

## STATISTICAL BRIEF #193

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### Neonatal and Maternal Hospital Stays Related to Substance Use, 2006–2012

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#### Introduction

Substance abuse during pregnancy can have serious effects on the health of both mother and child. When newborns have been exposed to drugs in the womb, symptoms of withdrawal often occur within hours after birth and may include trouble feeding, seizures, sleep problems, and slow weight gain.<sup>1</sup> In addition to these signs of withdrawal, drug use during pregnancy can increase the risk of birth defects, fetal growth restriction, low birth weight, premature birth, and abnormal neurodevelopment.<sup>2</sup> Fetal alcohol syndrome due to alcohol use during pregnancy is associated with similar outcomes, including cognitive and functional disabilities.<sup>3</sup>

Neonatal (newborn) drug withdrawal has been attributed to the use of a variety of drugs during pregnancy. However, it is thought that many of these cases involve maternal use of prescription or illegal opiates, such as oxycodone, codeine, or heroin, which may cause withdrawal in over half of infants exposed prenatally.<sup>4</sup> A recent study reported that neonatal drug withdrawal showed a substantial increase—from 1.2 per 1,000 births in 2000 to 3.4 per 1,000 births in 2009.<sup>5</sup> This paralleled an overall 300 percent increase in sales of prescription painkillers in the general population.<sup>6</sup>

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief used data from 38 States—those for which inpatient data were available each year between 2006 and 2012—to examine the prevalence and costs of newborn and maternal inpatient hospital stays associated with substance use, including abuse of

<sup>1</sup> Hudak ML, Tan RC, The Committee on Drugs, The Committee on Fetus and Newborn. Neonatal Drug Withdrawal. Clinical Report. *Pediatrics*. 2012;129(2):e540–60. <http://pediatrics.aappublications.org/content/129/2/e540.full#T2>. Accessed November 10, 2014.

<sup>2</sup> Ibid.

<sup>3</sup> Floyd RL, O'Connor MJ, Sokol RJ, Bertrand J, Cordero JF. Recognition and prevention of fetal alcohol syndrome. *Obstetrics & Gynecology*. 2005;106(5 Pt 1):1059–64.

<sup>4</sup> Hudak et al., 2012.

<sup>5</sup> Patrick SW, Schumacher RE, Benneworth BD, Krans EE, McAllister, JM, Davis MM. Neonatal abstinence syndrome and associated health care expenditures: United States, 2000–2009. *JAMA*. 2012;307(18):1934–40.

<sup>6</sup> Centers for Disease Control and Prevention. Vital Signs: Overdoses of Prescription Opioid Pain Relievers—United States, 1999–2008. *Morbidity and Mortality Weekly Report (MMWR)*. 2011;60(43):1–6.

#### Highlights

- Between 2006 and 2012, the rate of neonatal hospital stays related to substance use increased by 71 percent, from 5.1 to 8.7 per 1,000 neonatal stays, and associated aggregate hospital costs increased by 135 percent, from \$253 to \$595 million.
- Among maternal hospital stays related to substance use, the rate of stays increased by 33 percent, from 13.4 to 17.9 per 1,000 maternal stays, and aggregate hospital costs increased by 35 percent, from \$258 to \$349 million.
- From 2006 to 2012, the rate of neonatal and maternal stays related to cocaine decreased by more than 50 percent.
- Most neonatal stays with a substance-related condition in 2012 involved neonatal drug withdrawal (60 percent) or unspecified narcotics (23 percent), both of which more than doubled in rate from 2006.
- Twenty percent of neonatal stays with a substance-related condition in 2012 had low neonate birth weight compared with 7 percent of all other neonatal stays.
- In 2012, nearly one-fourth of maternal stays related to substance use involved opiates, and from 2006 to 2012 the rate increased by 135 percent, from 2.3 to 5.4 per 1,000 maternal stays.
- Mental disorders were indicated in one-fourth of maternal stays related to substance use in 2012 compared with 4 percent of other maternal stays.

