

STATISTICAL BRIEF #256

April 2020

Hospital Inpatient Stays Related to Opioid Use Disorder and Endocarditis, 2016

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Introduction

Declared a public health emergency by the Department of Health and Human Services in 2017, the opioid crisis continues to negatively affect communities across the United States.¹ The 47,600 overdose deaths due to opioids in 2017 represented 67.8 percent of all drug overdose deaths in that year and a 12-percent increase in opioid overdose deaths from the previous year alone.² In addition to overdose, opioid-related diagnoses such as abuse/dependence, withdrawal, and medical complications arising from opioid use have become more frequent among patients in recent years, leading to sharp increases in the use of acute care services.³ Between 2005 and 2014, the national rate of opioid-related inpatient stays and emergency department visits increased 64.1 percent and 99.4 percent, respectively.⁴ Despite the dramatic rise in opioid-related problems, little research has focused on clinical conditions that may be associated with opioid dependence and long-term use.

Concurrent with the opioid epidemic, there has been a rise in hospital inpatient stays for individuals with both drug dependence and endocarditis.^{5,6} Between 2002 and 2012, the number of inpatient stays involving opioid abuse/dependence and endocarditis increased by 46.1 percent.⁷ Endocarditis is an inflammation of the heart valves and the inner lining of the heart from bacteria or fungi that entered the bloodstream through a variety of mechanisms, including bleeding gums from brushing or dental procedures, infections, catheters, needles for body piercing and tattoos, and intravenous drug use.⁸ Endocarditis can lead to

Highlights

- Between 2005 and 2014, the number of inpatient stays related to both opioid use disorder and endocarditis (OUD-endocarditis) more than doubled.
- OUD-endocarditis inpatient stays were more likely for patients aged 18–34 years than were stays for either condition alone (50 vs. 22 and 8 percent for OUD and endocarditis stays, respectively).
- Compared with OUD or endocarditis stays, a higher percentage of OUD-endocarditis stays—
 - Had an expected primary payer of Medicaid or self-pay/no charge
 - Resulted in a discharge against medical advice
- Regionally, the Northeast had the highest population rate of OUD-endocarditis inpatient stays, the Northeast and Midwest had the highest rates of OUD stays, and the South had the highest rate of endocarditis stays.

¹ U.S. Department of Health and Human Services. What is the U.S. Opioid Epidemic? Updated September 4, 2019. www.hhs.gov/opioids/about-the-epidemic/index.html. Accessed February 11, 2020.

² Scholl L, Seth P, Kariisa M, Wilson N, Baldwin G. Drug and opioid-involved overdose deaths – United States, 2013–2017. *Morbidity and Mortality Weekly Report*. 2019;67:1419–27.

³ Weiss AJ, Elixhauser A, Barrett ML, Steiner CA, Bailey MK, O'Malley L. Opioid-Related Inpatient Stays and Emergency Department Visits by State, 2009–2014. HCUP Statistical Brief #219. December 2016. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/reports/statbriefs/sb219-Opioid-Hospital-Stays-ED-Visits-by-State.pdf. Accessed March 22, 2019.

⁴ Ibid.

⁵ McCarthy NL, Baggs J, Jernigan JA, Reddy SJ, See I, Fiore AE. National Trends of Infective Endocarditis and Other Infections Associated With Substance Use Disorder. *AcademyHealth Annual Research Meeting*, Washington, DC, June 2019.

⁶ Ronan MV, Herzig SJ. Hospitalizations related to opioid abuse/dependence and associated serious infections increased sharply, 2002–12. *Health Affairs*. 2016;35(5):832–7.

⁷ Ibid.

⁸ Mayo Clinic. Endocarditis. www.mayoclinic.org/diseases-conditions/endocarditis/symptoms-causes/syc-20352576. Accessed July 31, 2019.

severe complications such as heart failure, stroke, and pulmonary embolism, and if left untreated, the condition can be fatal.⁹ At least half of individuals with endocarditis will require heart valve replacement surgery.^{10,11}

The specific relationship between opioid use disorder (defined here as opioid abuse, opioid dependence, opioid use, long-term opiate use, poisoning, and adverse effects) and endocarditis is not clear. For example, a bloodstream infection resulting in endocarditis may develop subsequent to a dental procedure and may co-occur in a patient being treated with opioids. Endocarditis also may result from illicit intravenous drug (opioid) use, one of many possible risk factors for endocarditis.

Using the National (Nationwide) Inpatient Sample (NIS), this Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents statistics for three groups of inpatient stays for patients aged 18 years and older:

1. Those related to opioid use disorder and endocarditis (OUD-endocarditis stays)
2. Those related to opioid use disorder but not endocarditis (OUD stays)
3. Those related to endocarditis but not opioid use disorder (endocarditis stays)

Trends in inpatient stays for each group during 2005–2014 are presented, using International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) coded data. There are known discontinuities between the ICD-9-CM and the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) coding systems that impact the identification of cases. Estimates related to OUD and endocarditis for 2016 based on ICD-10-CM data are presented, establishing new baseline estimates of such cases. The distribution of stays for each group is provided by select patient characteristics in 2016, along with the population rates by U.S. census region and division. Finally, the most common principal diagnoses are presented for each group of inpatient stays. Because of the large sample size of the NIS data, small differences can be statistically significant. Thus, only percentage differences greater than or equal to 10 percent are discussed in the text.

⁹ Yang E, Frazee BW. Infective endocarditis. *Emergency Medicine Clinics of North America*. 2018;36:645–63.

¹⁰ Prendergast BD, Tornos P. Surgery for infective endocarditis: who and when? *Circulation*. 2010;121(9):1141–52.

