

STATISTICAL BRIEF #244

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Opioid-Related Inpatient Stays and Emergency Department Visits Among Patients Aged 65 Years and Older, 2010 and 2015

Audrey J. Weiss, Ph.D., Kevin C. Heslin, Ph.D.,
Marguerite L. Barrett, M.S., Rwaida Izar, M.P.H., and
Arlene S. Bierman, M.D., M.S.

Introduction

Opioid misuse in older adults is an underappreciated and growing problem. Although opioid misuse overall is lower among older than among younger Americans, the rate of opioid misuse among older adults nearly doubled between 2002 and 2014.¹ In 2016, a third of the more than 40 million Americans enrolled in Medicare Part D received prescription opioids and a substantial number received higher doses than recommended for prolonged periods of time, putting them at increased risk of misuse.² Between 2005 and 2014, the rate of opioid-related hospitalizations increased fastest among patients aged 65 years and older compared with all other age groups.³

Eighty percent of U.S. adults aged 65 years and older have multiple chronic conditions (e.g., heart disease, diabetes, arthritis, and depression) compared with less than 20 percent of adults aged 18–44 years.⁴ Chronic pain is common among older adults,⁵ and more than one-third of older Americans are living with

Highlights

- Among patients aged 65 years and older, the rate of opioid-related hospitalizations increased more than the rate of nonopioid-related hospitalizations between 2010 and 2015:
 - *Inpatient stays*: a 34.3 percent increase in the rate of opioid-related stays, from 199.3 to 267.6 per 100,000 population, versus a 17.4 percent decrease in the rate of nonopioid-related stays
 - *Emergency department (ED) visits*: a 74.2 percent increase in the rate of opioid-related ED visits, from 44.7 to 77.9 per 100,000 population, versus a 17.4 percent increase in the rate of nonopioid-related ED visits
- Compared with nonopioid-related stays among patients aged 65 years and older in 2015, opioid-related stays involved—
 - Higher average inpatient costs and ED charges
 - A higher proportion of patients discharged against medical advice
 - A higher proportion of patients with multiple chronic conditions
 - A higher hospitalization rate among patients residing in western States relative to other regions

¹ Substance Abuse and Mental Health Services Administration. Opioid Misuse Increases Among Older Adults. National Survey on Drug Use and Health: The CBHSQ Report. July 25, 2017. www.samhsa.gov/data/sites/default/files/report_3186/Spotlight-3186.html. Accessed July 24, 2018.

² U.S. Department of Health & Human Services, Office of Inspector General. Opioids in Medicare Part D: Concerns About Extreme Use and Questionable Prescribing. HHS OIG Data Brief. July 2017. www.oig.hhs.gov/oei/reports/oei-02-17-00250.pdf. Accessed July 24, 2018.

³ Weiss AJ, Bailey MK, O'Malley L, Barrett ML, Elixhauser A, Steiner CA. Patient Characteristics of Opioid-Related Inpatient Stays and Emergency Department Visits Nationally and by State, 2014. HCUP Statistical Brief #224. June 2017. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/reports/statbriefs/sb224-Patient-Characteristics-Opioid-Hospital-Stays-ED-Visits-by-State.pdf. Accessed July 24, 2018.

⁴ Gerteis J, Izrael D, Deitz D, LeRoy L, Ricciardi R, Miller T, et al. Multiple Chronic Conditions Chartbook: 2010 Medical Expenditure Panel Survey Data. Rockville, MD: Agency for Healthcare Research and Quality; 2014. www.ahrq.gov/sites/default/files/wysiwyg/professionals/prevention-chronic-care/decision/mcc/mcccchartbook.pdf. Accessed July 27, 2018.

⁵ Institute of Medicine, Board on Health Sciences Policy, Committee on Advancing Pain Research, Care, and Education. Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research. Washington, DC: The National Academies Press; 2011.

a disability,⁶ making this population more likely than younger adults to receive an opioid prescription.⁷ In addition, complex social needs and mental health issues including depression, substance abuse, cognitive decline, and dementia often go unrecognized and/or complicate clinical management.^{8,9} Compounded by the physiologic changes associated with aging, these conditions place older adults using opioid medications at increased risk for adverse events including injurious falls¹⁰ and delirium,¹¹ which may result in ED visits or hospital admissions.

Additionally, older adults are more likely than younger adults to take prescription medications,¹² which increases the likelihood of drug interactions and adverse effects associated with the use of opioids. In the period from 2011–2014, more than 90 percent of Americans aged 65 years and older reported use of a prescription drug in the past 30 days, with over 40 percent reporting use of five or more prescription drugs in the prior 30 days (compared with less than 5 percent of adults aged 18–44 years).¹³ This represents a substantial increase in the proportion of adults aged 65 years and older who used prescription medications compared with 20 years earlier (1988–1994: one prescription medication, 74 percent; five or more prescription medications, 14 percent).¹⁴

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents statistics on opioid-related hospital stays and ED visits among patients aged 65 years and older in fiscal year (FY) 2010 (from quarter 4 of 2009 through quarter 3 of 2010) and FY 2015 (from quarter 4 of 2014 through quarter 3 of 2015), hereinafter referred to as 2010 and 2015.¹⁵ The number and rate of opioid-related stays and ED visits in 2010 and 2015 are provided for three distinct age groups: 65–74 years, 75–84 years, and 85 years and older. The percentage of opioid-related inpatient stays and ED visits that involved a principal opioid diagnosis is provided for each of the three age groups in 2015. Characteristics of opioid-related stays and ED visits versus nonopioid-related stays and visits among adults aged 65 years and older are presented for 2015. Identification of opioid-related stays and ED visits is based on all-listed diagnoses and includes events associated with prescription opioids or illicit opioids such as heroin. Differences greater than 10 percent between estimates are noted in the text.

⁶ He W, Larsen LJ. Older Americans With a Disability: 2008-2012. U.S. Census Bureau, American Community Survey Reports, ACS-29. U.S. Government Printing Office, Washington, DC; 2014.

⁷ Centers for Disease Control and Prevention. Annual Surveillance Report of Drug-Related Risks and Outcomes—United States, 2017. Surveillance Special Report 1. Centers for Disease Control and Prevention. August 31, 2017. www.cdc.gov/drugoverdose/pdf/pubs/2017-cdc-drug-surveillance-report.pdf. Accessed July 27, 2018.

⁸ Bartels SJ, Blow FC, Brockmann LM, Van Citters AD. Substance Abuse and Mental Health Among Older Americans: The State of the Knowledge and Future Directions. Report prepared for the Substance Abuse and Mental Health Services Administration. Rockville MD: Westat; 2005. www.gsa-alcohol.fmhi.usf.edu/Substance%20Abuse%20and%20Mental%20Health%20Among%20Older%20Adults-%20The%20State%20of%20Knowledge%20and%20Future%20Directions.pdf. Accessed August 6, 2018.

⁹ Valtorta N, Hanratty B. Loneliness, isolation and the health of older adults: do we need a new research agenda? *Journal of the Royal Society of Medicine*. 2012 Dec;105(12):518–22.