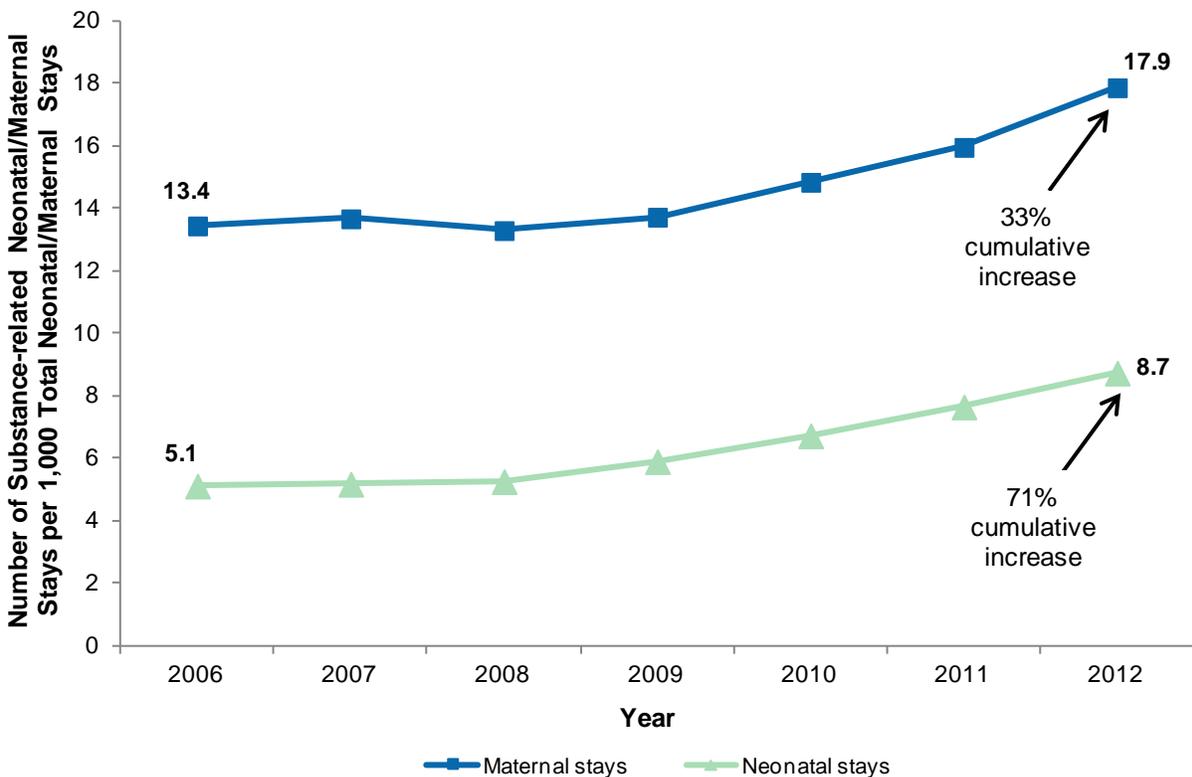
prescription drugs or use of illicit drugs or alcohol. Neonatal stays related to substance use were categorized according to the type of substance or substance-related condition: neonatal drug withdrawal, fetal alcohol syndrome, hallucinogens, cocaine, or unspecified narcotics. Maternal stays related to substance use were categorized according to the following types of substances: opiates, cocaine, cannabis, alcohol, other specified substances, or unspecified drugs. Rates of each type of substance and substance-related condition among neonatal and maternal stays were examined over time. Patient and hospital characteristics for neonatal and maternal stays related to substance use in 2012 are presented compared with all other neonatal and maternal stays. Differences between substance-related stays and all other neonatal and maternal stays of greater than 10 percent are noted in the text.

## Findings

### *Rate and costs of neonatal and maternal hospital stays related to substance use, 2006–2012*

Figure 1 presents trends in the rate of neonatal and maternal hospital stays related to substance use from 2006 through 2012.

**Figure 1. Rate of neonatal and maternal hospital stays related to substance use, 2006–2012**



Note: Neonatal and maternal stays related to substance use were identified using all-listed conditions. Neonatal and maternal rates were calculated separately based on total neonatal or total maternal stays.

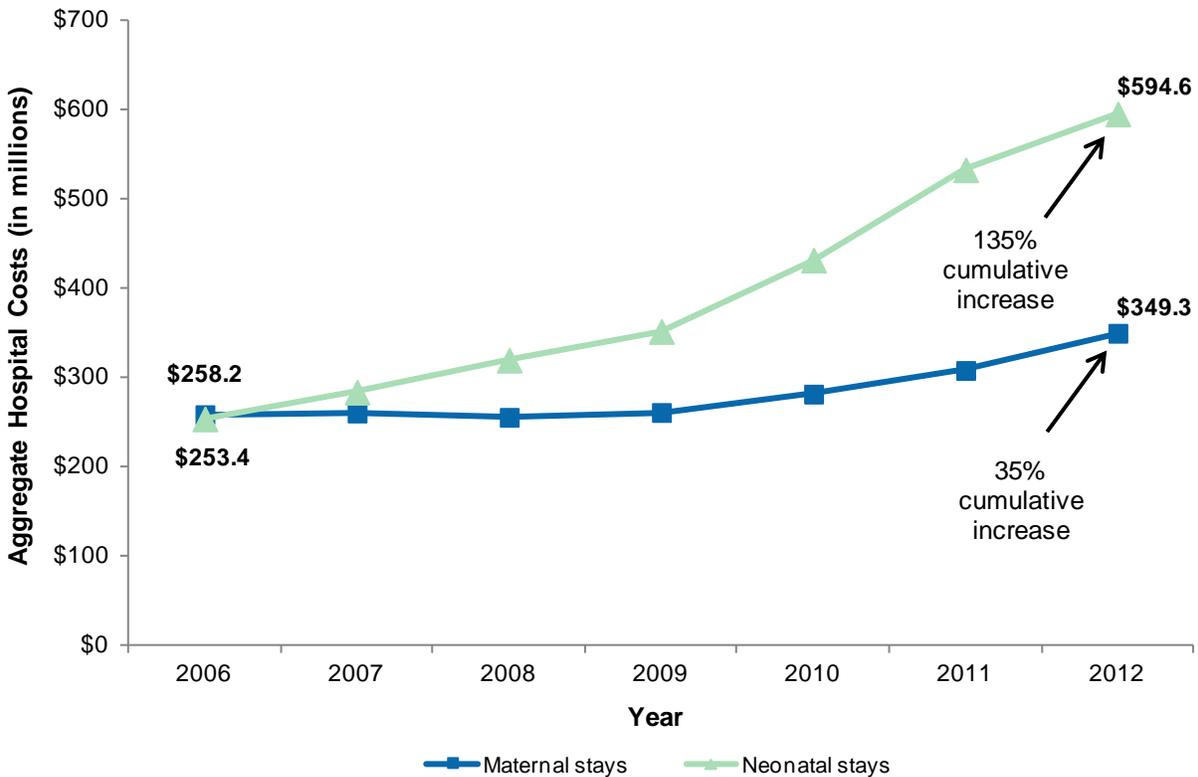
Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2006–2012