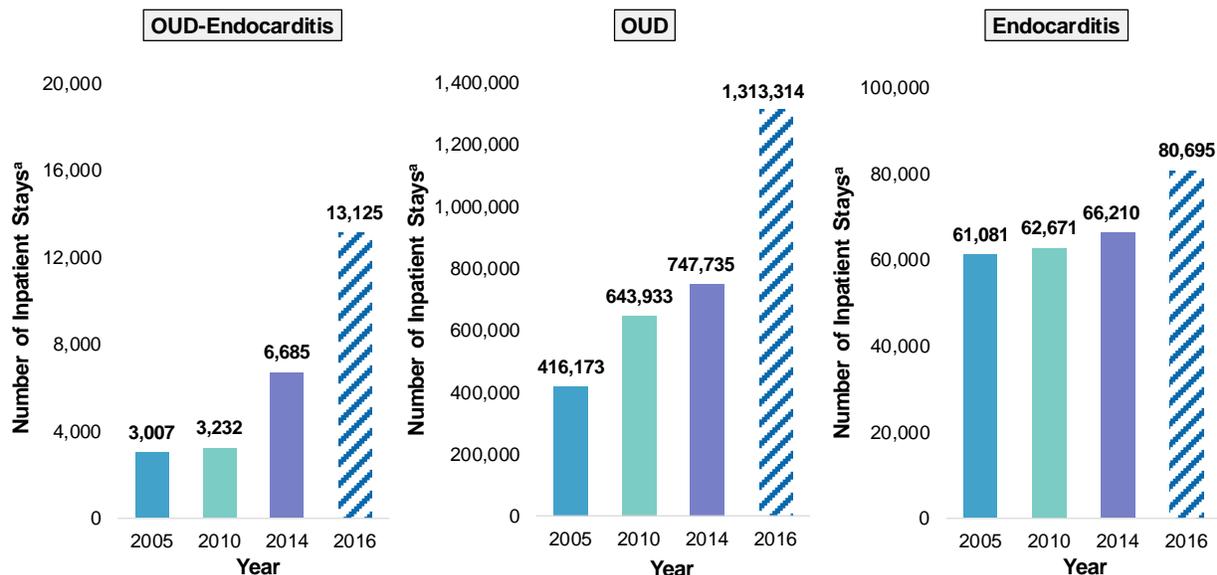
¹¹ Cleveland Clinic. Infective endocarditis surgery. Updated July 19, 2019. my.clevelandclinic.org/health/treatments/17125-infective-endocarditis-surgery. Accessed July 31, 2019.

Findings

Trends in inpatient stays related to opioid use disorder and/or endocarditis, 2005–2014

Figure 1 presents the total number of inpatient stays with any diagnosis related to opioid use disorder and/or endocarditis in 4 years: 2005, 2010, 2014, and 2016.¹²

Figure 1. Number of inpatient stays related to opioid use disorder and/or endocarditis, 2005–2016



Abbreviation: OUD, opioid use disorder

Note: The solid bars represent data under the International Classification of Diseases Ninth Revision, Clinical Modification (ICD-9-CM) coding system, and the diagonal bars represent data under the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) coding system.

^a Please note the differences in scales used in the y-axis across the three bar charts.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2005, 2010, 2014, 2016

- **The number of OUD-endocarditis inpatient stays more than doubled between 2005 and 2014.**

Between 2005 and 2014, the number of OUD-endocarditis inpatient stays increased by 122 percent, from 3,007 stays in 2005 to 6,685 stays in 2014. In 2016, there were 13,125 OUD-endocarditis stays.

- **Between 2005 and 2014, the percentage change in the number of OUD inpatient stays was ten times the percentage change in the number of endocarditis stays.**

The number of OUD inpatient stays increased 80 percent between 2005 and 2014, from 416,173 stays in 2005 to 747,735 stays in 2014. In contrast, the number of endocarditis stays increased 8 percent, from 61,081 in 2005 to 66,210 in 2014.

¹² Because of the change in clinical coding system in 2015, from the International Classification of Diseases Ninth Revision, Clinical Modification (ICD-9-CM) to the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), the coding and identification of stays related to opioid use disorder and/or endocarditis changed. For example, beginning in 2016, ICD-10-CM codes became available to identify cases with opioid use and opiate long-term use. Thus, we describe the trends based on data from the period 2005–2014 and 2016 separately.

Characteristics of inpatient stays related to opioid use disorder and/or endocarditis, 2016

Table 1 summarizes the distribution of inpatient stays with any diagnosis of opioid use disorder and/or endocarditis, by select patient characteristics in 2016. Figures 2 and 3 present the distributions by expected primary payer (Figure 2) and discharge status (Figure 3).

Table 1. Characteristics of inpatient stays related to opioid use disorder and/or endocarditis, 2016

Characteristic	OUD-endocarditis	OUD	Endocarditis
Total number of inpatient stays	13,125	1,313,314	80,695
Specific opioid diagnosis, % ^a			
Opioid abuse/dependence	82.3	50.6	n/a
Opioid use	5.5	5.0	n/a
Poisoning	1.8	4.8	n/a
Adverse effects	3.5	13.7	n/a
Long-term use of opiates	6.9	25.8	n/a
Sex, % ^b			
Female	52.8	52.8	45.8
Male	47.1	47.1	54.2
Age, years, %			
18–34	49.8	21.6	8.2
35–49	27.5	22.1	12.0
50–64	15.4	31.0	24.6
65–79	5.3	18.4	31.6
80+	2.0	6.8	23.7
Community-level income, %			
Low income (quartile 1)	37.1	32.9	32.7
Middle income (quartiles 2–3)	45.4	48.0	46.8
High income (quartile 4)	14.9	16.8	18.3
Missing	2.6	2.3	2.2
Patient location, %			
Metro	83.3	83.9	80.1
Rural-adjacent to metro	10.0	10.1	12.9
Rural-remote	5.4	5.1	6.4
Missing	1.3	0.9	0.6

Abbreviations: n/a, not applicable; OUD, opioid use disorder

^a Some discharges included more than one opioid diagnosis type. For this table, discharges were categorized into only one opioid diagnosis category using the following hierarchy: opioid abuse/dependence, opioid use, poisoning, adverse effects, long-term use of opiates.

