

## STATISTICAL BRIEF #260

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### Social Determinants of Health and County Population Rates of Opioid-Related Inpatient Stays and Emergency Department Visits, 2016

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#### Introduction

Increased use of prescription and nonprescription opioids in the past 20 years has led to substantial increases in opioid-related deaths and hospitalizations. During this time, the number of opioid-related overdose deaths has increased nearly sixfold, from 8,048 in 1999 to 46,802 in 2018.<sup>1</sup> Between 2005 and 2017, the rate of opioid-related emergency department (ED) visits nearly tripled from 89.1 to 249.1 per 100,000 population and the rate of opioid-related inpatient stays (IP) more than doubled from 136.8 to 299.7 per 100,000 population.<sup>2</sup> In 2017, the U.S. Department of Health and Human Services declared the opioid crisis to be a public health emergency.<sup>3</sup>

To better understand how and where to target interventions for the opioid crisis, policymakers need to assess the impact of social determinants of health (SDOH) at the community level. SDOH comprise the conditions in which people live that may affect their health.<sup>4</sup>

From a community context, SDOH can be classified into three key areas:<sup>5</sup>

- *Social, educational, and economic characteristics*—such as demographics, education, income, employment, social factors, and safety
- *Physical infrastructure*—such as population density, urban-rural location, housing, and access to healthy food
- *Healthcare characteristics*—such as availability and access to quality healthcare, health behaviors, health promotion initiatives, attitudes toward healthcare in the community, and healthcare laws

#### Highlights

- Among 2,214 counties (70.5 percent of all U.S. counties in 2016), 8.7 percent had population rates of opioid-related inpatient stays and emergency department (ED) visits that were high and 48.4 percent had rates that were low relative to the national average.
- Counties with high population rates of opioid-related inpatient stays and ED visits had the following social determinants of health (SDOH) characteristics:
  - *Social, educational, and economic*: lower population percentage of Hispanics/Latinos, higher percentage of economically disadvantaged residents, lower percentage of the population with religious congregation affiliation, and higher crime rates
  - *Physical infrastructure*: more likely to be urban, more densely populated, and more racially segregated
  - *Healthcare*: higher population rate of healthcare providers, greater pharmacy density, higher population percentage of Medicaid enrollment, more likely to have opioid-related State policies (e.g., permitting naloxone prescriptions for third parties), higher opioid prescribing rates, and higher State opioid mortality rates

<sup>1</sup> National Institute on Drug Abuse. Overdose Death Rates. Revised March 2020. [www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates](http://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates). Accessed May 15, 2020.

<sup>2</sup> Healthcare Cost and Utilization Project. HCUP Fast Stats – Opioid-Related Hospital Use. [www.hcup-us.ahrq.gov/faststats/OpioidUseServlet?setting1=IP](http://www.hcup-us.ahrq.gov/faststats/OpioidUseServlet?setting1=IP). Accessed May 15, 2020.

<sup>3</sup> 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](http://www.hhs.gov/opioids/about-the-epidemic/index.html). Accessed October 14, 2019.

<sup>4</sup> World Health Organization. About Social Determinants of Health. [www.who.int/social\\_determinants/sdh\\_definition/en/](http://www.who.int/social_determinants/sdh_definition/en/). Accessed October 14, 2019.

<sup>5</sup> Agency for Healthcare Research and Quality. Social Determinants of Health (SDOH). [www.ahrq.gov/sdoh/index.html](http://www.ahrq.gov/sdoh/index.html). Accessed February 25, 2020.

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents characteristics of U.S. counties based on population rates of opioid-related inpatient stays and treat-and-release ED visits for patients aged 15 years and older using comprehensive information from the 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia. County was defined based on patient ZIP Code of residence.

Each county's population rate of opioid-related hospital utilization was compared with the national average: 369.7 inpatient stays per 100,000 population (95% confidence interval [CI]: 357.2, 382.2) and 304.9 ED visits per 100,000 population (95% CI: 278.7, 331.1). Based on whether the county population rates were statistically significantly higher than, lower than, or similar to (i.e., not statistically significantly different from) the national average, counties were categorized into five opioid-related hospital utilization groups: High IP & ED, High IP & Low ED, Low IP & High ED, Low IP & ED, and similar to the average. Additional details are provided under "County groups" in the Definitions section.

Table 1 summarizes the county groups in this analysis, including the region and population estimates. HCUP IP and ED data were available for 2,214 (70.5 percent) of the 3,142 counties in the United States in 2016. Of the 2,214 counties, 8.7 percent had higher-than-average population rates of opioid-related inpatient stays and treat-and-release ED visits (High IP & ED) and nearly half (48.4 percent) had lower-than-average population rates of opioid-related inpatient stays and ED visits (Low IP & ED).