¹⁰ Miller M, Sturmer T, Azrael D, Levin R, Solomon DH. Opioid analgesics and the risk of fractures among older adults with arthritis. *Journal of the American Geriatrics Society*. 2011;59(3):430–8.

¹¹ Pisani MA, Murphy TE, Araujo KLB, Van Ness PH. Factors associated with persistent delirium following ICU admission in an older medical patient population. *Journal of Critical Care*. 2010;25(3):540.e1–540.e7.

¹² National Center for Health Statistics. Health, United States, 2016: With Chartbook on Long-Term Trends in Health. Table 79. Hyattsville, MD: National Center for Health Statistics; 2017. [www.cdc.gov/nchs/data/16.pdf](http://www.cdc.gov/nchs/data/hus/16.pdf). Accessed July 30, 2018.

¹³ *Ibid.*

¹⁴ *Ibid.*

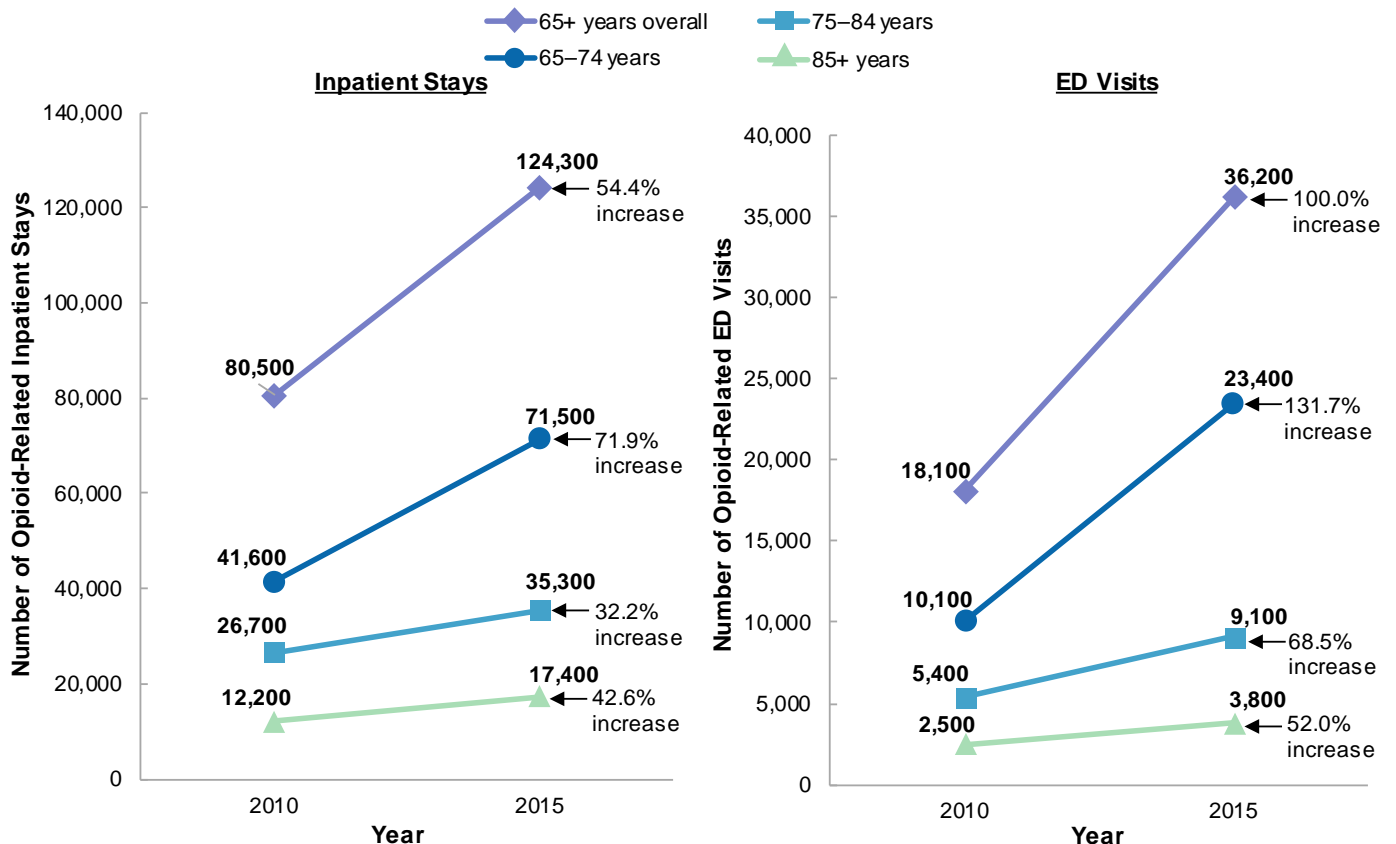
¹⁵ We used fiscal years (FYs) in this Statistical Brief because beginning FY 2016, on October 1, 2015, the United States transitioned from the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) clinical coding system to the International Classification of Diseases, Tenth Revision, Clinical Modification/Procedural Coding System (ICD-10-CM/PCS) clinical coding system. Although codes for opioid-related diagnoses are available in both coding systems, the change in coding systems resulted in a substantial shift in the number of opioid-related inpatient stays (ref. Heslin KC, Owens PL, Karaca Z, Barrett ML, Moore BJ, Elixhauser A. Trends in opioid-related inpatient stays shifted after the US transitioned to ICD-10-CM diagnosis coding in 2015. *Medical Care*. 2017;55(11):918–23). As a result, for comparability across years in this Statistical Brief, we used 2 FYs (2010 and 2015) with clinical coding entirely under the ICD-9-CM coding system.

Findings

Distribution of opioid-related inpatient stays and ED visits among patients aged 65 years and older, 2010 and 2015

Figure 1 provides the number of opioid-related inpatient stays and ED visits among patients aged 65 years and older by patient age group in 2010 and 2015.

Figure 1. Number of opioid-related inpatient stays and ED visits among patients aged 65 years and older, by age group, 2010 versus 2015



Abbreviation: ED, emergency department

Note: Number of stays and visits were based on all-listed diagnoses and rounded to the nearest hundred.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2010 and 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2009–2010 and 2014–2015; Nationwide Emergency Department Sample (NEDS), 2009–2010 and 2014–2015