^b Patient sex was missing for less than 0.1 percent of discharges in each group.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

- **There were differences in the types of opioid diagnoses listed on an inpatient record, depending on whether there was a coexisting diagnosis of endocarditis.**

The majority of OUD-endocarditis inpatient stays included a diagnosis of opioid abuse/dependence (82.3 percent), whereas only about half of OUD stays involved an opioid abuse/dependence diagnosis (50.6 percent). Diagnoses of adverse effects and long-term use of opiates were more

common among OUD stays than among OUD-endocarditis stays (adverse effects: 13.7 vs. 3.5 percent; long-term use of opiates: 25.8 vs. 6.9 percent).

- **A larger percentage of OUD-endocarditis inpatient stays were for patients aged 18–34 years and for patients from the lowest-income communities compared with inpatient stays for either condition alone.**

Among OUD-endocarditis inpatient stays, approximately half (49.8 percent) involved patients aged 18–34 years. In contrast, this age group represented 21.6 percent of OUD stays and 8.2 percent of endocarditis stays.

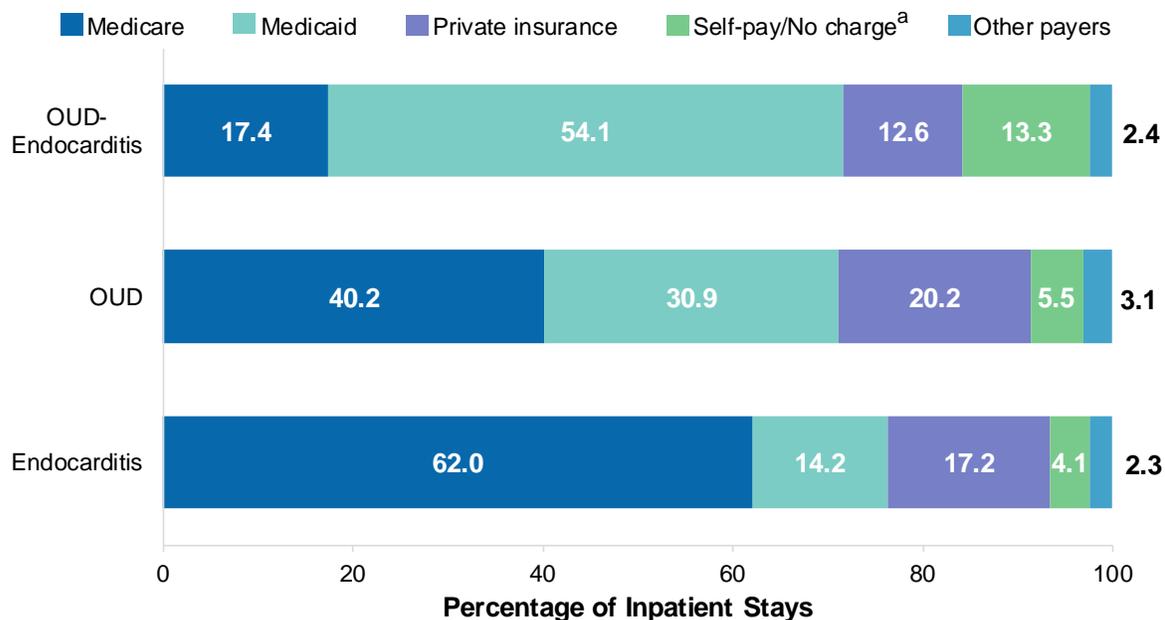
A larger percentage of OUD-endocarditis inpatient stays were for patients from the lowest-income communities (37.1 percent) compared with OUD stays (32.9 percent) or endocarditis stays (32.7 percent). In contrast, a larger percentage of endocarditis stays were for patients from the highest-income communities (18.3 percent) compared with OUD-endocarditis stays (14.9 percent).

- **Compared with OUD-endocarditis stays and OUD stays, a larger percentage of endocarditis inpatient stays were for older patients.**

Patients aged 50 years and older constituted 79.9 percent of endocarditis inpatient stays, 56.2 percent of OUD stays, and 22.7 percent of OUD-endocarditis stays.

Figure 2 presents the distribution of inpatient stays with any diagnosis related to opioid use disorder and/or endocarditis by expected primary payer in 2016.

Figure 2. Expected primary payer of inpatient stays related to opioid use disorder and/or endocarditis, 2016



Abbreviation: OUD, opioid use disorder

Note: Expected payer was missing for less than 0.2 percent of discharges in each group.