**Table 1. Population and region of counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**

| Characteristic  | All counties | County group based on population rates of opioid-related IP stays & ED visits |                  |                  |             |                    |
|---|--------------|---|------------------|------------------|-------------|--------------------|
|   |              | High IP & ED  | High IP & Low ED | Low IP & High ED | Low IP & ED | Similar to average |
| <b>Counties included in analysis (row percentages)</b>                  |              |   |                  |                  |             |                    |
| Number of counties  | 2,214        | 193   | 27               | 50               | 1,071       | 873                |
| Counties, %   | 100.0        | 8.7   | 1.2              | 2.3              | 48.4        | 39.4               |
| Total population aged 15+ years, no. <sup>a</sup>                       | 200,348,800  | 43,568,600  | 6,318,700        | 5,092,000        | 90,676,300  | 54,693,200         |
| Population aged 15+ years, %  | 100.0        | 21.7  | 3.2              | 2.5              | 45.3        | 27.3               |
| <b>Counties included in analysis, by region, % (column percentages)</b> |              |   |                  |                  |             |                    |
| Northeast   | 6.3          | 23.8  | 0.0              | 14.0             | 1.6         | 8.0                |
| Midwest   | 43.9         | 29.5  | 11.1             | 42.0             | 47.2        | 44.1               |
| South   | 39.0         | 36.3  | 74.1             | 30.0             | 43.0        | 34.1               |
| West  | 10.7         | 10.4  | 14.8             | 14.0             | 8.1         | 13.7               |

Abbreviations: ED, emergency department; IP, inpatient

<sup>a</sup> Population counts are rounded to the nearest hundred.

Sources: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 35 States and the District of Columbia, 2016; U.S. Census Bureau American Community Survey for U.S. county and population data, 2016

The purpose of this Statistical Brief is to describe how counties that have high versus low population rates of opioid-related hospital use differ with regard to SDOH. Thus, differences are presented only for counties with high population rates of opioid-related inpatient stays and ED visits (High IP & ED) compared with counties with low population rates of opioid-related inpatient stays and ED visits (Low IP & ED) for the three community SDOH areas: social, educational, and economic characteristics; physical infrastructure; and healthcare characteristics. The High IP & ED and Low IP & ED groups (shaded columns in Table 1) are the only groups further addressed in this Statistical Brief. As noted in the tables, data values presented for each SDOH characteristic represent either the average value across counties or the percentage of counties with the characteristic. All differences between estimates noted in the text are statistically significant at the .05 level or better.

## Findings

*Social, educational, and economic characteristics of counties with high and low population rates of opioid-related inpatient stays and ED visits across 35 States and the District of Columbia, 2016*

Table 2 presents the social, educational, and economic characteristics of counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits in 2016.

**Table 2. Social, educational, and economic characteristics of counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**

| Characteristic   | County group based on population rates of opioid-related inpatient stays and ED visits |                          |
|--|--|--------------------------|
|  | High IP & ED<br>(N=193)  | Low IP & ED<br>(N=1,071) |
| <b>Demographics</b>  |  |                          |
| Age, years, % of population aged 15+ years   |  |                          |
| 15–17  | 4.7  | 5.0                      |
| 18–44  | 40.7   | 40.4                     |
| 45–64  | 34.1   | 33.2                     |
| 65+  | 20.5   | 21.4                     |
| Female, % of population  | 50.7   | 49.8                     |
| Race, % of population  |  |                          |
| White  | 84.8   | 84.5                     |
| Black  | 7.4  | 8.3                      |
| American Indian, Alaska Native   | 1.5  | 1.4                      |
| Asian, Pacific Islander  | 1.8  | 1.5                      |
| Other, 2+ races  | 4.5  | 4.3                      |
| Ethnicity: Hispanic, Latino, % of population                                       | 6.6  | 11.7                     |
| <b>Education</b>   |  |                          |
| Associate's degree or higher in population aged 25+ years, % of population         | 32.0   | 29.9                     |
| <b>Poverty/income</b>  |  |                          |
| County population in poverty, % of population                                      | 16.8   | 15.6                     |
| Occupied units with housing costs at 30+% of household income, % of occupied units | 30.6   | 24.0                     |
| <b>Employment</b>  |  |                          |
| Unemployment rate, aged 16+ years  | 5.4  | 4.8                      |
| <b>Social factors</b>  |  |                          |
| Children living in single parent households, % of children                         | 35.6   | 30.9                     |
| Affiliated with a religious congregation, % of population                          | 44.8   | 56.2                     |
| <b>Community safety</b>  |  |                          |
| Property crime rate per 1,000 population   | 23.5   | 16.5                     |
| Violent crime rate per 1,000 population  | 2.8  | 2.1                      |

Abbreviations: ED, emergency department; IP, inpatient

Note: Data values are presented as the average value across the counties in the High IP & ED or Low IP & ED group.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia; supplemental data sources (see Appendix A.1)

- **Counties with high population rates of both opioid-related inpatient stays and ED visits had a smaller percentage of Hispanics/Latinos in the population than did counties with low rates.**

The percentage of Hispanics/Latinos was, on average, 6.6 percent in counties with high population rates of opioid-related inpatient stays and ED visits compared with 11.7 percent in counties with low opioid-related inpatient and ED rates.