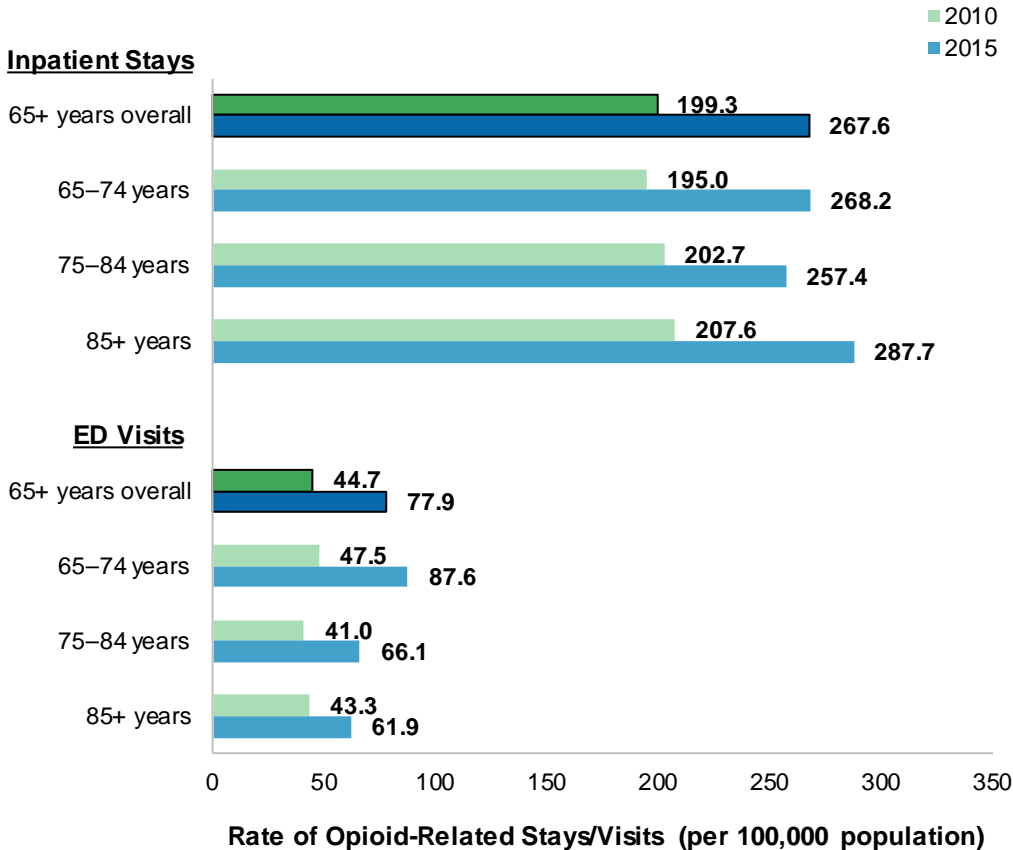
- **The number of opioid-related inpatient stays and ED visits increased substantially between 2010 and 2015 among patients aged 65 years and older.**

Overall, between 2010 and 2015, the number of opioid-related inpatient stays increased 54.4 percent among patients aged 65 years and older, from 80,500 stays in 2010 to 124,300 stays in 2015. This increase occurred among all three age groups (65–74 years, 75–84 years, and 85 years and older), but the increase was largest among patients aged 65–74 years (71.9 percent increase) compared with the two older age groups (32.2 percent increase among patients aged 75–84 years and 42.6 percent increase among patients aged 85 years and older).

Similarly, between 2010 and 2015, the number of opioid-related ED visits doubled among patients aged 65 years and older, from 18,100 visits in 2010 to 36,200 visits in 2015. Again, an increase was observed among all three age groups but was largest among patients aged 65–74 years (131.7 percent increase) compared with those aged 75–84 years (68.5 percent increase) and those aged 85 years and older (52.0 percent increase).

Figure 2 presents the rate of opioid-related inpatient stays and ED visits per 100,000 population among patients aged 65 years and older by patient age group in 2010 and 2015. The percentage change in these rates is provided in Figure 3.

Figure 2. Population rate of opioid-related inpatient stays and ED visits among patients aged 65 years and older, by age group, 2010 versus 2015



Abbreviation: ED, emergency department

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2010 and 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2009–2010 and 2014–2015; Nationwide Emergency Department Sample (NEDS), 2009–2010 and 2014–2015

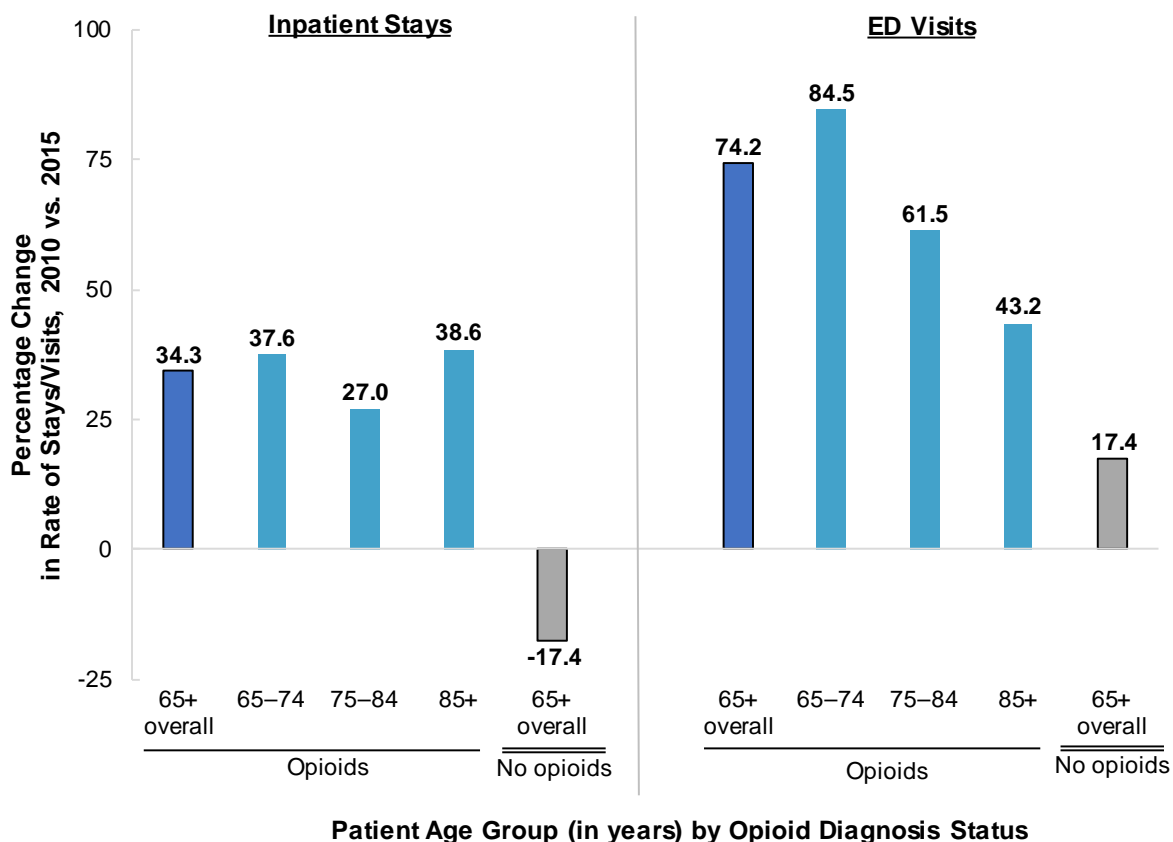
■ **The rate of opioid-related inpatient stays and ED visits increased substantially between 2010 and 2015 among patients aged 65 years and older.**

Overall, between 2010 and 2015, the rate of opioid-related inpatient stays increased 34.3 percent among patients aged 65 years and older, from 199.3 stays per 100,000 population in 2010 to 267.6 stays per 100,000 population in 2015. An increase occurred among all three age groups: 65–74 years (37.6 percent increase), 75–84 years (27.0 percent increase), and 85 years and older (38.6 percent increase).