^a Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

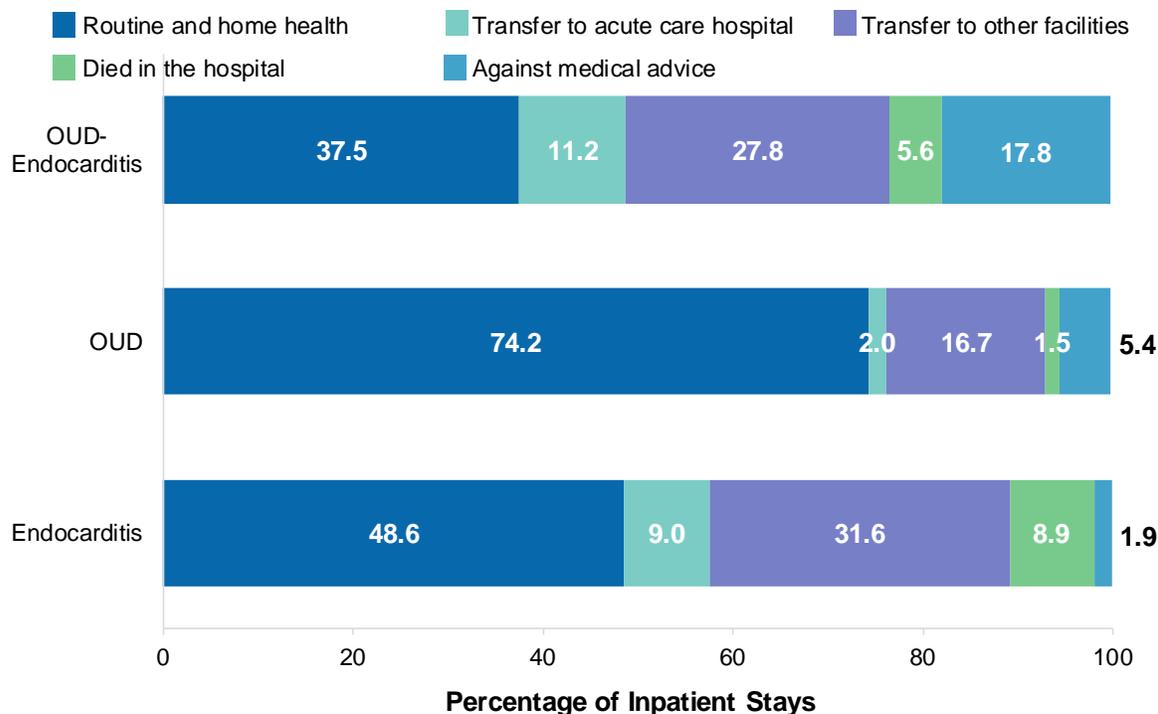
■ **Medicaid was the expected payer for more than half of OUD-endocarditis inpatient stays in 2016.**

More than half of OUD-endocarditis inpatient stays had Medicaid as the expected primary payer (54.1 percent). In contrast, Medicaid was the expected payer for 30.9 percent of OUD stays and 14.2 percent of endocarditis stays.

The percentage of stays that were expected to be self-pay/no charge also was higher for OUD-endocarditis stays (13.3 percent) than for OUD stays (5.5 percent) or endocarditis stays (4.1 percent).

Figure 3 presents the distribution of inpatient stays related to opioid use disorder and/or endocarditis by discharge status in 2016.

Figure 3. Discharge status of inpatient stays related to opioid use disorder and/or endocarditis, 2016



Abbreviation: OUD, opioid use disorder

Note: Discharge status was missing or destination was unknown for less than 0.3 percent of discharges in each group.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

■ **Nearly one-fifth of OUD-endocarditis inpatient stays were discharged against medical advice.**

Among OUD-endocarditis inpatient stays, 17.8 percent resulted in discharge against medical advice, compared with 5.4 percent of OUD stays and 1.9 percent of endocarditis stays.

Just over one-third of OUD-endocarditis stays resulted in routine discharge or discharge to home health care (37.5 percent), compared with three-fourths of OUD stays (74.2 percent) and nearly half of endocarditis stays (48.6 percent).

Geographic variation in inpatient stays related to opioid use disorder and endocarditis, 2016

Table 2 presents the population rate of inpatient stays related to opioid use disorder and/or endocarditis, by the U.S. census region and division of the hospital in which patients were treated in 2016.

Table 2. Rate per 100,000 population of inpatient stays related to opioid use disorder and/or endocarditis, by U.S. census region and division, 2016

U.S. census region and division	Rate of inpatient stays (per 100,000 population)		
	OUD-endocarditis	OUD	Endocarditis
Northeast	6.4	608.2	33.4
New England	8.7	665.2	29.6
Middle Atlantic	5.5	587.7	34.7
Midwest	4.7	567.9	32.3
East North Central	5.5	610.1	33.1
West North Central	2.8	473.4	30.6
South	5.4	497.6	37.2
South Atlantic	6.2	550.2	38.5
East South Central	9.6	644.5	46.8
West South Central	2.0	335.5	30.4
West	4.8	481.4	24.3
Mountain	4.8	555.9	23.6
Pacific	4.8	448.4	24.6

Abbreviation: OUD, opioid use disorder

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

■ **The population rate of inpatient stays related to opioid use disorder and/or endocarditis varied across and within census regions.**

The Northeast had the highest population rate of OUD-endocarditis inpatient stays (6.4 per 100,000 population) compared with the other regions, whereas the Midwest and West had the lowest rates (4.7 and 4.8). The Northeast and Midwest had the highest rate of OUD stays (608.2 and 567.9), and the West and South had the lowest rates (481.4 and 497.6). The South had the highest rate of endocarditis stays (37.2), whereas the West had the lowest rate (24.3).

The rate of stays related to opioid use disorder and/or endocarditis also varied within census regions. For example, within the South census region, the East South Central division had the highest rate compared with the other two divisions for all types of stays, with the rate of OUD-endocarditis stays nearly 5 times higher in the East South Central division versus the West South Central division.

Most common reason for inpatient stays related to opioid use disorder and/or endocarditis, 2016

Table 3 presents the top 10 principal diagnoses among inpatient stays with any diagnosis of opioid use disorder and/or endocarditis in 2016.

