defining preeclampsia/eclampsia and other types of hypertension complicating pregnancy, childbirth, and the puerperium

ICD-9-CM diagnosis code	Description	Type of hypertension[a]
642.0x	Benign essential hypertension complicating pregnancy, childbirth, and the puerperium	Preexisting
642.1x	Hypertension secondary to renal disease, complicating pregnancy, childbirth, and the puerperium	
642.2x	Other pre-existing hypertension complicating pregnancy, childbirth, and the puerperium	
642.3x	Transient hypertension of pregnancy	Gestational
642.9x	Unspecified hypertension complicating pregnancy, childbirth, and the puerperium	Unspecified
642.4x	Mild or unspecified pre-eclampsia	Preeclampsia/ eclampsia
642.5x	Severe pre-eclampsia	
642.6x	Eclampsia	
642.7x	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension	

[a] Records with multiple codes were assigned to one category using the following hierarchy: preeclampsia/eclampsia, preexisting hypertension, gestational, unspecified.

Table 8. ICD-9-CM diagnosis codes defining types of preeclampsia/eclampsia

ICD-9-CM diagnosis code	Description	Type of preeclampsia/ eclampsia[a]
642.40	Mild or unspecified pre-eclampsia, unspecified as to episode of care or not applicable	Mild or unspecified preeclampsia
642.41	Mild or unspecified pre-eclampsia, delivered, with or without mention of antepartum condition	
642.42	Mild or unspecified pre-eclampsia, delivered, with mention of postpartum complication	
642.43	Mild or unspecified pre-eclampsia, antepartum condition or complication	
642.44	Mild or unspecified pre-eclampsia, postpartum condition or complication	
642.50	Severe pre-eclampsia, unspecified as to episode of care or not applicable	Severe preeclampsia
642.51	Severe pre-eclampsia, delivered, with or without mention of antepartum condition	
642.52	Severe pre-eclampsia, delivered, with mention of postpartum complication	
642.53	Severe pre-eclampsia, antepartum condition or complication	
642.54	Severe pre-eclampsia, postpartum condition or complication	
642.60	Eclampsia, unspecified as to episode of care or not applicable	Eclampsia
642.61	Eclampsia, delivered, with or without mention of antepartum condition	
642.62	Eclampsia, delivered, with mention of postpartum complication	
642.63	Eclampsia, antepartum condition or complication	
642.64	Eclampsia, postpartum condition or complication	
642.70	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension, unspecified as to episode of care or not applicable	Preeclampsia/ eclampsia with preexisting hypertension
642.71	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension, delivered, with or without mention of antepartum condition	
642.72	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension, delivered, with mention of postpartum complication	
642.73	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension, antepartum condition or complication	
642.74	Pre-eclampsia or eclampsia superimposed on pre-existing hypertension, postpartum condition or complication	

[a] Records with multiple codes were assigned to one category using the following hierarchy: eclampsia, severe preeclampsia, mild or unspecified preeclampsia, preeclampsia or eclampsia with preexisting hypertension.

ICD-9-CM diagnosis codes identifying coexisting conditions and maternal and infant outcomes are provided in Tables 9 and 10. Codes came from both Chapter 11 of the ICD manual on *Complications of Pregnancy, Childbirth, and the Puerperium* (ICD-9-CM codes 630–679), as well as from non-pregnancy-related chapters. Maternal outcomes are generally consistent with the definitions used by a prior study on severe obstetric morbidity.[23]

Table 9. ICD-9-CM diagnosis and CCS codes defining coexisting conditions at delivery

ICD-9-CM diagnosis code or CCS category	Description	Condition
648.2	Anemia	Anemia
280	Iron deficiency anemias	
281	Other deficiency anemias	
282	Hereditary hemolytic anemias	
283	Acquired hemolytic anemias	
284	Aplastic anemia and other bone marrow failure syndromes	
285	Other and unspecified anemias	
648.5	Congenital cardiovascular disorders	Cardiovascular disorders
648.6	Other cardiovascular diseases	
745	Bulbus cordis anomalies and anomalies of cardiac septal closure	
746	Other congenital anomalies of heart	
747	Other congenital anomalies of circulatory system	
390–392	Acute rheumatic fever	
393–398	Chronic rheumatic heart disease	
410–414	Ischemic heart disease	
415–417	Diseases of pulmonary circulation	
420–429	Other forms of heart disease	
648.8	Abnormal glucose tolerance	Gestational diabetes[a]
651	Multiple gestation	Multiple gestations
V27.2	Twins, both liveborn	
V27.3	Twins, one liveborn and one stillborn	
V27.4	Twins, both stillborn	
V27.5	Other multiple birth, all liveborn	
V27.6	Other multiple birth, some liveborn	
V27.7	Other multiple birth, all stillborn	
649.1	Obesity complicating pregnancy, childbirth, or the puerperium	Obesity
278.0	Overweight and obesity	
V85.2	Body Mass Index between 25–29, adult	
V85.3	Body Mass Index between 30–39, adult	
V85.4	Body Mass Index 40 and over, adult	
648.0	Diabetes mellitus	Preexisting diabetes
CCS 49	Diabetes mellitus without complications	
CCS 50	Diabetes mellitus with complications	
648.1	Thyroid dysfunction	Thyroid dysfunction
240–246	Disorders of thyroid gland	

Abbreviation: CCS: Clinical Classifications Software

[a] Records with codes for both preexisting and gestational diabetes were categorized as preexisting diabetes.

[23] Kuklina EV, Meikle SF, Jamieson DJ, Whiteman MK, Barfield WD, Hills SD, et al. Severe obstetric morbidity in the United States: 1998–2005. Obstetrics and Gynecology. 2009;113(2 Pt 1):293–9.