Similarly, between 2010 and 2015, the rate of opioid-related ED visits increased 74.2 percent among patients aged 65 years and older, from 44.7 visits per 100,000 population in 2010 to 77.9 visits per 100,000 population in 2015. An increase was observed among all three age groups but was largest among patients aged 65–74 years (84.5 percent increase) compared with those aged 75–84 years (61.5 percent increase) and those aged 85 years and older (43.2 percent increase).

Figure 3 provides the percentage change from 2010 to 2015 in the population rate of opioid-related inpatient stays and ED visits among patients aged 65 years and older by patient age group. For comparison, the percentage change in the rate of nonopioid-related inpatient stays and ED visits among patients aged 65 years and older is presented.

Figure 3. Change in the rate of opioid-related inpatient stays and ED visits among patients aged 65 years and older, by age group, 2010 versus 2015



Abbreviation: ED, emergency department

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2010 and 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2009–2010 and 2014–2015; Nationwide Emergency Department Sample (NEDS), 2009–2010 and 2014–2015

- **Among patients aged 65 years and older, the rate of opioid-related inpatient stays increased between 2010 and 2015, whereas the rate of nonopioid-related stays decreased; the rate of opioid-related ED visits increased substantially more than did nonopioid-related visits.**

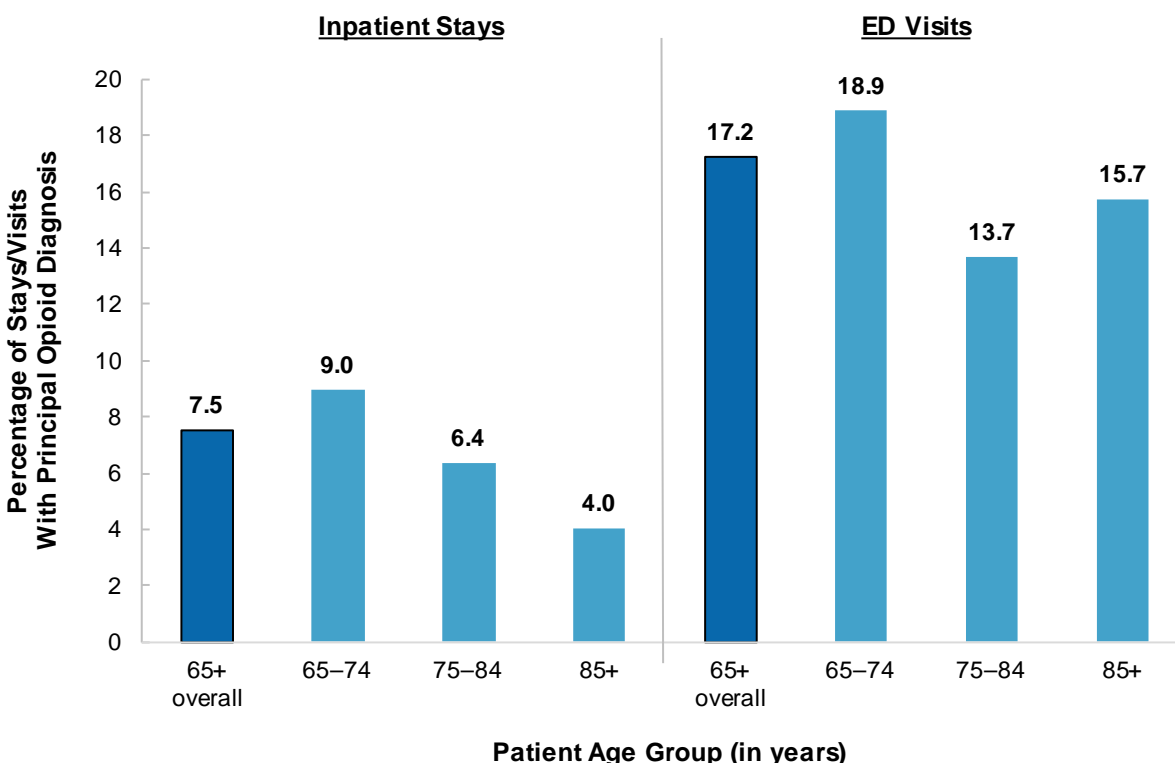
Among inpatient stays for patients aged 65 years and older, the rate of opioid-related stays increased between 27.0 and 38.6 percent from 2010 to 2015, depending on the age group. In contrast, during this same time period the rate of nonopioid-related stays decreased 17.4 percent among patients aged 65 years and older.

Among ED visits for patients aged 65 years and older, the rate of opioid-related ED visits increased between 43.2 and 84.5 percent from 2010 to 2015, depending on the age group. Although the rate of nonopioid-related ED visits also increased during this time period among patients aged 65 years and older, the 17.4 percent increase was substantially lower than the increase in the rate of opioid-related ED visits.

Characteristics of opioid-related inpatient stays and ED visits among patients aged 65 years and older, 2015

Figure 4 presents the percentage of opioid-related inpatient stays and ED visits that involved a principal opioid diagnosis among patients aged 65 years and older, by patient age group, in 2015.

Figure 4. Principal opioid diagnosis among opioid-related inpatient stays and ED visits for patients aged 65 years and older, by age group, 2015



Abbreviation: ED, emergency department

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2014–2015; Nationwide Emergency Department Sample (NEDS), 2014–2015

- **Among patients aged 65 years and older, opioid-related ED visits more commonly had opioids as a principal diagnosis (vs. a secondary diagnosis) than did opioid-related inpatient stays.**

Opioids was listed as a principal diagnosis more than twice as often among opioid-related ED visits (17.2 percent) than among opioid-related inpatient stays (7.5 percent) for patients aged 65 years and older. This pattern held for each of the three specific older age groups, with the differential the highest among patients aged 85 years and older (15.7 percent of ED visits vs. 4.0 percent of inpatient stays with a principal opioid diagnosis).

- **The percentage of opioid-related inpatient stays and ED visits with opioids as the principal diagnosis in 2015 was highest among patients aged 65–74 years compared with patients in the two older age groups.**

Among patients aged 65 years and older with an opioid-related inpatient stay in 2015, a larger percentage of stays involved a principal diagnosis of opioids among patients aged 65–74 years (9.0 percent) than among patients aged 75–84 years (6.4 percent) and 85 years and older (4.0 percent).

Similarly, for opioid-related ED visits in 2015, a larger percentage of visits involved a principal opioid diagnosis among those aged 65–74 years (18.9 percent) than among those aged 75–84 years (13.7 percent) and those aged 85 years and older (15.7 percent).

Table 1 provides hospital resource use characteristics for opioid-related inpatient stays and ED visits among patients aged 65 years and older in 2015. For comparison, hospital resource use characteristics are also provided for nonopioid-related inpatient stays and ED visits.