- **Counties with high population rates of both opioid-related inpatient stays and ED visits were more likely to have an economically disadvantaged population than were counties with low rates.**

The poverty rate in counties with high population rates of opioid-related inpatient stays and ED visits averaged 16.8 percent compared with 15.6 percent in counties with low opioid-related inpatient and ED rates.

The percentage of occupied units in the county with housing costs equal to or greater than 30 percent of household income averaged 30.6 percent in counties with high population rates of opioid-related inpatient stays and ED visits versus 24.0 percent in counties with low opioid-related inpatient and ED rates.

Counties with high population rates of opioid-related inpatient stays and ED visits had a higher average unemployment rate than did counties with low opioid-related inpatient and ED rates (5.4 vs. 4.8 percent).

- **Social factors, specifically single-parent households and religious affiliation, were associated with population rates of opioid-related inpatient stays and ED visits.**

Counties with high population rates of opioid-related inpatient stays and ED visits had a higher average percentage of children living in single-parent households than did counties with low opioid-related inpatient and ED rates (35.6 vs. 30.9 percent).

In counties with high population rates of opioid-related inpatient stays and ED visits, the percentage of the population with an affiliation to a religious congregation was 44.8 percent, on average, compared with 56.2 percent in counties with low opioid-related inpatient and ED rates.

- **Counties with high population rates of opioid-related inpatient stays and ED visits had higher crime rates than did counties with low rates.**

Compared with counties with low population rates of opioid-related inpatient stays and ED visits, counties with high opioid-related inpatient and ED rates had, on average, a 42 percent higher rate of property crime (23.5 vs. 16.5 per 1,000 population) and a 33 percent higher rate of violent crime (2.8 vs. 2.1 per 1,000 population).

*Physical infrastructure of counties with high and low population rates of opioid-related inpatient stays and ED visits across 35 States and the District of Columbia, 2016*

Table 3 presents the physical infrastructure characteristics of counties with high and low opioid-related population rates of inpatient stays and treat-and-release ED visits in 2016.

**Table 3. Physical infrastructure of counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**

| Characteristic                                 | County group based on population rates of opioid-related inpatient stays and ED visits |                       |
|--|--|-----------------------|
|  | High IP & ED (N=193)   | Low IP & ED (N=1,071) |
| <b>Population</b>                              |  |                       |
| Population density per square mile             | 789.1  | 152.8                 |
| Urban/rural designation, % of counties         |  |                       |
| Metro  | 65.3   | 32.8                  |
| Rural-adjacent to metro                        | 24.4   | 31.3                  |
| Rural-remote                                   | 10.4   | 35.9                  |
| Residential segregation index, % of counties   |  |                       |
| Low segregation (index value 0.6–23.9)         | 11.9   | 23.3                  |
| Moderate segregation (index value 24.0–40.4)   | 38.9   | 44.9                  |
| High segregation (index value 40.5–89.1)       | 48.7   | 17.6                  |
| Segregation index not calculated <sup>a</sup>  | 0.5  | 14.1                  |
| <b>Food access</b>                             |  |                       |
| Food environment index, 0 (worst) to 10 (best) | 7.1  | 7.0                   |
| <b>Housing</b>                                 |  |                       |
| Severe housing problems, % of households       | 16.7   | 13.7                  |

Abbreviations: ED, emergency department; IP, inpatient

Note: Unless otherwise noted, data values are presented as the average value across the counties in the High IP & ED or Low IP & ED group.

<sup>a</sup> No index value is calculated for counties with too little variation in the race of the population (i.e., fewer than 100 non-White people in the county in the time frame).

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia; supplemental data sources (see Appendix A.1)