- **The rate of neonatal and maternal stays related to substance use increased substantially between 2006 and 2012.**

The rate of neonatal hospital stays involving substance use had a cumulative increase of 71 percent between 2006 and 2012, from 5.1 to 8.7 per 1,000 neonatal stays. The rate of maternal hospital stays involving substance use had a cumulative increase of 33 percent, from 13.4 per 1,000 maternal stays in 2006 to 17.9 per 1,000 maternal stays in 2012. In 2006, the rate of maternal stays related to substance use was 2.6 times the rate of neonatal stays related to substance use; in 2012, the rate of substance-related maternal stays was also more than double the rate of substance-related neonatal stays (2.1 times higher).

Figure 2 presents trends in aggregate hospital costs for neonatal and maternal stays related to substance use from 2006 through 2012. Costs are inflation adjusted and expressed in 2012 dollars.

**Figure 2. Inflation-adjusted aggregate hospital costs for neonatal and maternal stays related to substance use, 2006–2012**



Notes: Neonatal and maternal stays related to substance use were identified using all-listed conditions. Inflation-adjusted costs are presented in 2012 dollars.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2006–2012

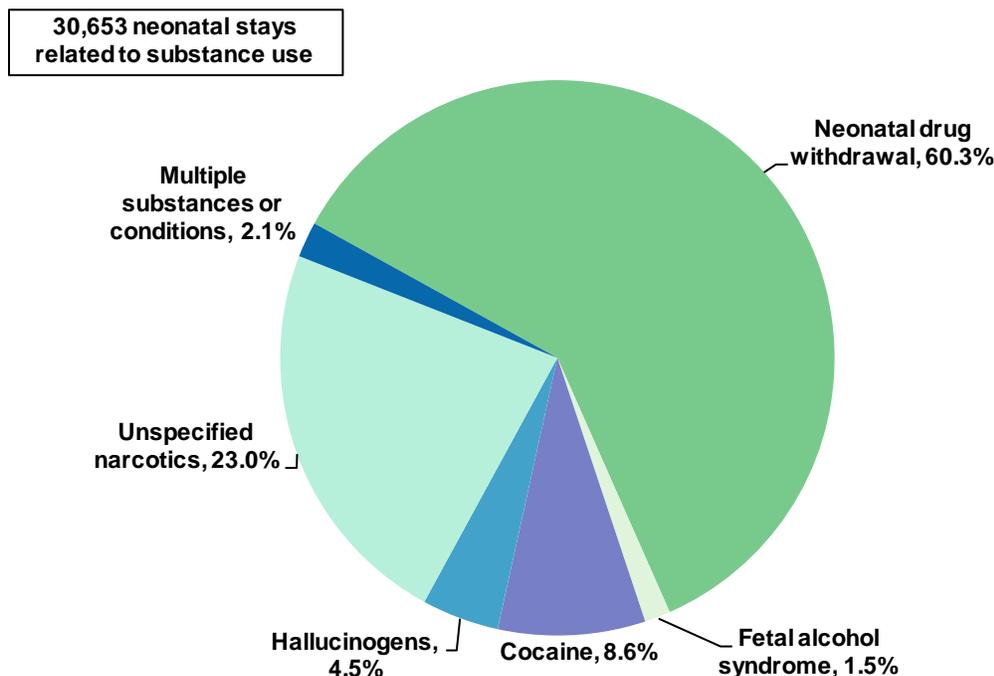
- **Costs for neonatal stays related to substance use increased by 135 percent between 2006 and 2012; costs for maternal stays related to substance use grew by only 35 percent.**

Between 2006 and 2012, inflation-adjusted aggregate hospital costs for neonatal stays related to substance use had a cumulative increase of 135 percent, from \$253.4 million in 2006 to \$594.6 million in 2012. The cumulative increase in costs for maternal stays related to substance use was only 35 percent over the 6-year period. Although costs for neonatal and maternal stays related to substance use were similar in 2006 at approximately \$250 million, in 2012 hospital costs for neonatal stays related to substance use were 1.7 times greater than costs for maternal stays related to substance use. Taken together, total costs for substance-related neonatal and maternal stays were \$944 million in 2012.

*Types of substances and substance-related conditions among neonatal and maternal hospital stays, 2012*

Figure 3 presents the distribution of neonatal hospital stays related to substance use in 2012 according to the type of substance or substance-related condition that was present.

**Figure 3. Neonatal hospital stays related to substance use by type of substance or substance-related condition, 2012**



Note: Neonatal stays were assigned to mutually exclusive categories based on all-listed conditions using the following hierarchy: (1) "multiple substances or conditions" if more than one known substance or condition was indicated, (2) specific substance or condition (i.e., neonatal drug withdrawal, cocaine, hallucinogens, fetal alcohol syndrome) if only one known substance or condition was indicated, and (3) "unspecified narcotics" if only unspecified narcotics were indicated.