Table 1. Resource use for opioid-related versus nonopioid-related inpatient stays and ED visits among patients aged 65 years and older, 2015

Variable	Opioid-related stays/visits	Nonopioid-related stays/visits	% difference
Number of inpatient stays	124,300	12,537,100	
Utilization characteristics			
Average cost per stay, \$	14,900	13,200	12.9
Average length of stays, days	6.0	5.2	14.4
Discharge disposition, %			
Routine discharge	36.1	43.8	-17.7
Another short-term hospital	1.9	2.4	-22.5
Another institution (SNF, ICF, etc.)	36.9	29.6	24.4
Home health care	21.0	19.8	6.3
Against medical advice	1.4	0.5	165.6
In-hospital death	2.7	3.7	-28.8
Number of ED visits	36,200	17,617,300	
Utilization characteristics			
Average charge per visit, \$	6,600	4,900	34.7
Discharge disposition, %			
Routine discharge	81.6	83.4	-2.2
Another short-term hospital	2.5	4.1	-40.1
Another institution (SNF, ICF, etc.)	6.2	3.7	66.7
Home health care	3.2	0.9	280.1
Against medical advice	1.6	1.1	38.5
Died in ED	0.3	0.6	-56.4

Abbreviation: ED, emergency department; ICF, intermediate care facility; SNF, skilled nursing facility

Note: Number of stays/visits and average costs/charges were rounded to the nearest hundred.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2014–2015; Nationwide Emergency Department Sample (NEDS), 2014–2015

- **The average cost or charge for opioid-related inpatient stays and ED visits among patients aged 65 years and older was higher in 2015 than was the cost or charge for nonopioid-related stays and visits in this age group.**

Among patients aged 65 years and older, the average cost of opioid-related inpatient stays in 2015 was 12.9 percent higher than the average cost of nonopioid-related stays (\$14,900 vs. \$13,200). Similarly, the average charge for opioid-related ED visits in 2015 was 34.7 percent higher than the average charge for nonopioid-related ED visits (\$6,600 vs. \$4,900).

The average opioid-related inpatient stay also was 14.4 percent longer than the average nonopioid-related stay among older adults (6.0 vs. 5.2 days).

- **A higher proportion of patients aged 65 years and older were discharged to a nonhospital institution, such as a skilled nursing facility or intermediate care facility when the hospitalization or ED visit was opioid related versus nonopioid related.**

In 2015, a higher proportion of patients were discharged to a nonhospital institution, such as a skilled nursing facility or intermediate care facility, when the hospitalization was opioid related rather than nonopioid related (36.9 vs. 29.6 percent of inpatient stays and 6.2 vs. 3.7 percent of ED visits).

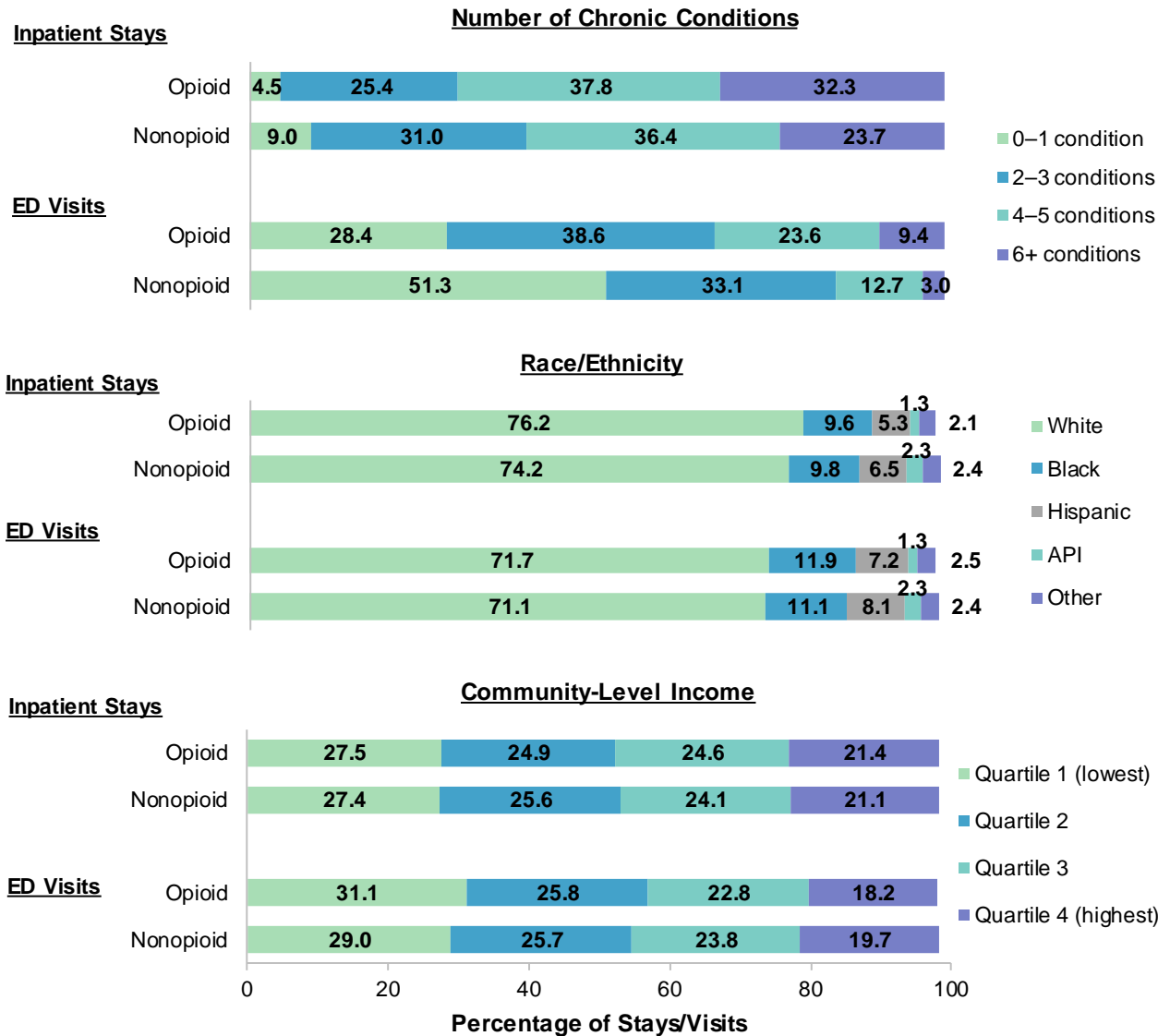
- **A higher proportion of patients aged 65 years and older left the hospital against medical advice and a lower proportion died in the hospital when the hospitalization was opioid related versus nonopioid related.**

In 2015, the proportion of patients aged 65 years and older who left the hospital against medical advice was higher among opioid-related than among nonopioid-related inpatient stays (1.4 vs. 0.5 percent of stays) and ED visits (1.6 vs. 1.1 percent of visits).

The proportion of patients aged 65 years and older who died during their hospitalization was lower among opioid-related than among nonopioid-related inpatient stays (2.7 vs. 3.7 percent of stays) and ED visits (0.3 vs. 0.6 percent of visits).

Figure 5 presents the distribution of opioid-related versus nonopioid-related inpatient stays and ED visits among patients aged 65 years and older by number of chronic conditions, race/ethnicity, and community-level income in 2015.

Figure 5. Opioid-related versus nonopioid-related inpatient stays and ED visits by number of chronic conditions, race/ethnicity, and community-level income among patients aged 65 years and older, 2015



Abbreviations: API, Asian/Pacific Islander; ED, emergency department

Note: Secondary diagnoses used to identify chronic conditions may not be reported on ED visit records as frequently as on inpatient discharge records.