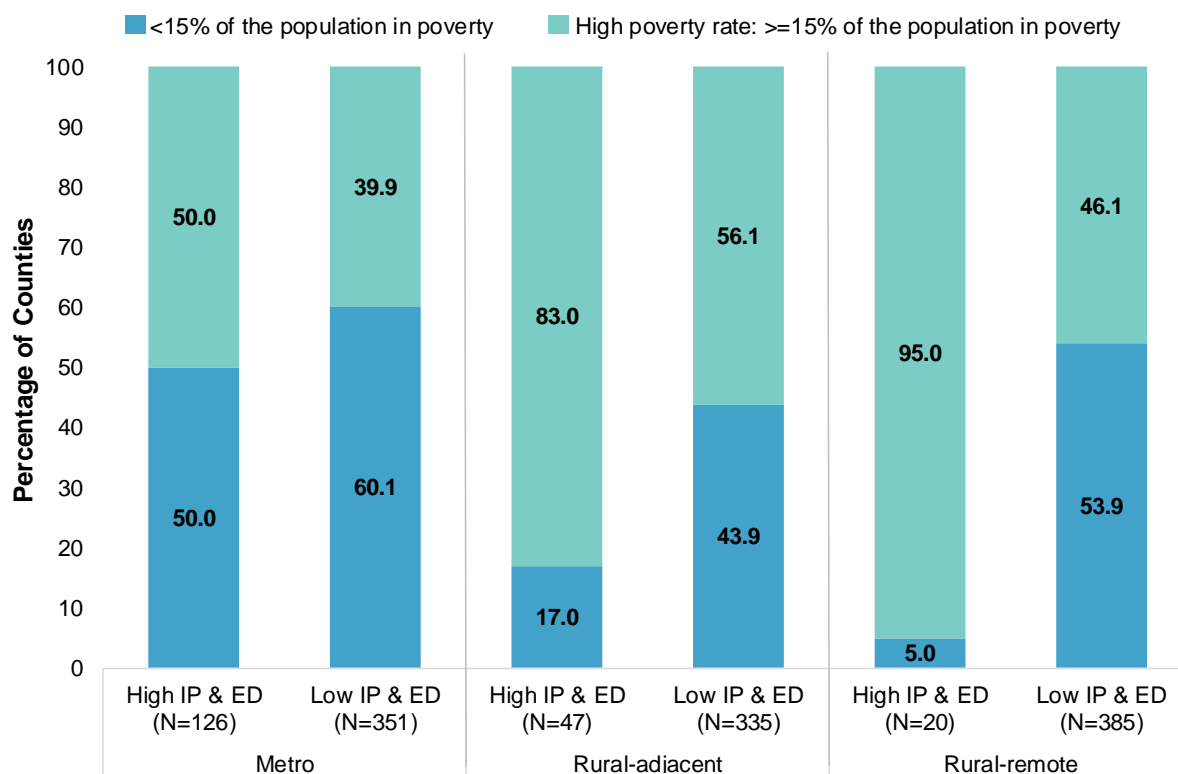
- **Counties with high population rates of opioid-related inpatient stays and ED visits were more densely populated, more likely to be urban, and more racially segregated than counties with low rates.**

Compared with counties with low population rates of opioid-related inpatient stays and ED visits, counties with high opioid-related inpatient and ED rates were more densely populated (an average of 789.1 vs. 152.8 people per square mile), more likely to be in metropolitan areas (65.3 vs. 32.8 percent of counties), and more racially segregated (48.7 vs. 17.6 percent of counties with high segregation).

Counties with high population rates of opioid-related inpatient stays and ED visits also had a higher percentage of households with severe housing problems, on average, compared with counties with low opioid-related inpatient and ED rates (16.7 vs. 13.7 percent).

Figure 1 presents the distribution of counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits in 2016 by urban-rural location (metro, rural-adjacent to a metro area, and rural-remote area) and poverty rate (high, low). Based on the national average, *high poverty rate* is defined as 15 percent or more of the population living in poverty.<sup>6</sup>

**Figure 1. Urban-rural location and poverty level in counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**



Abbreviations: ED, emergency department; IP, inpatient

Note: Counties with a high poverty rate were defined as those with at least 15 percent of the population in poverty. As noted in Table 2, on average, 16.8 percent of the population in the High IP & ED counties and 15.6 percent of the population in the Low IP & ED counties lived in poverty. On average, 12.7 percent of the U.S. population lived in poverty in 2016.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia; supplemental data sources (see Appendix A.1)

- **Rural-remote and rural-adjacent counties with high population rates of opioid-related inpatient stays and ED visits were more likely to have a high poverty rate than were counties with low rates.**

Nearly all rural-remote counties (95.0 percent) and 83.0 percent of rural-adjacent counties with high population rates of opioid-related inpatient stays and ED visits had high rates of poverty (greater than or equal to 15 percent) compared with less than 60 percent of rural-remote and rural-adjacent counties with low opioid-related inpatient and ED rates.

<sup>6</sup> Percentage of the county population in poverty was obtained from the American Community Survey, U.S. Census Bureau, 2016. The national average poverty rate in 2016 was obtained from the U.S. Census Bureau Report #P60-259, *Income and Poverty in the United States: 2016*, published September 12, 2017. [www.census.gov/library/publications/2017/demo/p60-259.html](http://www.census.gov/library/publications/2017/demo/p60-259.html). Accessed May 5, 2020.

*Characteristics of healthcare in counties with high and low population rates of opioid-related inpatient stays and ED visits across 35 States and the District of Columbia, 2016*

Table 4 describes the availability of and access to healthcare in counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits in 2016.