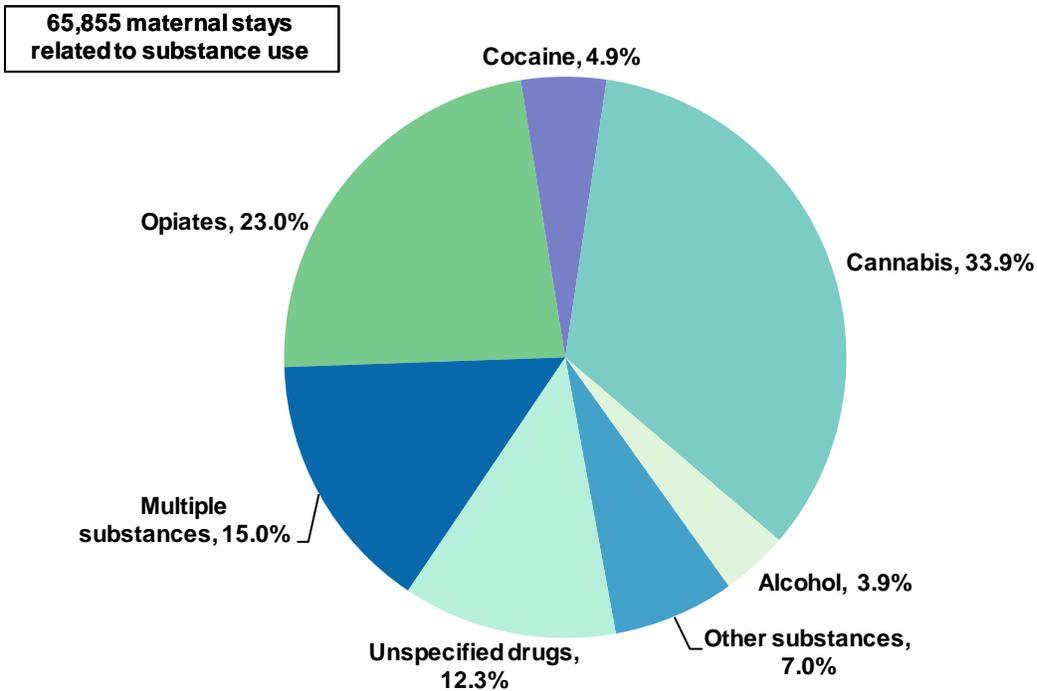
Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2012

- **Of the 30,653 neonatal hospital stays related to substance use in 2012, most involved neonatal drug withdrawal or unspecified narcotics.**

The vast majority of neonatal hospital stays related to substance use in 2012 involved either neonatal drug withdrawal (60.3 percent) or unspecified narcotics (23.0 percent). The remaining 16.7 percent of neonatal stays involved specific types of substances: cocaine (8.6 percent of stays), hallucinogens (4.5 percent), multiple substances or conditions (2.1 percent), or fetal alcohol syndrome (1.5 percent).

Figure 4 presents the distribution of maternal hospital stays related to substance use in 2012 according to the type of substance that was present.

**Figure 4. Maternal hospital stays related to substance use by type of substance, 2012**



Notes: Maternal stays were assigned to mutually exclusive categories based on all-listed conditions using the following hierarchy: (1) "multiple substances" if more than one known substance was indicated, (2) specific substance (i.e., opiates, cocaine, cannabis, alcohol, other) if only one known substance was indicated, and (3) "unspecified drugs" if only unspecified drugs were indicated. "Other substances" includes hallucinogens, psychostimulants, sedatives, antidepressants, absinthe, glue, inhalants, and phencyclidine.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2012

- **Of the 65,855 maternal hospital stays related to substance use in 2012, one-third involved cannabis and nearly one-fourth involved opiates.**

The majority of maternal hospital stays related to substance use in 2012 involved either cannabis (33.9 percent) or opiates (23.0 percent). Another 31 percent of maternal stays also involved specific types of substances: multiple substances (15.0 percent of stays), other specified substances (e.g., hallucinogens and sedatives; 7.0 percent), cocaine (4.9 percent), and alcohol (3.9 percent). The remaining 12.3 percent of maternal stays related to substance use involved unspecified drugs.

*Trends in the rate of neonatal and maternal hospital stays related to substance use, 2006–2012*

Table 1 presents the number, rate, and cumulative percentage change in rate from 2006 to 2012 for neonatal and maternal hospital stays related to substance use by the type of substance or substance-related condition.

**Table 1. Change in rate of neonatal and maternal hospital stays related to substance use by type of substance or substance-related condition, 2006–2012**

Type of substance or substance-related condition	Stays, N		Rate per 1,000 neonatal or maternal stays		Cumulative % change in rate, 2006–2012
	2006	2012	2006	2012	
<b>Total substance-related neonatal stays</b>	<b>19,670</b>	<b>30,653</b>	<b>5.1</b>	<b>8.7</b>	<b>70.5</b>
Neonatal drug withdrawal	7,240	18,968	1.9	5.4	186.7
Unspecified narcotics	3,898	8,856	1.0	2.5	148.6
Hallucinogens	1,127	1,518	0.3	0.4	47.4
Fetal alcohol syndrome	675	595	0.2	0.2	–3.6
Cocaine	8,627	3,175	2.2	0.9	–59.7
<b>Total substance-related maternal stays</b>	<b>55,115</b>	<b>65,855</b>	<b>13.4</b>	<b>17.9</b>	<b>32.9</b>
Opiates	9,490	20,029	2.3	5.4	134.7
Unspecified drugs	15,971	24,130	3.9	6.5	68.0
Cannabis	21,041	28,626	5.1	7.8	51.3
Other substances	9,117	8,571	2.2	2.3	4.5
Alcohol	5,487	5,012	1.3	1.4	1.6
Cocaine	16,545	7,366	4.0	2.0	–50.5