Table 10. ICD-9-CM procedure codes defining maternal and infant outcomes at delivery

ICD-9-CM procedure code	Description	Outcome
Procedures		
68.3	Subtotal abdominal hysterectomy	Hysterectomy[a]
68.4	Total abdominal hysterectomy	
68.5	Vaginal hysterectomy	
68.6	Radical abdominal hysterectomy	
68.7	Radical vaginal hysterectomy	
68.8	Pelvic evisceration	
68.9	Other and unspecified hysterectomy	
99.04	Transfusion of packed cells	Red blood cell or platelet transfusion
99.05	Transfusion of platelets	
93.90	Non-invasive mechanical ventilation	Ventilation[a]
96.01	Insertion of nasopharyngeal airway	
96.02	Insertion of oropharyngeal airway	
96.03	Insertion of esophageal obturator airway	
96.04	Insertion of endotracheal tube	
96.05	Other intubation of respiratory tract	
96.7	Other continuous invasive mechanical ventilation	
Maternal diagnoses		
518.5	Pulmonary insufficiency following trauma and surgery	Adult respiratory distress syndrome[a]
518.81	Acute respiratory failure	
518.82	Other pulmonary insufficiency, not elsewhere classified	
518.84	Acute and chronic respiratory failure	
671.3	Deep phlebothrombosis, antepartum	Deep venous thrombosis[a]
671.4	Deep phlebothrombosis, postpartum	
671.9	Unspecified venous complication	
451	Phlebitis and thrombophlebitis	
452	Portal vein thrombosis	
453	Other venous embolism and thrombosis	
666.3	Postpartum coagulation defects	Disseminated intravascular coagulation[a]
286.6	Defibrination syndrome	
286.9	Other and unspecified coagulation defects	
644.2	Early onset of delivery	Early onset of labor
669.4	Other complications of obstetrical surgery and procedures	Heart failure[a]
427.5	Cardiac arrest	
428.1	Left heart failure	
428.21	Systolic heart failure, acute	
428.31	Diastolic heart failure, acute	
428.41	Combined systolic and diastolic heart failure, acute	
997.1	Cardiac complications	
674.5	Peripartum cardiomyopathy	Peripartum cardiomyopathy
425	Cardiomyopathy	
641.2	Abruptio placenta	Placental abruption

ICD-9-CM procedure code	Description	Outcome
674.0	Cerebrovascular disorders in the puerperium	Puerperal cerebrovascular disorders[a]
671.5	Other phlebitis and thrombosis	
430	Subarachnoid hemorrhage	
431	Intracerebral hemorrhage	
432	Other and unspecified intracranial hemorrhage	
433	Occlusion and stenosis of precerebral arteries	
434	Occlusion of cerebral arteries	
436	Acute, but ill-defined, cerebrovascular disease	
437	Other and ill-defined cerebrovascular disease	
997.2	Peripheral vascular complications	
999.2	Other vascular complications	
518.4	Acute edema of lung, unspecified	Pulmonary edema[a]
428.1	Left heart failure	
673	Obstetrical pulmonary embolism	Pulmonary embolism[a]
415.1	Pulmonary embolism and infarction	
669.3	Acute renal failure following labor and delivery	Renal failure[a]
584	Acute renal failure	
038	Septicemia	Sepsis[a]
995.1	Sepsis	
995.2	Severe sepsis	
668.0	Pulmonary complications following administration of anesthetic or other sedation in labor and delivery	Severe anesthesia complications[a]
668.1	Cardiac complications following administration of anesthetic or other sedation in labor and delivery	
668.2	Central nervous system complications following administration of anesthetic or other sedation in labor and delivery	
669.1	Shock during or following labor and delivery	Shock[a]
998.0	Postoperative shock	
995.0	Other anaphylactic shock	
995.4	Shock due to anesthesia	
785.5	Shock without mention of trauma	
Infant-related diagnoses on the maternal record		
656.3	Fetal distress	Fetal distress
656.4	Intrauterine death	Intrauterine death
V27.1	Single, stillborn	
V27.3	Twins, one liveborn and one stillborn	
V27.4	Twins, both stillborn	
V27.6	Other multiple birth, some liveborn	
V27.7	Other multiple birth, all stillborn	
656.5	Poor fetal growth	Poor fetal growth

[a] Definition consistent with measures of severe obstetric morbidity used by Kuklina EV, Meikle SF, Jamieson DJ, Whiteman MK, Barfield WD, Hills SD, et al. Severe Obstetric Morbidity in the United States: 1998–2005. Obstetrics and Gynecology. 2009;113(2 Pt 1): 293–9.

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, 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.

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 1 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 & Medicaid Services (CMS).[24] *Costs* reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; *charges* represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Location of patients' residence
Place of residence is based on the Urban Influence Codes (UIC) for the urban-rural classification scheme for U.S. counties:

- Large metropolitan areas with at least 1 million residents
- Small metropolitan areas with less than 1 million residents
- Micropolitan
- Nonmetropolitan and nonmicropolitan counties (rural, noncore)

Median community-level income
Median community-level income is the median household income of the patient's ZIP Code of residence. Income levels are separated into population-based quartiles with cut-offs determined using ZIP Code demographic data obtained from the Nielsen Company. 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

[24] Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2014. Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2016. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed January 31, 2017.

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.

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, Asian/Pacific Islander, and non-Hispanic Other, including American Indian/Alaska Native.

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
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 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, ambulatory surgery, 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 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.

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), 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 December 2016. www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed January 31, 2017.

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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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