**Table 4. Availability of and access to healthcare in counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**

| Characteristic  | County group based on population rates of opioid-related IP stays & ED visits |                       |
|---|---|-----------------------|
|   | High IP & ED (N=193)  | Low IP & ED (N=1,071) |
| <b>Availability of services</b>                             |   |                       |
| Total beds per 100,000 population                           | 231.5   | 222.5                 |
| Federally Qualified Health Centers, no.                     | 7.1   | 2.0                   |
| Primary care physicians per 100,000 population              | 57.5  | 42.9                  |
| Psychiatrists per 100,000 population                        | 8.2   | 3.3                   |
| Psychiatric beds per 100,000 population                     | 13.3  | 7.5                   |
| Buprenorphine providers per 100,000 population <sup>a</sup> | 11.8  | 2.9                   |
| Pharmacy density per 100 square miles                       | 15.0  | 2.4                   |
| <b>Access to care: insurance, % of population</b>           |   |                       |
| Medicare enrollment   | 19.8  | 19.5                  |
| Medicaid enrollment   | 22.2  | 18.2                  |
| Private insurance coverage                                  | 64.6  | 66.3                  |
| Uninsured   | 10.1  | 12.3                  |

Abbreviations: ED, emergency department; IP, inpatient

Note: Data values are presented as the average value across the counties in the High IP & ED or Low IP & ED group.

<sup>a</sup> Buprenorphine is an opioid used to treat opioid use disorder, acute pain, and chronic pain.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia; supplemental data sources (see Appendix A.1)

- **Counties with high population rates of opioid-related inpatient stays and ED visits had greater availability of health service providers than did counties with low rates.**

Compared with counties with low population rates of opioid-related inpatient stays and ED visits, counties with high opioid-related inpatient and ED rates had more Federally Qualified Health Centers (mean of 7.1 vs. 2.0), primary care physicians (57.5 vs. 42.9 per 100,000 population), psychiatrists (8.2 vs. 3.3 per 100,000 population), psychiatric beds (13.3 vs. 7.5 per 100,000 population), and buprenorphine providers (11.8 vs. 2.9 per 100,000 population).

Counties with high population rates of opioid-related inpatient stays and ED visits also had a greater average density of pharmacies than did counties with low opioid-related inpatient and ED rates (15.0 vs. 2.4 per 100 square miles).

- **Counties with high population rates of opioid-related inpatient stays and ED visits had a higher percentage of Medicaid enrollees than did counties with low rates.**

Counties with high population rates of opioid-related inpatient stays and ED visits had an average of 22.2 percent of the population enrolled in Medicaid, whereas counties with low population rates of opioid-related inpatient stays and ED visits had an average of 18.2 percent of the population enrolled in Medicaid.

Table 5 presents State-level opioid-related activities and healthcare policies, county-level opioid prescribing rates, and State-level opioid mortality rates in counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits in 2016.

**Table 5. Opioid-related activities, policies, prescribing rate, and mortality in counties with high and low population rates of opioid-related inpatient stays and treat-and-release ED visits across 35 States and the District of Columbia, 2016**

| Characteristic  | County group based on population rates of opioid-related IP stays & ED visits |                       |
|---|---|-----------------------|
|   | High IP & ED (N=193)  | Low IP & ED (N=1,071) |
| <b>State-level opioid-related activity and healthcare policies</b>                                  |   |                       |
| Law enforcement seizures of fentanyl, no.   | 1,852.2   | 336.3                 |
| Naloxone prescriptions permitted for third parties, % of counties <sup>a</sup>                      | 92.2  | 82.7                  |
| Prescription drug monitoring program (PDMP) permitted to share data with other PDMPs, % of counties | 86.0  | 79.6                  |
| Prescribers required to check PDMP before prescribing controlled substances, % of counties          | 58.5  | 10.6                  |
| Medicaid expansion State, % of counties   | 73.1  | 39.4                  |
| <b>County-level opioid prescribing rate</b>   |   |                       |
| Opioid prescribing rate per 100 residents per year  | 89.8  | 61.6                  |
| <b>State-level opioid mortality rate</b>  |   |                       |
| Opioid mortality rate per 100,000 population  | 19.8  | 8.9                   |

Abbreviations: ED, emergency department; IP, inpatient

Note: Unless otherwise noted, data values are presented as the average value across the counties in the High IP & ED or Low IP & ED group.