Note: Substances were identified using all-listed conditions. If more than one type of substance was identified, the stay was counted in the row for each type of substance. Therefore, the numbers of stays for specific types of substances and substance-related conditions do not add up to the total number of substance-related stays. “Other substances” includes hallucinogens, psychostimulants, sedatives, antidepressants, absinthe, glue, inhalants, and phencyclidine. Cumulative percentage change was calculated from rates that were not rounded.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2006 and 2012

■ **Among neonatal stays, the rate of stays with neonatal drug withdrawal increased by 187 percent and the rate of stays related to cocaine decreased by 60 percent from 2006 to 2012.**

The most rapidly increasing substance or substance-related condition among neonatal hospital stays was neonatal drug withdrawal, which increased by 187 percent, from 1.9 per 1,000 neonatal stays in 2006 to 5.4 per 1,000 neonatal stays in 2012. The rate of neonatal stays with unspecified narcotics also increased substantially across the 6-year period—by 149 percent—from 1.0 to 2.5 per 1,000 neonatal stays. The rate of neonatal stays with neonatal drug withdrawal was more than twice the rate of neonatal stays for any other type of substance or substance-related condition in 2012.

In 2006, the rate of neonatal stays related to cocaine was higher than the rate of neonatal stays for any other type of substance or substance-related condition. Neonatal hospital stays related to cocaine subsequently decreased by 60 percent, from 2.2 per 1,000 neonatal stays in 2006 to 0.9 per 1,000 neonatal stays in 2012.

■ **Among maternal stays, the rate of stays related to opiates increased by 135 percent and the rate of stays related to cocaine decreased by 51 percent from 2006 to 2012.**

Between 2006 and 2012, maternal hospital stays related to opiates had the most rapid change in rate among maternal stays related to substance use, with a 135 percent increase, from 2.3 to 5.4 per 1,000 maternal stays. Substantial increases also occurred in the rate of maternal stays with unspecified drugs (68 percent increase) and cannabis (51 percent increase).

Similar to neonatal stays, maternal stays related to cocaine had a notable decrease of 51 percent, from 4.0 per 1,000 maternal stays in 2006 to 2.0 per 1,000 maternal stays in 2012.

*Characteristics of neonatal and maternal hospital stays related to substance use, 2012*

Table 2 presents characteristics of neonatal hospital stays related to substance use compared with all other neonatal stays that were not related to substance use in 2012.

**Table 2. Characteristics of neonatal stays related to substance use compared with all other neonatal stays, 2012**

Variable		Neonatal stays related to substance use (N=30,653)	All other neonatal stays (N=3,479,654)
<b>Patient and hospital characteristics, %</b>			
Sex	Male	53.2	51.3
	Female	46.8	48.6
Primary expected payer	Medicaid	79.9	46.2
	Private insurance	11.8	46.4
	Uninsured	5.6	3.9
	Medicare or other	2.6	3.4
Median income	Quartile 1 (lowest income)	39.0	26.8
	Quartile 2	25.7	23.9
	Quartile 3	20.3	24.5
	Quartile 4 (highest income)	12.8	23.2
Patient's residence	Large metropolitan	48.0	57.7
	Small metropolitan	33.5	28.9
	Micropolitan	10.8	8.0
	Not metro or micropolitan (rural)	7.4	5.2
Hospital location (region)	Northeast	15.5	14.0
	Midwest	24.0	23.7
	South	39.0	37.0
	West	21.5	25.3
Co-occurring conditions	Low birth weight	20.3	6.7
	Seizures	1.4	0.3
	Respiratory distress	30.1	10.0
	Difficulty feeding	16.2	3.8
<b>Hospital resource utilization</b>			
Stay and costs	Length of stay, days	14.7	3.7
	Hospital costs, \$	19,684	4,500

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2012

- **Compared with all other neonatal stays in 2012, Medicaid was more likely and private insurance was less likely to be the expected primary payer among neonatal stays related to substance use.**

In 2012, Medicaid was the expected primary payer for 79.9 percent of neonatal stays related to substance use compared with 46.2 percent of all other neonatal stays. Substance-related neonatal stays were also more likely to be uninsured, compared with all other neonatal stays (5.6 vs. 3.9 percent). In contrast, private insurance was the expected primary payer for 11.8 percent of neonatal stays involving substance use versus 46.4 percent of all other neonatal stays.

- **In 2012, neonatal stays related to substance use were more likely than other neonatal stays to occur among patients from communities with a lower median household income and less likely to occur in large metropolitan areas.**

Compared with all other neonatal stays, neonatal stays related to substance use were more likely to be for neonates from communities with low median household income (39.0 vs. 26.8 percent in the lowest income quartile). Neonatal stays related to substance use were less likely than other neonatal stays to be for neonates from large metropolitan areas (48.0 vs. 57.7 percent).

- **Low birth weight, seizures, respiratory distress, and difficulty feeding were more likely to occur among neonatal stays related to substance use than among other neonatal stays.**

Compared with all other neonatal stays, those neonatal stays related to substance use were more likely to involve low birth weight (20.3 vs. 6.7 percent), seizures (1.4 vs. 0.3 percent), respiratory distress (30.1 vs. 10.0 percent), and difficulty feeding (16.2 vs. 3.8 percent).