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2014–2015; Nationwide Emergency Department Sample (NEDS), 2014–2015

- **The proportion of patients aged 65 years and older with multiple chronic conditions in 2015 was higher for opioid-related than for nonopioid-related hospitalizations.**

Among patients aged 65 years and older, 95.5 percent of opioid-related inpatient stays in 2015 involved multiple chronic conditions, compared with 91 percent of nonopioid-related stays. A total of 32.3 percent of opioid-related stays involved at least six chronic conditions versus only 23.7 percent of nonopioid-related stays. Similarly, the proportion of ED visits that involved multiple chronic conditions was higher among opioid-related than nonopioid-related visits.

- **White patients constituted the majority of opioid-related hospitalizations among those aged 65 years and older.**

Among patients aged 65 years and older, more than three-fourths (76.2 percent) of opioid-related inpatient stays in 2015 involved White patients. This was consistent with the proportion of nonopioid-related inpatient stays in this age group (74.2 percent involved White patients). White patients also constituted 71.7 percent of all opioid-related ED visits among patients aged 65 years and older in 2015. Again, this was very similar to the 71.1 percent of nonopioid-related ED visits that involved White patients in this age group.

Non-White racial/ethnic groups constituted a much lower proportion than White patients of both opioid-related and nonopioid-related hospitalizations among patients aged 65 years and older. For example, Hispanic patients represented 5.3 percent of opioid-related inpatient stays and 6.5 percent of nonopioid-related stays; Asian/Pacific Islanders represented 1.3 percent of opioid-related inpatient stays and 2.3 percent of nonopioid-related stays.

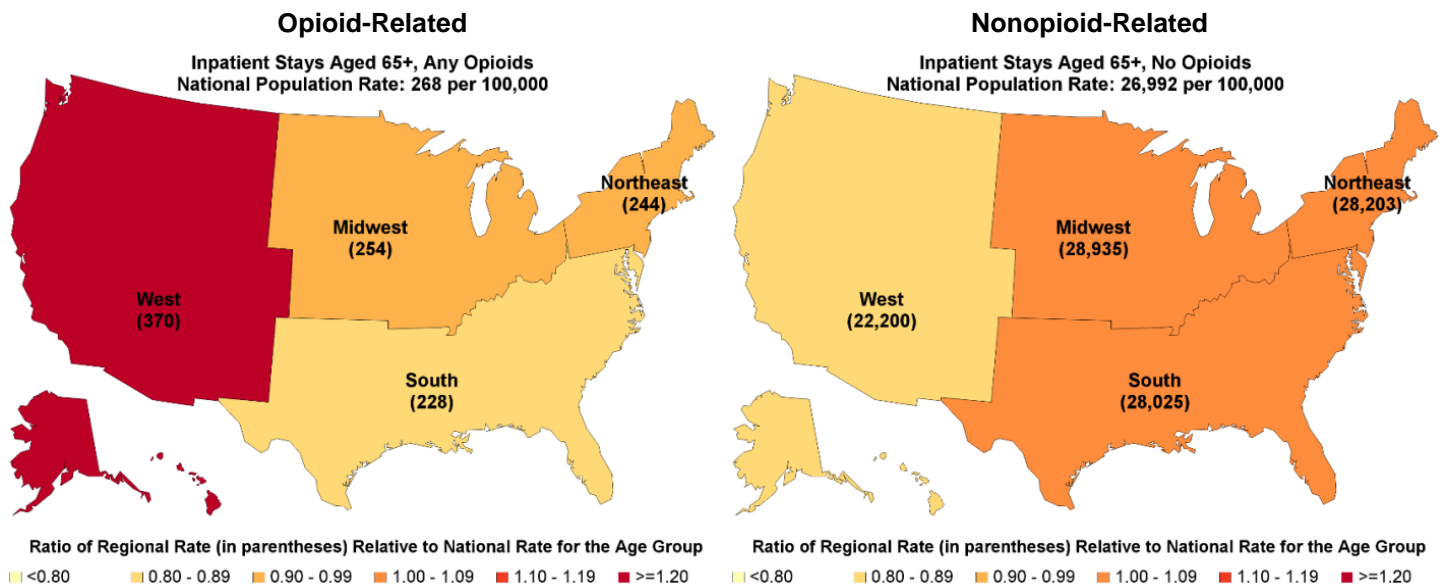
- **The distribution by community-level income among patients aged 65 years and older was similar for opioid-related and nonopioid-related hospitalizations.**

Among patients aged 65 years and older, the proportion of hospitalizations by community-level income was similar for opioid-related and nonopioid-related inpatient stays and ED visits in 2015. For example, just over 1 in 4 inpatient stays were among patients in the lowest income quartile: 27.5 percent of opioid-related stays and 27.4 percent of nonopioid-related stays. Over 1 in 5 inpatient stays were among patients in the highest income quartile: 21.4 percent of opioid-related stays and 21.1 percent of nonopioid-related stays.

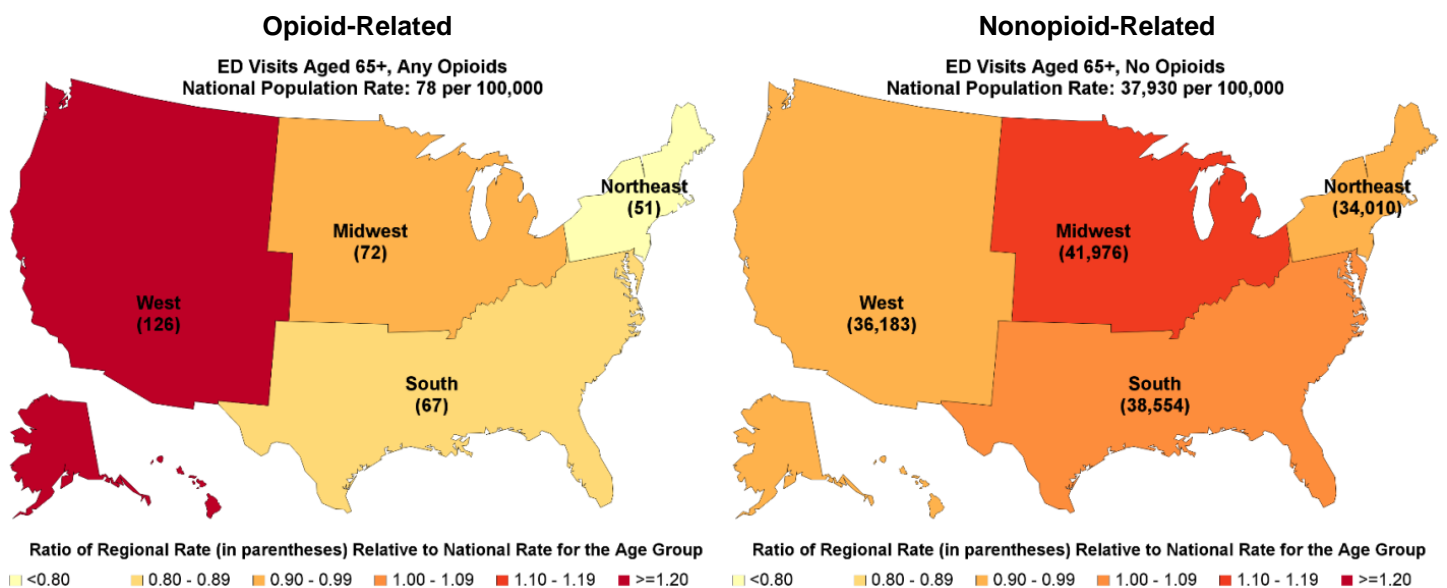
Figure 6 provides the population rate of opioid-related inpatient stays and ED visits compared with the rate of nonopioid-related inpatient stays and ED visits among patients aged 65 years and older by U.S. census region in 2015. The ratio of each census region rate to the national rate also is provided in the figure and reflected in the color-coding of the maps.