<sup>a</sup> Naloxone is an opioid antagonist and is designed to rapidly reverse the effects of an opioid overdose.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia; supplemental data sources (see Appendix A.1)

- **Counties with high population rates of opioid-related inpatient stays and ED visits were more likely to be located in States with opioid-related healthcare policies than were counties with low rates.**

Compared with counties with low population rates of opioid-related inpatient stays and ED visits, counties with high opioid-related inpatient and ED rates were more likely to be in States that permitted naloxone prescriptions for third parties (92.2 vs. 82.7 percent), permitted prescription drug monitoring programs (PDMPs) to share data with other PDMPs (86.0 vs. 79.6 percent), required prescribers to check the PDMP before prescribing controlled substances (58.5 vs. 10.6 percent), and had more law enforcement seizures of fentanyl, a synthetic opioid pain reliever (mean of 1,852.2 vs. 336.3).

Counties with high population rates of opioid-related inpatient stays and ED visits were more likely to be in a Medicaid expansion State than were counties with low opioid-related inpatient and ED rates (73.1 vs. 39.4 percent).

- **Counties with high population rates of opioid-related inpatient stays and ED visits had higher opioid prescribing and opioid mortality rates than did counties with low rates.**

Compared with counties with low population rates of opioid-related inpatient stays and ED visits, counties with high opioid-related inpatient and ED rates had an average opioid prescribing rate that was nearly 50 percent higher (89.8 vs. 61.1 per 100 residents) and an average mortality rate that was more than twice as high (19.8 vs. 8.9 per 100,000 population).



## 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 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia: Arkansas, Arizona, California, Connecticut, District of Columbia, Florida, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, Montana, North Carolina, North Dakota, Nebraska, Nevada, New Jersey, New York, Ohio, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Wisconsin, and Wyoming.

Supplemental data sources used for the county characteristics, including detailed descriptions of each county characteristic and data source websites, are presented in Appendix A.1, available as a separate, supplemental file associated with this Statistical Brief on the HCUP-US website at [www.hcup-us.ahrq.gov/reports/statbriefs/sb260-appendix.pdf](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb260-appendix.pdf). Whenever possible, data from 2016 was used. In some cases, only data from an earlier or later time period were available.

## Definitions

### *Diagnoses and ICD-10-CM*

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-10-CM is the International Classification of Diseases, Tenth Revision, Clinical Modification. In October 2015, ICD-10-CM replaced the ICD-9-CM diagnosis 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.

### *Case definition*

The following ICD-10-CM diagnosis codes were used to define opioid-related inpatient stays and ED visits:

- F11 series: opioid-related disorders
  - All codes are included except remission code F11.21 (opioid dependence in remission).
- T40 series: poisoning by, adverse effect of, and underdosing of narcotics.
  - The following codes are included—encompassing accidental (unintentional) poisoning, intentional self-harm, assault, undetermined, and adverse effect (except heroin)—with the following characteristics in the 4th through 6th digits and a 7th digit indicating initial or subsequent encounter:
    - 0X1, 0X2, 0X3, 0X4, 0X5: Opium
    - 1X1, 1X2, 1X3, 1X4: Heroin
    - 2X1, 2X2, 2X3, 2X4, 2X5: Other opioids
    - 3X1, 3X2, 3X3, 3X4, 3X5: Methadone
    - 4X1, 4X2, 4X3, 4X4, 4X5: Other synthetic narcotics
    - 601, 602, 603, 604, 605: Unspecified narcotics
    - 691, 692, 693, 694, 695: Other narcotics

- Codes with a 6th digit of “6”, indicating underdosing, or a 7th digit of “S”, indicating sequela, are excluded.

The opioid diagnosis could be either a principal or secondary diagnosis. A full list of the individual ICD-10-CM codes used in the definition of opioid-related inpatient stays and ED visits is provided in Appendix A.2, available as a separate, supplemental file associated with this Statistical Brief on the HCUP-US website at [www.hcup-us.ahrq.gov/reports/statbriefs/sb260-appendix.pdf](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb260-appendix.pdf).

#### *County assignment*

Patient county was assigned based on the ZIP Code of the patient’s residence using the SAS function for ZIP Code to county assignment. For ZIP Codes that cross county boundaries, the SAS function used the geographic centroid of the ZIP Code to assign the county.<sup>7</sup> If the patient’s ZIP Code indicated that the patient was homeless (HCUP data element ZIP = “H”), then the patient county was assigned to be the same as the hospital county. Records for patients with a ZIP Code that was missing, invalid, or indicated that the person was from a foreign country were excluded from the tabulated counts. This exclusion dropped less than 1 percent of records.

#### *County groups*

Counties were classified into five opioid-related hospital utilization population rate groups based on comparison of the 95 percent confidence interval around each county’s population rate of opioid-related inpatient stays and emergency department (ED) visits compared with the 95 percent confidence interval around the national average rate (inpatient: 369.7 per 100,000 population; ED: 304.9 per 100,000 population), (see Table 6). Statistical significance was conservatively defined as nonoverlapping 95 percent confidence intervals. The focus of this Statistical Brief was the comparisons of counties described by the bolded text (High IP & ED and Low IP & ED groups).