- **Neonatal stays related to substance use were approximately 4 times as long and 4 times as costly as other neonatal stays.**

The mean length of stay was 14.7 days for neonatal stays related to substance use compared with 3.7 days for other neonatal stays. Similarly, average hospital costs were substantially more for neonatal stays related to substance use (\$19,684) than for other neonatal stays (\$4,500).

Table 3 presents characteristics of maternal hospital stays related to substance use compared with all other maternal stays that were not related to substance use in 2012.

**Table 3. Characteristics of maternal stays related to substance use compared with all other maternal stays, 2012**

Variable		Maternal stays related to substance use (N=65,855)	All other maternal stays (N=3,621,974)
<b>Patient and hospital characteristics, %</b>			
Maternal age, years	<20	7.9	8.0
	20–24	32.1	23.0
	25–34	50.6	53.6
	35+	9.3	15.3
Primary expected payer	Medicaid	75.0	44.2
	Private insurance	13.7	49.0
	Uninsured	5.4	2.8
	Medicare or other	5.9	3.9
Median income	Quartile 1 (lowest income)	42.2	27.3
	Quartile 2	25.4	23.9
	Quartile 3	18.8	24.3
	Quartile 4 (highest income)	11.1	22.8
Patient's residence	Large metropolitan	51.1	58.0
	Small metropolitan	32.0	28.7
	Micropolitan	10.1	7.9
	Not metro or micropolitan (rural)	6.3	5.1
Hospital location (region)	Northeast	15.2	14.2
	Midwest	26.6	23.3
	South	35.5	37.4
	West	22.7	25.2
Co-occurring conditions	Chronic pain	2.1	0.1
	Mental disorders	26.1	3.9
<b>Hospital resource utilization</b>			
Stay and costs	Length of stay, days	3.4	2.7
	Hospital costs, \$	5,432	4,466

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 38 States, 2012

- **Maternal stays related to substance use were more likely than other maternal stays to involve young women aged 20–24 years and to have Medicaid as the expected primary payer.**

In 2012, nearly one-third (32.1 percent) of maternal stays related to substance use were for women aged 20–24 years compared with 23.0 percent of all other maternal stays.

Medicaid was the expected primary payer for 75.0 percent of maternal stays related to substance use compared with 44.2 percent for all other maternal stays. Substance-related maternal stays were also more likely to be uninsured than all other maternal stays (5.4 vs. 2.8 percent). In contrast, private insurance was the expected primary payer for 13.7 percent of maternal stays involving substance use versus 49.0 percent of all other maternal stays.

- **Compared with all other maternal stays, those related to substance use were more likely to occur among patients in communities with a lower median household income and less likely to occur in large metropolitan areas.**

Maternal stays related to substance use were more likely than other maternal stays to be for women from communities with low median household income (42.2 vs. 27.3 percent in the lowest income quartile). Additionally, compared with all other maternal stays, maternal stays related to substance use were less likely to be for women from large metropolitan areas (51.1 vs. 58.0 percent).

- **Over one-fourth of maternal stays related to substance use included mental disorders as a co-occurring condition.**

Maternal stays related to substance use were substantially more likely than all other maternal stays to include mental disorders as a co-occurring condition (26.1 vs. 3.9 percent). Compared with all other maternal stays, those related to substance use also were more likely to involve chronic pain (2.1 vs. 0.1 percent).

## Data Source

The estimates in this Statistical Brief are based upon data from the Healthcare Cost and Utilization Project (HCUP) 2006–2012 State Inpatient Databases (SID) from 38 States: Arizona, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin. Combined, these States account for approximately 90 percent of all births in the United States.<sup>7</sup>

## Definitions

### *Diagnoses, procedures, ICD-9-CM, and Clinical Classifications Software (CCS)*

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 and approximately 4,000 ICD-9-CM procedure codes.

CCS categorizes ICD-9-CM diagnoses and procedures into a manageable number of clinically meaningful categories.<sup>8</sup> This clinical grouper makes it easier to quickly understand patterns of diagnoses and procedures. CCS categories identified as Other typically are not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses and procedures that may be difficult to interpret as a group.

*Neonatal and maternal stays* were identified based on the following all-listed ICD-9-CM diagnosis and/or procedure codes, which include delivery records that resulted in a live birth or stillbirth at that stay, as well as pregnancy-related records that did not result in a delivery at that stay. If the same woman or neonate was hospitalized multiple times, each stay was counted separately:

- Neonatal: Diagnoses 27701, 74783, 76061–76064, 76077–76078, 7620–7706, 77081–7785, 7787–7796, 77981–7799, 7966, V2031–V2032, and V290–V392. Neonatal records were restricted to neonates aged <1 year.
- Maternal: Diagnoses 630–67914, 7923, 7965, V220–V2384, V2386–V242, V270–V282, V286–V2889, V616–V617, V6511, V7242, and V8901–V8909, and V9100–V9199. Procedures 720–7537 and 754–7599. Maternal records were restricted to females aged 15–45 years.

*Substance-related* ICD-9-CM codes were selected that indicated alcohol or illicit drug use during pregnancy. Illicit drug use was defined as the use of illegal drugs or misuse of prescription drugs or other substances. Tobacco use was not examined. Codes were excluded if (1) it could not be determined that substance use occurred during pregnancy or (2) the code pertained to prescription drugs and it could not

<sup>7</sup> Hamilton BE, Martin JA, Ventura SJ. Births: Preliminary Data for 2012. National Vital Statistics Reports. 62(3). Hyattsville, MD: National Center for Health Statistics. 2013. [http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62\\_03.pdf](http://www.cdc.gov/nchs/data/nvsr/nvsr62/nvsr62_03.pdf). Accessed November 11, 2014.