Figure 6. Rate of opioid-related versus nonopioid-related inpatient stays and ED visits among patients aged 65 years and older by census region, and ratio of census region to national rate, 2015

Inpatient Stays



ED Visits



Abbreviation: ED, emergency department

Source: Agency for Healthcare Research and Quality (AHRQ), Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project (HCUP), 2015 fiscal year data from the National (Nationwide) Inpatient Sample (NIS), 2014–2015; Nationwide Emergency Department Sample (NEDS), 2014–2015

- **Among patients aged 65 years and older, those residing in western States had the highest rate of opioid-related hospitalizations but the lowest rate of nonopioid-related hospitalizations compared with other regions of the United States in 2015.**

The rate of opioid-related inpatient stays among patients aged 65 years and older was highest in western States in 2015 (370 per 100,000 population vs. the national average of 268 per 100,000 population). In contrast, those residing in western States had the lowest average rate of nonopioid-related inpatient stays (22,200 per 100,000 population vs. the national average of 26,992 per 100,000 population).

Similarly, the rate of opioid-related ED visits among patients aged 65 years and older was highest in western States (126 per 100,000 population vs. the national average of 78 per 100,000 population). In contrast, those residing in western States had the second lowest average rate of nonopioid-related ED visits (36,183 per 100,000 population vs. the national average of 37,930 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 health care data. Topics include hospital inpatient, ambulatory surgery, and emergency department use and costs, quality of care, access to care, medical conditions, procedures, and patient populations, among other topics. The reports are intended to generate hypotheses that can be further explored in other research; the reports are not designed to answer in-depth research questions using multivariate methods.

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2014–2015 National Inpatient Sample (NIS) and 2014–2015 Nationwide Emergency Department Sample (NEDS). Historical data were drawn from the 2009–2010 Nationwide Inpatient Sample (NIS) and 2009–2010 NEDS. In both sets of years, the calendar year databases were used to create a fiscal year file from October to September. The NEDS was limited to emergency department (ED) visits that do not result in an admission to the same hospital (i.e., ED admissions). ED admissions are included under inpatient stays. Supplemental sources included population denominator data for use with HCUP databases, derived from information available from Claritas, a vendor that compiles and adds value to data from the U.S. Census Bureau.¹⁶

Definitions

Diagnoses, ICD-9-CM, and Clinical Classifications Software

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.

CCS categorizes ICD-9-CM diagnosis codes into a manageable number of clinically meaningful categories.¹⁷ This clinical grouper makes it easier to quickly understand patterns of diagnoses. CCS categories identified as Other typically are not reported; these categories include miscellaneous, otherwise unclassifiable diagnoses that may be difficult to interpret as a group.

Case definition

Opioid-related hospital use was identified using the following all-listed ICD-9-CM diagnosis codes:

- 304.00–304.02: Opioid type dependence (unspecified; continuous; episodic)
- 304.70–304.72: Combinations of opioid type drug with any other drug dependence (unspecified; continuous; episodic)
- 305.50–305.52: Opioid abuse (unspecified; continuous; episodic)
- 965.00–965.02; 965.09: Poisoning by opium (alkaloids), unspecified; heroin; methadone; other opiates and related narcotics
- 970.1: Poisoning by opiate antagonists
- E850.0–E850.2: Accidental poisoning by heroin; methadone; other opiates and related narcotics
- E935.0–E935.2: Heroin, methadone, other opiates and related narcotics causing adverse effects in therapeutic use
- E940.1: Opiate antagonists causing adverse effects in therapeutic use

¹⁶ Claritas. Claritas Demographic Profile. www.claritas.com. Accessed January 18, 2018.

¹⁷ Agency for Healthcare Research and Quality. HCUP Clinical Classifications Software (CCS) for ICD-9-CM. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality. Updated March 2017. www.hcup-us.ahrq.gov/toolsoftware/ccs/ccs.jsp. Accessed January 18, 2018.

It should be noted that ICD-9-CM diagnosis codes related to opioid dependence or abuse “in remission” were not used to identify opioid-related hospital use because remission does not indicate active use of opioids. Potential changes in the use of ICD-9-CM codes identifying opioid use cannot be isolated in these analyses.

These codes include opioid-related use stemming from illicit opioids such as heroin, illegal use of prescription opioids, and the use of opioids as prescribed. Each type of opioid use is important for understanding and addressing the opioid epidemic in the United States.¹⁸ Although there may be interest in examining how much each type of opioid use contributes to the overall opioid problem, many of the opioid-related codes under the ICD-9-CM clinical coding system do not allow heroin-related cases to be explicitly identified (e.g., in the 304.0x series, heroin is not distinguished from other opioids). In addition, the codes do not distinguish between illegal use of prescription drugs and their use as prescribed.

Chronic conditions were identified using the set of chronic conditions developed by the U.S. Department of Health and Human Services (HHS) Interagency Workgroup on multiple chronic conditions (MCC) and the Office of the Assistant Secretary of Health.¹⁹ As reported by Goodman and colleagues (2013), 20 chronic conditions were identified with definitions for five selected HHS health data systems, including the HCUP Nationwide Inpatient Sample (NIS). For the HCUP inpatient databases, the 20 chronic conditions were defined using the Agency for Healthcare Research and Quality (AHRQ) Clinical Classifications Software (CCS), which groups together highly related diagnoses of the same condition. One condition, autism spectrum disorder, was defined using ICD-9-CM diagnosis codes rather than CCS categories. Steiner and Friedman (2013) implemented these chronic condition definitions in an analysis of MCC using the 2009 NIS.²⁰ The 20 chronic conditions and corresponding clinical coding criteria are provided in Table 2.

Consistent with Steiner and Friedman (2013), we identified chronic conditions on the basis of the clinical coding criteria (listed in Table 2) indicated in either a principal or a secondary diagnosis code field on the discharge record. A chronic condition was counted only once per discharge regardless of the number of diagnosis codes (principal and secondary) that indicated the condition.

¹⁸ Compton WM, Jones CM, Baldwin GT. Relationship between nonmedical prescription-opioid use and heroin use. *The New England Journal of Medicine*. 2016;374:154–63.

¹⁹ Goodman RA, Posner SF, Huang ES, Parekh AK, Koh HK. Defining and measuring chronic conditions: imperatives for research, policy, program and practice. *Preventing Chronic Disease*. 2013;10:120239.