- **High IP & ED: counties with population rates of opioid-related hospital utilization that were statistically significantly above the national average for both IP stays and ED visits (N=193)**
- *High IP & Low ED: counties with population rates of opioid-related hospital utilization that were statistically significantly above the national average for IP stays and statistically significantly below the national average for ED visits (N=27)*
- *Low IP & High ED: counties with population rates of opioid-related hospital utilization that were statistically significantly below the national average for IP stays and statistically significantly above the national average for ED visits (N=50)*
- **Low IP & ED: counties with population rates of opioid-related hospital utilization that were statistically significantly below the national average for both IP stays and ED visits (N=1,071)**
- *Similar to average: counties with opioid-related hospital utilization rates that were not statistically significantly different from the national average for IP stays and/or ED visits (N=873)*

<sup>7</sup> Additional information from SAS on the geocode procedure is available at SAS. Understanding ZIP Code Geocoding. [support.sas.com/documentation/cdl/en/graphref/65389/HTML/default/viewer.htm#n1cqwropowwd4l6n1lmw39ughipuh.htm](http://support.sas.com/documentation/cdl/en/graphref/65389/HTML/default/viewer.htm#n1cqwropowwd4l6n1lmw39ughipuh.htm). Accessed January 25, 2020.

**Table 6. Distribution of counties based on population rates of opioid-related inpatient stays and treat-and-release ED visits compared with the national average across 35 States and the District of Columbia, 2016**

| Number of counties based on comparison of opioid-related <i>inpatient stay</i> population rate to national average | Number of counties based on comparison of opioid-related <i>ED visit</i> population rate to national average |                         |                    |       |
|--|--|-------------------------|--------------------|-------|
|  | Above U.S. average   | Similar to U.S. average | Below U.S. average | Total |
| Above U.S. average   | 193 <sup>a</sup>   | 80 <sup>e</sup>         | 27 <sup>b</sup>    | 300   |
| Similar to U.S. average  | 102 <sup>e</sup>   | 209 <sup>e</sup>        | 173 <sup>e</sup>   | 484   |
| Below U.S. average   | 50 <sup>c</sup>  | 309 <sup>e</sup>        | 1,071 <sup>d</sup> | 1,430 |
| Total  | 345  | 598                     | 1,271              | 2,214 |

Abbreviations: ED, emergency department; IP, inpatient

Note: Classification was based on comparison of county-level population rates to the U.S. average rate. Counties with population rates that were statistically significantly above the U.S. average rate were classified as “above U.S. average.” Counties with population rates that were statistically significantly below the U.S. average rate were classified as “below U.S. average.” Counties that were not statistically significantly different from the national average were classified as “similar to U.S. average.”

<sup>a</sup> These counties were classified as having high population rates of opioid-related inpatient stays and ED visits (High IP & ED county group).

<sup>b</sup> These counties were classified as having high population rates of opioid-related inpatient stays and low population rates of opioid-related ED visits (High IP & Low ED county group).

<sup>c</sup> These counties were classified as having low population rates of opioid-related inpatient stays and high population rates of opioid-related ED visits (Low IP & High ED county group).

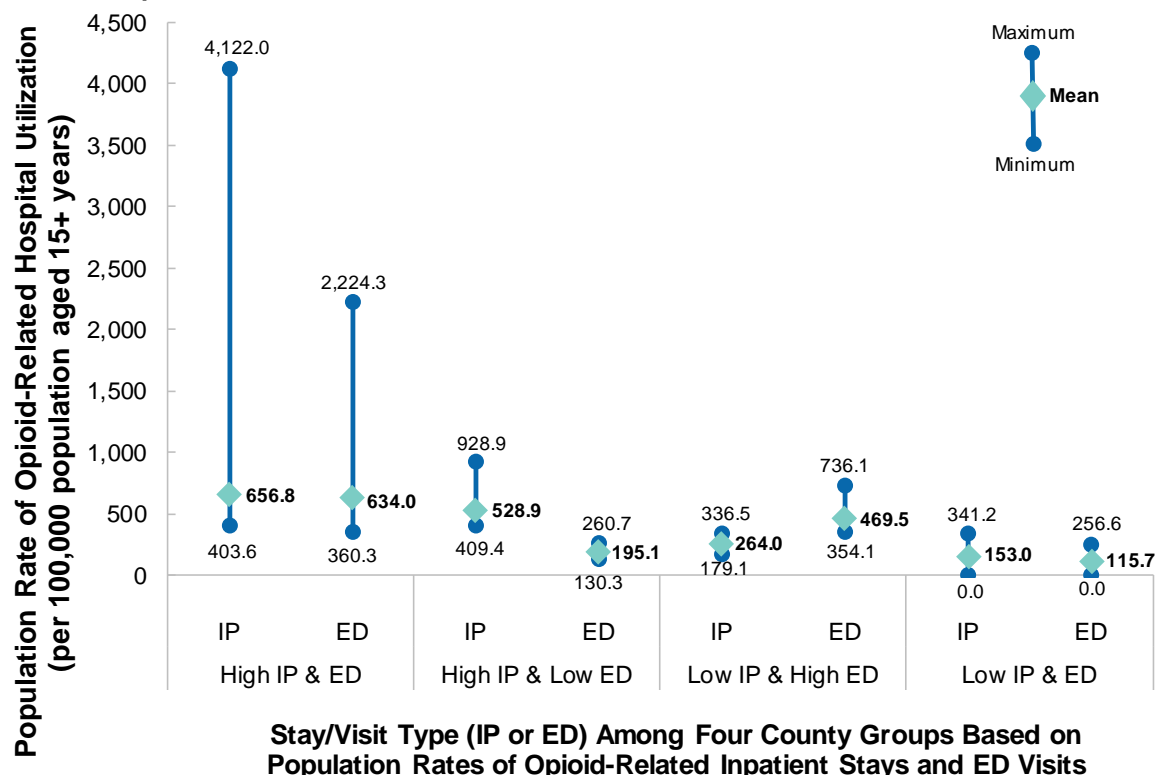
<sup>d</sup> These counties were classified as having low population rates of opioid-related inpatient stays and ED visits (Low IP & ED county group).