<sup>8</sup> Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software (CCS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality, Rockville, MD. Updated November 2014. <http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp>. Accessed January 7, 2015.

be determined whether the substance was misused or the effect was iatrogenic (i.e., induced inadvertently by medical treatment). Table 4 provides the ICD-9-CM diagnosis codes that were used to identify the substances and substance-related conditions among neonatal and maternal stays related to alcohol or illicit drug use during pregnancy.

**Table 4. ICD-9-CM diagnosis codes used to identify substances or substance-related conditions among neonatal and maternal hospital stays**

ICD-9-CM diagnosis code	ICD-9-CM code description	Type of substance or substance-related condition
<b>Neonatal</b>		
76071	Alcohol affecting fetus or newborn via placenta or breast milk	Fetal alcohol syndrome
76072	Narcotics affecting fetus or newborn via placenta or breast milk	Unspecified narcotics
76073	Hallucinogenic agents affecting fetus or newborn via placenta or breast milk	Hallucinogens
76075	Cocaine affecting fetus or newborn via placenta or breast milk	Cocaine
7795	Drug withdrawal syndrome in newborn	Drug withdrawal
<b>Maternal</b>		
30300–30302	Acute alcoholic intoxication in alcoholism, unspecified, continuous or episodic	Alcohol
30390–30392	Other and unspecified alcohol dependence, unspecified, continuous or episodic	Alcohol
30400–30402	Opioid type dependence, unspecified, continuous or episodic	Opiates
30410–30412	Sedative, hypnotic or anxiolytic dependence, unspecified, continuous or episodic	Other
30420–30422	Cocaine dependence, unspecified, continuous or episodic	Cocaine
30430–30432	Cannabis dependence, unspecified, continuous or episodic	Cannabis
30440–30442	Amphetamine and other psychostimulant dependence, unspecified, continuous or episodic	Other
30450–30452	Hallucinogen dependence, unspecified, continuous or episodic	Other
30460–30462	Other specified drug dependence (includes absinthe, glue, inhalants, phencyclidine), unspecified, continuous or episodic	Other
30470–30472	Combinations of opioid type drug with any other drug dependence, unspecified, continuous or episodic	Opiates
30480–30482	Combinations of drug dependence excluding opioid type drug, unspecified, continuous or episodic	Unspecified drugs
30490–30492	Unspecified drug dependence, unspecified, continuous or episodic	Unspecified drugs
30500–30502	Alcohol abuse, unspecified, continuous or episodic	Alcohol
30520–30522	Cannabis abuse, unspecified, continuous or episodic	Cannabis
30530–30532	Hallucinogen abuse, unspecified, continuous or episodic	Other
30540–30542	Sedative, hypnotic or anxiolytic abuse, unspecified, continuous or episodic	Other
30550–30552	Opioid abuse, unspecified, continuous or episodic	Opiates
30560–30562	Cocaine abuse, unspecified, continuous or episodic	Cocaine
30570–30572	Amphetamine or related acting sympathomimetic abuse, unspecified, continuous or episodic	Other
30580–30582	Antidepressant type abuse, unspecified, continuous or episodic	Other
30590–30592	Other, mixed, or unspecified drug abuse, unspecified, continuous or episodic	Unspecified drugs
64830-64834	Drug dependence of mother	Unspecified drugs
96501	Poisoning by heroin	Opiates
96509	Poisoning by other opiates and related narcotics	Opiates
9696	Poisoning by psychodysleptics (hallucinogens)	Other
97081	Poisoning by cocaine	Cocaine
9800	Toxic effect of ethyl alcohol	Alcohol
E8500	Accidental poisoning by heroin	Opiates
E8541	Accidental poisoning by psychodysleptics (hallucinogens)	Other

ICD-9-CM diagnosis code	ICD-9-CM code description	Type of substance or substance-related condition
E8600	Accidental poisoning by alcoholic beverages	Alcohol
E8608	Accidental poisoning by other specified alcohols	Alcohol
E8609	Accidental poisoning by unspecified alcohol	Alcohol

*Co-occurring diagnoses* were identified using the following all-listed ICD-9-CM diagnosis codes and CCS categories:

- Low birth weight: as defined for the AHRQ Low Birth Weight Rate Prevention Quality Indicator<sup>9</sup>
- Seizures: ICD-9-CM codes 7803, 7790
- Respiratory distress: ICD-9-CM codes 769, 770
- Difficulty feeding: ICD-9-CM code 7793
- Chronic pain: ICD-9-CM code 3382
- Mental disorders: CCS 651 (anxiety disorders), CCS 657 (mood disorders), CCS 658 (personality disorders), CCS 659 (schizophrenia)

#### *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 psychiatric or chemical dependency conditions 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 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).<sup>10</sup> *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.

Aggregate hospital costs were inflation adjusted using the Gross Domestic Product (GDP) from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA), with 2012 as the index base.<sup>11</sup>

#### *How HCUP estimates of costs differ from National Health Expenditure Accounts*

There are a number of differences between the costs cited in this Statistical Brief and spending as measured in the National Health Expenditure Accounts (NHEA), which are produced annually by the

<sup>9</sup> Agency for Healthcare Research and Quality. AHRQ QI, Prevention Quality Indicators #9, Technical Specifications, Low Birth Weight Rate. Rockville, MD: Agency for Healthcare Research and Quality. August 2011. <http://www.qualityindicators.ahrq.gov/Downloads/Modules/PQI/V43/TechSpecs/PQI%2009%20Low%20Birth%20Weight%20Rate.pdf>. Accessed November 11, 2014.