Table 3. Top 10 principal diagnoses of inpatient stays related to opioid use disorder and/or endocarditis, 2016

Principal diagnosis (CCSR category) ^a	OUD-endocarditis			OUD			Endocarditis		
	Rank	Number of stays	Stays, %	Rank	Number of stays	Stays, %	Rank	Number of stays	Stays, %
Total number of stays	—	13,125	100.0	—	1,313,314	100.0	—	80,695	100.0
Septicemia (INF002)	1	5,640	43.0	2	85,115	6.5	1	20,360	25.2
Endocarditis and endocardial disease (CIR004)	2	3,075	23.4				2	10,100	12.5
Complication of cardiovascular device, implant or graft (INJ033)	3	915	7.0				3	8,220	10.2
Opioid-related disorders (MBD018)	4	265	2.0	1	144,125	11.0			
Skin and subcutaneous tissue infections (SKN001)	5	235	1.8	4	44,860	3.4			
Complication of other surgical or medical care, injury (INJ037)	6	230	1.8				6	1,805	2.2
Other specified complications in pregnancy (PRG028)	7	155	1.2						
Osteomyelitis (MUS002)	8	135	1.0						
Pneumonia (RSP002)	9	115	0.9	10	26,425	2.0	7	1,540	1.9
Cerebral infarction (CIR020)	10	110	0.8				5	1,810	2.2
Depressive disorders (MBD002)				3	54,325	4.1			
Osteoarthritis (MUS006)				5	36,450	2.8			
Spondylopathies/ spondyloarthropathy (MUS011)				6	31,710	2.4			
COPD and bronchiectasis (RSP008)				7	28,005	2.1			
Alcohol-related disorders (MBD017)				8	27,910	2.1			
Bipolar and related disorders (MBD003)				9	27,280	2.1			
Heart failure (CIR019)							4	4,710	5.8
Acute myocardial infarction (CIR009)							8	1,415	1.8
Cardiac dysrhythmias (CIR017)							9	1,380	1.7
Acute and unspecified renal failure (GEN002)							10	1,195	1.5
Top 10 principal diagnoses	—	10,875	82.9	—	506,205	38.5	—	52,535	65.1

Abbreviations: CCSR, Clinical Classifications Software Refined; COPD, chronic obstructive pulmonary disease; OUD, opioid use disorder

^a Principal diagnosis was grouped using the CCSR for International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnoses.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

- **Septicemia was the principal diagnosis for over 40 percent of OUD-endocarditis inpatient stays and one-fourth of endocarditis stays.**

Septicemia was the most common reason for OUD-endocarditis inpatient stays (43.0 percent of stays) and for endocarditis stays (25.2 percent of stays). Septicemia was the second most common reason for OUD stays (6.5 percent of stays).

- **Endocarditis was the principal diagnosis for nearly one in four OUD-endocarditis inpatient stays and one in eight endocarditis stays.**

Behind septicemia, endocarditis was the second most common reason for OUD-endocarditis inpatient stays (23.4 percent of stays) and for endocarditis stays (12.5 percent of stays).

- **Four of the top 10 reasons for OUD inpatient stays involved mental or substance use disorders.**

Among OUD inpatient stays, 4 of the top 10 principal diagnoses involved mental or substance use disorders—opioid-related disorders (11.0 percent of stays), depressive disorders (4.1 percent), alcohol-related disorders (2.1 percent), and bipolar and related disorders (2.1 percent)—accounting for approximately one in five OUD stays.

- **The 10 most common principal diagnoses accounted for a larger percentage of OUD-endocarditis inpatient stays than OUD or endocarditis stays.**

Two-thirds of OUD-endocarditis inpatient stays were for either septicemia or endocarditis (43.0 and 23.4 percent of stays, respectively). The 10 most common principal diagnoses accounted for 82.9 percent of all OUD-endocarditis stays.

In addition to opioid-related disorders (11.0 percent), the most common principal diagnoses for OUD stays were septicemia (6.5 percent) and depressive disorders (4.1 percent). The 10 most common principal diagnoses accounted for just over one-third (38.5 percent) of all OUD stays.

Nearly half of endocarditis stays had a principal diagnosis of septicemia (25.2 percent of stays), endocarditis (12.5 percent), or complication of cardiovascular device (10.2 percent). The 10 most common principal diagnoses accounted for 65.1 percent of all endocarditis stays.

About Statistical Briefs

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

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2016 National Inpatient Sample (NIS). Historical data were drawn from the 2005, 2010, and 2014 National (Nationwide) Inpatient Sample (NIS). Supplemental sources included population denominator data for use with HCUP databases, derived from information available from the U.S. Census Bureau.¹³

Definitions

Diagnoses, ICD-9-CM, ICD-10-CM, and Clinical Classifications Software Refined (CCSR) for ICD-10-CM diagnoses

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

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

ICD-10-CM is the International Classification of Diseases, Tenth Revision, Clinical Modification. In October 2015, ICD-10-CM replaced the ICD-9-CM diagnosis coding system with the ICD-10-CM diagnosis coding system for most inpatient and outpatient medical encounters. There are over 70,000 ICD-10-CM diagnosis codes.

The CCSR for ICD-10-CM aggregates the diagnosis codes into a manageable number of clinically meaningful categories.¹⁴ The CCSR for ICD-10-CM is intended to be used analytically to examine patterns of healthcare in terms of cost, utilization, and outcomes; rank utilization by diagnoses; and risk adjust by clinical condition. The CCSR capitalizes on the specificity of the ICD-10-CM coding scheme and allows ICD-10-CM codes to be classified in more than one category. Approximately 10 percent of diagnosis codes are associated with more than one CCSR category because the diagnosis code documents either multiple conditions or a condition along with a common symptom or manifestation. For this Statistical Brief, the principal diagnosis code is assigned to a single default CCSR based on clinical coding guidelines, etiology and pathology of diseases, and standards set by other Federal agencies. The assignment of the default CCSR for the principal diagnosis is available starting with v2020.2 of the software tool. For this Statistical Brief, a preliminary version of the default CCSR was used.