<sup>e</sup> These counties were classified as having population rates of opioid-related inpatient stays and/or ED visits that were similar to the U.S. national average population rates (similar to average county group).

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) for 35 States and the District of Columbia, 2016

Figure 2 provides the county-level mean and range of the population rates of opioid-related inpatient stays and ED visits in the four county groups classified as having high and/or low opioid-related hospitalization. Counties with extreme outliers were not removed from this analysis in order to include all counties; however, it is important to note that the high-end outliers may increase the overall mean.

**Figure 2. County-level mean and range of the population rates of opioid-related inpatient stays and treat-and-release ED visits among counties with high and low population rates of opioid-related hospital utilization across 35 States and the District of Columbia, 2016**



Abbreviations: ED, emergency department; IP, inpatient

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), 2016 State Inpatient Databases (SID) and State Emergency Department Databases (SEDD) from 35 States and the District of Columbia

*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 center hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay was included in the analysis.

*Types of hospitals included in HCUP State Emergency Department Databases*

This analysis used State Emergency Department Databases (SEDD) limited to data from community hospitals with a hospital-owned emergency department. Community hospitals are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include specialty, pediatric, public, and academic medical center hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals.

### *Unit of analysis*

The unit of analysis in this Statistical Brief is the county. The county groups, defined by population rates of opioid-related hospital utilization, are based on the hospital discharge (i.e., the hospital stay) or emergency department (ED) visit, not individual patients. A patient admitted to the hospital multiple times in 1 year will be counted each time as a separate discharge from the hospital, and a patient seen in the ED multiple times in 1 year will be counted each time as a separate ED visit.

### *Region*

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

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

### **About HCUP**

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of healthcare 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 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  
University of **Hawaii**, Hilo, Center for Rural Health Science  
**Hawaii** Laulima Data Alliance  
**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 SID

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

### About the SEDD

The HCUP State Emergency Department Databases (SEDD) include information from hospital-owned emergency departments (EDs) from data organizations participating in HCUP, translated into a uniform format to facilitate multistate comparisons and analyses. The SEDD capture the universe of records on ED visits in participating HCUP States that do not result in an admission to the same hospital (i.e., patients who are treated in the ED and then discharged, transferred to another hospital, left against medical advice, or died). The SEDD contain a core set of clinical and nonclinical information on all patients, including individuals covered by Medicare, Medicaid, or private insurance, as well as those whose stays were not expected to be covered by insurance. The SEDD 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 injury surveillance, emerging infections, and other conditions treated in the ED.

## For More Information

For other information on mental and substance use disorders, including opioids, refer to the HCUP Statistical Briefs located at [www.hcup-us.ahrq.gov/reports/statbriefs/sb\\_mhsa.jsp](http://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](http://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/](http://www.hcupnet.ahrq.gov/)

For more information about HCUP, visit [www.hcup-us.ahrq.gov/](http://www.hcup-us.ahrq.gov/).

For a detailed description of HCUP and more information on the design of the State Inpatient Databases (SID) and State Emergency Department Databases (SEDD), 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 2019. [www.hcup-us.ahrq.gov/sidoverview.jsp](http://www.hcup-us.ahrq.gov/sidoverview.jsp). Accessed February 3, 2020.

Agency for Healthcare Research and Quality. Overview of the State Emergency Department Databases (SEDD). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated January 2020. [www.hcup-us.ahrq.gov/seddooverview.jsp](http://www.hcup-us.ahrq.gov/seddooverview.jsp). Accessed February 3, 2020.

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

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