²⁰ Steiner CA, Friedman B. Hospital utilization, costs, and mortality for adults with multiple chronic conditions, Nationwide Inpatient Sample, 2009. *Preventing Chronic Disease*. 2013;10:120292.

Table 2. Chronic conditions and clinical coding criteria

Chronic condition	Clinical coding criteria
Hypertension	CCS 98, 99
Hyperlipidemia	CCS 53
Congestive heart failure	CCS 108
Coronary artery disease (CAD) (includes acute myocardial infarction, which indicates chronic underlying CAD)	CCS 100, 101
Diabetes	CCS 49, 50
Stroke (includes acute stroke but indicates underlying cerebrovascular disease)	CCS 109–112
Cardiac arrhythmias	CCS 105, 106
Arthritis	CCS 202, 203
Cancer	CCS 11–43
Depression	CCS 657
Dementia (includes Alzheimer's and other senile dementias)	CCS 653
Substance abuse disorders	CCS 660, 661
Chronic obstructive pulmonary disease	CCS 127
Asthma	CCS 128
Chronic kidney disease	CCS 156, 158
Human immunodeficiency virus (HIV)	CCS 5
Hepatitis	CCS 6
Autism spectrum disorder	ICD-9-CM 29900, 29901
Schizophrenia	CCS 659
Osteoporosis	CCS 206

Abbreviations: CCS, Clinical Classifications Software; ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification

Because the number of secondary diagnoses reported on hospital discharge and ED visit records in HCUP data has increased over time, we held the number of secondary diagnosis fields constant across both data years to ensure comparability: 25 diagnosis codes for hospital discharge records and 15 diagnosis codes for ED visit records.

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.

Types of hospitals included in the HCUP Nationwide Emergency Department Sample

The Nationwide Emergency Department Sample (NEDS) 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 NEDS includes specialty, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Hospitals included in the NEDS have hospital-owned EDs and no more than 90 percent of their ED visits resulting in admission.

Unit of analysis

The unit of analysis is the hospital discharge (i.e., the hospital stay) or the ED visit, not a person or patient. This means that a person who is admitted to the hospital or seen in the ED multiple times in 1 year will be counted each time as a separate discharge from the hospital or visit in the ED.

Charges

Charges represent what the hospital billed for the discharge. Hospital charges reflect the amount the hospital charged for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, charges are rounded to the nearest hundred dollars.

Costs and charges

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services.²¹ Costs reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; charges represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

Annual costs were inflation adjusted using the Gross Domestic Product Price Index from the U.S. Department of Commerce, Bureau of Economic Analysis, with 2015 as the index base.²² That is, all costs are expressed in 2015 dollars. Annual charges were inflation adjusted using the Consumer Price Index for Urban Consumers from the U.S. Department of Labor, Bureau of Labor Statistics, with 2015 as the index base.²³ That is, all charges are expressed in 2015 dollars.

Community-level income

Community-level income is based on the median household income of the patient's ZIP Code of residence. Quartiles are defined so that the total U.S. population is evenly distributed. Cut-offs for the quartiles are determined annually using ZIP Code demographic data obtained from Claritas, a vendor that adds value to data from the U.S. Census Bureau.²⁴ The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign.

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

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

²¹ Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2015. Agency for Healthcare Research and Quality. Updated December 2017. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed January 18, 2018.

²² U.S. Bureau of Economic Analysis. GDP & Personal Income Tables, Table 1.1.4. Price Indexes for Gross Domestic Product. www.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=3&isuri=1&1910=x&0=-99&1921=survey&1903=4&1904=2000&1905=2016&1906=a&1911=0. Accessed March 26, 2018.

²³ U.S. Bureau of Labor, Bureau of Labor Statistics, Table 24. Historical Consumer Price Index for All Urban Consumers (CPI-U): U.S. City Average, All Items. www.bls.gov/cpi/tables/supplemental-files/historical-cpi-u-201803.pdf. Accessed April 17, 2018.

²⁴ Claritas. Claritas Demographic Profile by ZIP Code. www.claritas360.claritas.com/mybestsegments/. Accessed June 6, 2018.

(including skilled nursing facility, intermediate care, and another type of facility such as a nursing home), home health care, against medical advice, or died in the hospital.

Reporting of race and ethnicity

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

About HCUP

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

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

Alaska Department of Health and Social Services
Alaska State Hospital and Nursing Home Association
Arizona Department of Health Services
Arkansas Department of Health
California Office of Statewide Health Planning and Development
Colorado Hospital Association
Connecticut Hospital Association
Delaware Division of Public Health
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Health Information Corporation
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Louisiana Department of Health
Maine Health Data Organization
Maryland Health Services Cost Review Commission
Massachusetts Center for Health Information and Analysis
Michigan Health & Hospital Association
Minnesota Hospital Association
Mississippi State Department of Health
Missouri Hospital Industry Data Institute
Montana Hospital Association

Nebraska Hospital Association
Nevada Department of Health and Human Services
New Hampshire Department of Health & Human Services
New Jersey Department of Health
New Mexico Department of Health
New York State Department of Health
North Carolina Department of Health and Human Services
North Dakota (data provided by the Minnesota Hospital Association)
Ohio Hospital Association
Oklahoma State Department of Health
Oregon Association of Hospitals and Health Systems
Oregon Office of Health Analytics
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Department of Health and Human Resources, West Virginia Health Care Authority
Wisconsin Department of Health Services
Wyoming Hospital Association

About the NIS

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

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

- Revisions to the sample design—starting with 2012, the NIS is now a *sample of discharge records from all HCUP-participating hospitals*, rather than a sample of hospitals from which all discharges were retained (as is the case for NIS years before 2012).
- Revisions to how hospitals are defined—the NIS now uses the *definition of hospitals and discharges supplied by the statewide data organizations* that contribute to HCUP, rather than the definitions used by the American Hospital Association (AHA) Annual Survey of Hospitals.

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

About the NEDS

The HCUP Nationwide Emergency Department Database (NEDS) is a unique and powerful database that yields national estimates of emergency department (ED) visits. The NEDS was constructed using records from both the HCUP State Emergency Department Databases (SEDD) and the State Inpatient Databases (SID). The SEDD capture information on ED visits that do not result in an admission (i.e., patients who were treated in the ED and then released from the ED, or patients who were transferred to another hospital); the SID contain information on patients initially seen in the ED and then admitted to the same hospital. The NEDS was created to enable analyses of ED utilization patterns and support public health professionals, administrators, policymakers, and clinicians in their decisionmaking regarding this critical source of care. The NEDS is produced annually beginning in 2006. Over time, the sampling frame for the NEDS has changed; thus, the number of States contributing to the NEDS varies from year to year. The NEDS is intended for national estimates only; no State-level estimates can be produced.

For More Information

For other information on mental health and substance abuse, including opioids, 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 health information topics
- HCUPnet, HCUP's interactive query system, at www.hcupnet.ahrq.gov/

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

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

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

Agency for Healthcare Research and Quality. Overview of the Nationwide Emergency Department Sample (NEDS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated December 2017. www.hcup-us.ahrq.gov/nedsoverview.jsp. Accessed January 18, 2018.

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AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United

States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

Virginia Mackay-Smith, Acting Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
5600 Fishers Lane
Rockville, MD 20857

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