Case definition

Opioid use disorder and endocarditis were defined using the all-listed ICD-9-CM and ICD-10-CM diagnosis codes shown in Tables 4 and 5, respectively. Note that the specificity of ICD-10-CM allowed for the identification of cases with opioid use and long-term use that was not previously available in ICD-9-CM.

¹³ Barrett M, Coffey R, Levit K. Population Denominator Data for Use with the HCUP Databases (Updated with 2016 Population Data). HCUP Methods Series Report #2017-04. October 17, 2017. U.S. Agency for Healthcare Research and Quality. www.hcup-us.ahrq.gov/reports/methods/2017-04.pdf. Accessed January 4, 2019.

¹⁴ Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality. Updated January 2020. www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed February 3, 2020.

The definition of opioid use disorder in this Statistical Brief may differ from the definition used in other HCUP reports about opioid-related hospitalizations because of the specific focus on the relationship between opioids and endocarditis in this Statistical Brief. In particular, the definition used here includes not only the general opioid dependence, abuse and use, poisoning, and adverse effect codes as an initial or subsequent encounter but also opioid abuse/dependence in remission and long-term use of opiates. The definition does not include sequela codes for poisoning and adverse effects.

Table 4. ICD-9-CM and ICD-10-CM diagnosis codes defining opioid use disorder (OUD)

Diagnosis code	Description
ICD-9-CM diagnosis codes	
304.00	Opioid type dependence, unspecified
304.01	Opioid type dependence, continuous
304.02	Opioid type dependence, episodic
304.03	Opioid type dependence, in remission
304.70	Combinations of opioid type drug with any other drug dependence, unspecified
304.71	Combinations of opioid type drug with any other drug dependence, continuous
304.72	Combinations of opioid type drug with any other drug dependence, episodic
304.73	Combinations of opioid type drug with any other drug dependence, in remission
305.50	Opioid abuse, unspecified
305.51	Opioid abuse, continuous
305.52	Opioid abuse, episodic
305.53	Opioid abuse, in remission
965.00	Poisoning by opium (alkaloids), unspecified
965.01	Poisoning by heroin
965.02	Poisoning by methadone
965.09	Poisoning by other opiates and related narcotics
970.1	Poisoning by opiate antagonists
E850.0	Accidental poisoning by heroin
E850.1	Accidental poisoning by methadone
E850.2	Accidental poisoning by other opiates and related narcotics
E935.0	Heroin causing adverse effects in therapeutic use
E935.1	Methadone causing adverse effects in therapeutic use
E935.2	Other opiates and related narcotics causing adverse effects in therapeutic use
E940.1	Adverse effects of opiate antagonists
ICD-10-CM diagnosis codes	
Opioid abuse/dependence	
F11.10	Opioid abuse, uncomplicated
F11.120	Opioid abuse with intoxication, uncomplicated
F11.121	Opioid abuse with intoxication, delirium
F11.122	Opioid abuse with intoxication, with perceptual disturbance
F11.129	Opioid abuse with intoxication, unspecified
F11.14	Opioid abuse with opioid-induced mood disorder
F11.150	Opioid abuse with opioid-induced psychotic disorder, with delusions
F11.151	Opioid abuse with opioid-induced psychotic disorder, with hallucinations
F11.159	Opioid abuse with opioid-induced psychotic disorder, unspecified

Diagnosis code	Description
F11.181	Opioid abuse with opioid-induced sexual dysfunction
F11.182	Opioid abuse with opioid-induced sleep disorder
F11.188	Opioid abuse with other opioid-induced disorder
F11.19	Opioid abuse with unspecified opioid-induced disorder
F11.20	Opioid dependence, uncomplicated
F11.21	Opioid dependence, in remission
F11.220	Opioid dependence with intoxication, uncomplicated
F11.221	Opioid dependence with intoxication, delirium
F11.222	Opioid dependence with intoxication, with perceptual disturbance
F11.229	Opioid dependence with intoxication, unspecified
F11.23	Opioid dependence with withdrawal
F11.24	Opioid dependence with opioid-induced mood disorder
F11.250	Opioid dependence with opioid-induced psychotic disorder, with delusions
F11.251	Opioid dependence with opioid-induced psychotic disorder, with hallucinations
F11.259	Opioid dependence with opioid-induced psychotic disorder, unspecified
F11.281	Opioid dependence with opioid-induced sexual dysfunction
F11.282	Opioid dependence with opioid-induced sleep disorder
F11.288	Opioid dependence with other opioid-induced disorder
F11.29	Opioid dependence with unspecified opioid-induced disorder
Opioid use	
F11.90	Opioid use, unspecified, uncomplicated
F11.920	Opioid use, unspecified with intoxication, uncomplicated
F11.921	Opioid use, unspecified with intoxication delirium
F11.922	Opioid use, unspecified with intoxication, with perceptual disturbance
F11.929	Opioid use, unspecified with intoxication, unspecified
F11.93	Opioid use, unspecified, with withdrawal
F11.94	Opioid use, unspecified, with opioid-induced mood disorder
F11.950	Opioid use, unspecified with opioid-induced psychotic disorder, with delusions
F11.951	Opioid use, unspecified with opioid-induced psychotic disorder, with hallucinations
F11.959	Opioid use, unspecified with opioid-induced psychotic disorder, unspecified
F11.981	Opioid use, unspecified with opioid-induced sexual dysfunction
F11.982	Opioid use, unspecified with opioid-induced sleep disorder
F11.988	Opioid use, unspecified with other opioid-induced disorder
F11.99	Opioid use, unspecified, with unspecified opioid-induced disorder
Poisoning	
T40.0X1A	Poisoning by opium, accidental (unintentional), initial encounter
T40.0X1D	Poisoning by opium, accidental (unintentional), subsequent encounter
T40.0X2A	Poisoning by opium, intentional self-harm, initial encounter
T40.0X2D	Poisoning by opium, intentional self-harm, subsequent encounter
T40.0X3A	Poisoning by opium, assault, initial encounter
T40.0X3D	Poisoning by opium, assault, subsequent encounter
T40.0X4A	Poisoning by opium, undetermined, initial encounter
T40.0X4D	Poisoning by opium, undetermined, subsequent encounter