<sup>10</sup> Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2012. Rockville, MD: Agency for Healthcare Research and Quality. Updated August 2013. <http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp>. Accessed January 7, 2015.

<sup>11</sup> U.S. Bureau of Economic Analysis. National Income and Product Account Tables, Table 1.1.4 Price Indexes for Gross Domestic Product. <http://www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1#reqid=9&step=1&isuri=1>. Accessed August 25, 2014.

Centers for Medicare & Medicaid Services (CMS).<sup>12</sup> The largest source of difference comes from the HCUP coverage of inpatient treatment only in contrast to the NHEA inclusion of outpatient costs associated with emergency departments and other hospital-based outpatient clinics and departments as well. The outpatient portion of hospitals' activities has been growing steadily and may exceed half of all hospital revenue in recent years. On the basis of the American Hospital Association Annual Survey, 2012 outpatient gross revenues (or charges) were about 44 percent of total hospital gross revenues.<sup>13</sup>

Smaller sources of differences come from the inclusion in the NHEA of hospitals that are excluded from HCUP. These include Federal hospitals (Department of Defense, Veterans Administration, Indian Health Services, and Department of Justice [prison] hospitals) as well as psychiatric, substance abuse, and long-term care hospitals. A third source of difference lies in the HCUP reliance on billed charges from hospitals to payers, adjusted to provide estimates of costs using hospital-wide cost-to-charge ratios, in contrast to the NHEA measurement of spending or revenue. HCUP costs estimate the amount of money required to produce hospital services, including expenses for wages, salaries, and benefits paid to staff as well as utilities, maintenance, and other similar expenses required to run a hospital. NHEA spending or revenue measures the amount of income received by the hospital for treatment and other services provided, including payments by insurers, patients, or government programs. The difference between revenues and costs include profit for for-profit hospitals or surpluses for nonprofit hospitals.

#### *Location of patients' residence*

Place of residence is based on the 2003 version of the Urban Influence Codes:

- Large Metropolitan: Metropolitan areas with 1 million or more residents
- Small Metropolitan: Metropolitan areas with fewer than 1 million residents
- Micropolitan: Micropolitan areas adjacent and nonadjacent to metropolitan areas
- Rural: Nonmetropolitan and nonmicropolitan counties

#### *Median community-level income*

Median community-level income is the median household income of the patient's ZIP Code of residence. The cut-offs for the quartile designation are 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 primary 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 Worker's 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.

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. Only those States included in this Statistical Brief are listed below for each region:

<sup>12</sup> For additional information about the NHEA, see Centers for Medicare & Medicaid Services (CMS). National Health Expenditure Data. CMS Web site May 2014. <http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=/NationalHealthExpendData/>. Accessed January 7, 2015.

<sup>13</sup> American Hospital Association. TrendWatch Chartbook, 2014. Table 4.2. Distribution of Inpatient vs. Outpatient Revenues, 1992–2012. <http://www.aha.org/research/reports/tw/chartbook/2014/table4-2.pdf>. Accessed January 7, 2015.

- Northeast: Maine, Vermont, Massachusetts, Rhode Island, Connecticut, New York, and New Jersey
- Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, South Dakota, Nebraska, and Kansas
- South: Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Arkansas, Oklahoma, and Texas
- West: Colorado, Arizona, Utah, Nevada, Washington, Oregon, California, and Hawaii

## About HCUP

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

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

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

**Oklahoma** State Department of Health  
**Oregon** Association of Hospitals and Health Systems  
**Oregon** Office of Health Analytics  
**Pennsylvania** Health Care Cost Containment Council  
**Rhode Island** Department of Health  
**South Carolina** Revenue and Fiscal Affairs Office  
**South Dakota** Association of Healthcare Organizations  
**Tennessee** Hospital Association  
**Texas** Department of State Health Services  
**Utah** Department of Health  
**Vermont** Association of Hospitals and Health Systems  
**Virginia** Health Information  
**Washington** State Department of Health  
**West Virginia** Health Care Authority  
**Wisconsin** Department of Health Services  
**Wyoming** Hospital Association

### About Statistical Briefs

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

### About the SID

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

### About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases that are publicly available. HCUPnet has an easy step-by-step query system that creates tables and graphs of national and regional statistics as well as data trends for community hospitals in the United States. HCUPnet generates statistics using data from HCUP's National (Nationwide) Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the Nationwide Emergency Department Sample (NEDS), the State Inpatient Databases (SID), and the State Emergency Department Databases (SEDD).

### For More Information

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

For additional HCUP statistics, visit HCUPnet, our interactive query system, at <http://hcupnet.ahrq.gov/>.

For information on other hospitalizations in the United States, refer to the following HCUP Statistical Briefs located at <http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp>:

- Statistical Brief #180, Overview of Hospital Stays in the United States, 2012
- Statistical Brief #181, Costs for Hospital Stays in the United States, 2012
- Statistical Brief #186, Most Frequent Operating Room Procedures Performed in U.S. Hospitals, 2003–2012
- Statistical Brief #162, Most Frequent Conditions in U.S. Hospitals, 2011

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

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

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

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