Diagnosis code	Description
T40.1X1A	Poisoning by heroin, accidental (unintentional), initial encounter
T40.1X1D	Poisoning by heroin, accidental (unintentional), subsequent encounter
T40.1X2A	Poisoning by heroin, intentional self-harm, initial encounter
T40.1X2D	Poisoning by heroin, intentional self-harm, subsequent encounter
T40.1X3A	Poisoning by heroin, assault, initial encounter
T40.1X3D	Poisoning by heroin, assault, subsequent encounter
T40.1X4A	Poisoning by heroin, undetermined, initial encounter
T40.1X4D	Poisoning by heroin, undetermined, subsequent encounter
T40.2X1A	Poisoning by other opioids, accidental (unintentional), initial encounter
T40.2X1D	Poisoning by other opioids, accidental (unintentional), subsequent encounter
T40.2X2A	Poisoning by other opioids, intentional self-harm, initial encounter
T40.2X2D	Poisoning by other opioids, intentional self-harm, subsequent encounter
T40.2X3A	Poisoning by other opioids, assault, initial encounter
T40.2X3D	Poisoning by other opioids, assault, subsequent encounter
T40.2X4A	Poisoning by other opioids, undetermined, initial encounter
T40.2X4D	Poisoning by other opioids, undetermined, subsequent encounter
T40.3X1A	Poisoning by methadone, accidental (unintentional), initial encounter
T40.3X1D	Poisoning by methadone, accidental (unintentional), subsequent encounter
T40.3X2A	Poisoning by methadone, intentional self-harm, initial encounter
T40.3X2D	Poisoning by methadone, intentional self-harm, subsequent encounter
T40.3X3A	Poisoning by methadone, assault, initial encounter
T40.3X3D	Poisoning by methadone, assault, subsequent encounter
T40.3X4A	Poisoning by methadone, undetermined, initial encounter
T40.3X4D	Poisoning by methadone, undetermined, subsequent encounter
T40.4X1A	Poisoning by synthetic narcotics, accidental (unintentional), initial encounter
T40.4X1D	Poisoning by synthetic narcotics, accidental (unintentional), subsequent encounter
T40.4X2A	Poisoning by other synthetic narcotics, intentional self-harm, initial encounter
T40.4X2D	Poisoning by other synthetic narcotics, intentional self-harm, subsequent encounter
T40.4X3A	Poisoning by other synthetic narcotics, assault, initial encounter
T40.4X3D	Poisoning by other synthetic narcotics, assault, subsequent encounter
T40.4X4A	Poisoning by synthetic narcotics, undetermined, initial encounter
T40.4X4D	Poisoning by synthetic narcotics, undetermined, subsequent encounter
T40.601A	Poisoning by unspecified narcotics, accidental (unintentional), initial encounter
T40.601D	Poisoning by unspecified narcotics, accidental (unintentional), subsequent encounter
T40.602A	Poisoning by unspecified narcotics, intentional self-harm, initial encounter
T40.602D	Poisoning by unspecified narcotics, intentional self-harm, subsequent encounter
T40.603A	Poisoning by unspecified narcotics, assault, initial encounter
T40.603D	Poisoning by unspecified narcotics, assault, subsequent encounter
T40.604A	Poisoning by unspecified narcotics, undetermined, initial encounter
T40.604D	Poisoning by unspecified narcotics, undetermined, subsequent encounter
T40.691A	Poisoning by other narcotics, accidental (unintentional), initial encounter
T40.691D	Poisoning by other narcotics, accidental (unintentional), subsequent encounter
T40.692A	Poisoning by other narcotics, intentional self-harm, initial encounter

Diagnosis code	Description
T40.692D	Poisoning by other narcotics, intentional self-harm, subsequent encounter
T40.693A	Poisoning by other narcotics, assault, initial encounter
T40.693D	Poisoning by other narcotics, assault, subsequent encounter
T40.694A	Poisoning by other narcotics, undetermined, initial encounter
T40.694D	Poisoning by other narcotics, undetermined, subsequent encounter
Adverse effects	
T40.0X5A	Adverse effect of opium, initial encounter
T40.0X5D	Adverse effect of opium, subsequent encounter
T40.2X5A	Adverse effect of other opioids, initial encounter
T40.2X5D	Adverse effect of other opioids, subsequent encounter
T40.3X5A	Adverse effect of methadone, initial encounter
T40.3X5D	Adverse effect of methadone, subsequent encounter
T40.4X5A	Adverse effect of synthetic narcotics, initial encounter
T40.4X5D	Adverse effect of synthetic narcotic, subsequent encounter
T40.605A	Adverse effect of unspecified narcotics, initial encounter
T40.605D	Adverse effect of unspecified narcotics, subsequent encounter
T40.695A	Adverse effect of other narcotics, initial encounter
T40.695D	Adverse effect of other narcotics, subsequent encounter
Long-term use of opiates	
Z79.891	Long-term (current) use of opiate analgesic

Abbreviations: ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

Table 5. ICD-9-CM and ICD-10-CM diagnosis codes defining endocarditis

Diagnosis code	Description
ICD-9-CM diagnosis codes	
036.42	Meningococcal endocarditis
098.84	Gonococcal endocarditis
112.81	Candidal endocarditis
115.04	Infection by <i>Histoplasma capsulatum</i> , endocarditis
115.14	Infection by <i>Histoplasma duboisii</i> , endocarditis
115.94	Histoplasmosis, unspecified, endocarditis
421.0	Acute and subacute bacterial endocarditis
421.1	Acute and subacute infective endocarditis in diseases classified elsewhere
421.9	Acute endocarditis, unspecified
424.90	Endocarditis, valve unspecified, unspecified cause
424.91	Endocarditis in diseases classified elsewhere
424.99	Other endocarditis, valve unspecified
ICD-10-CM diagnosis codes	
A32.82	Listerial endocarditis
A39.51	Meningococcal endocarditis
A52.03	Syphilitic endocarditis
A54.83	Gonococcal heart infection

Diagnosis code	Description
B33.21	Viral endocarditis
B37.6	Candidal endocarditis
I01.1	Acute rheumatic endocarditis
I33.0	Acute and subacute infective endocarditis
I33.9	Acute and subacute endocarditis, unspecified
I38	Endocarditis, valve unspecified
I39	Endocarditis and heart valve disorders in diseases classified elsewhere
M32.11	Endocarditis in systemic lupus erythematosus

Abbreviations: ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

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.

Location of patients' residence

Place of residence is based on the rural-urban continuum codes (RUCC) for U.S. counties developed by the United States Department of Agriculture (USDA).¹⁵ For this Statistical Brief, we collapsed the RUCC categories into the following three groups:

- Metro:
 - Counties in metro areas of 1 million population or more
 - Counties in metro areas of 250,000 to 1 million population
 - Counties in metro areas of fewer than 250,000 population
- Rural (nonmetro), adjacent to metro area:
 - Urban population of 20,000 or more, adjacent to a metro area
 - Urban population of 2,500 to 19,999, adjacent to a metro area
 - Completely rural or less than 2,500 urban population, adjacent to a metro area
- Rural (nonmetro), remote area:
 - Urban population of 20,000 or more, not adjacent to a metro area
 - Urban population of 2,500 to 19,999, not adjacent to a metro area
 - Completely rural or less than 2,500 urban population, not adjacent to a metro area

Community-level income

Community-level income is based on the median household income of the patient's ZIP Code of residence. Quartiles are defined so that the total U.S. population is evenly distributed. Cut-offs for the quartiles are determined annually using ZIP Code demographic data obtained from Claritas, a vendor that

¹⁵ United States Department of Agriculture. Rural-Urban Continuum Codes. Updated October 25, 2019. www.ers.usda.gov/data-products/rural-urban-continuum-codes/. Accessed June 26, 2019.

produces population estimates and projections based on data from the U.S. Census Bureau.¹⁶ The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign.

Expected payer

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

- Medicare: includes fee-for-service and managed care Medicare
- Medicaid: includes fee-for-service and managed care Medicaid
- Private insurance: includes commercial nongovernmental payers, regardless of the type of plan (e.g., private health maintenance organizations [HMOs], preferred provider organizations [PPOs])
- Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment
- Other payers: includes other Federal and local government programs (e.g., TRICARE, CHAMPVA, Indian Health Service, Black Lung, Title V) and Workers' Compensation

Hospital stays that were expected to be billed to the State Children's Health Insurance Program (SCHIP) may be classified as Medicaid or Other, depending on the structure of the State program. Because most State data do not identify SCHIP as a separate expected payer, 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.

Discharge status

Discharge status reflects the disposition of the patient at discharge from the hospital and includes the following six categories: routine (to home); transfer to another short-term hospital; other transfers (including skilled nursing facility, intermediate care, and another type of facility such as a nursing home); home health care; against medical advice (AMA); or died in the hospital.

Region and division

Region is one of the four regions defined by the U.S. Census Bureau. Division corresponds to the location of the hospital and is one of the nine divisions defined by the U.S. Census Bureau.

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

About HCUP

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of healthcare databases and related software tools and products developed through a Federal-State-Industry

¹⁶ Claritas. Claritas Demographic Profile by ZIP Code. <https://claritas360.claritas.com/mybestsegments/>. Accessed January 4, 2019.

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 healthcare 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 healthcare programs, and outcomes of treatments at the national, State, and local market levels.

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

Alaska Department of Health and Social Services
Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Delaware Division of Public Health
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Laulima Data Alliance, a subsidiary of the Healthcare Association of Hawaii
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi State Department of Health
Missouri Hospital Industry Data Institute
Montana Hospital Association
Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health

Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Department of Health and Human Resources, West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the NIS

The HCUP National (Nationwide) Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, nonrehabilitation hospitals). The NIS includes all payers. It is drawn from a sampling frame that contains hospitals comprising more than 95 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use. Over time, the sampling frame for the NIS has changed; thus, the number of States contributing to the NIS varies from year to year. The NIS is intended for national estimates only; no State-level estimates can be produced. The unweighted sample size for the 2016 NIS is 7,135,090 (weighted, this represents 35,675,421 inpatient stays).

For More Information

For other information on mental and substance use disorders, including opioid-related hospitalizations, refer to the HCUP Statistical Briefs located at www.hcup-us.ahrq.gov/reports/statbriefs/sb_mhsa.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 healthcare 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 August 2018. www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed January 4, 2019.

Suggested Citation

Weiss AJ (IBM Watson Health), Heslin KC (George Washington University), Stocks C (West Virginia University), Owens PL (AHRQ). Hospital Inpatient Stays Related to Opioid Use Disorder and Endocarditis, 2016. HCUP Statistical Brief #256. April 2020. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/reports/statbriefs/sb256-Opioids-Endocarditis-Inpatient-Stays-2016.pdf.

Acknowledgments

The authors would like to acknowledge the contributions of Minya Sheng of IBM Watson Health.

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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 healthcare 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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This Statistical Brief was posted online on April 14, 2020.