HEALTHCARE COST AND UTILIZATION PROJECT

Agency for Healthcare Research and Quality

STATISTICAL BRIEF #251

September 2019

Characteristics of Inpatient Hospital Stays Involving Sickle Cell Disease, 2000–2016

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Introduction

Approximately 100,000 Americans have sickle cell disease (SCD), a genetic group of blood disorders that most frequently affect individuals with ancestry from Africa, certain Mediterranean countries, Saudi Arabia, India, and Spanish-speaking regions of South America, Central America, and the Caribbean (areas of the world where malaria is or was more common).[1,2] SCD alters the body's red blood cells, causing some to have a disc or sickle shape and to become hard and sticky.[3,4]

When sickled red blood cells travel through small blood vessels, they can block blood flow that carries oxygen to vital organs. As a result, people with SCD experience "pain episodes" or "pain crises" that start suddenly, vary in severity, and can last any length of time.[5] Pain is the leading reason people with SCD go to the hospital or the emergency department.[6] Additional complications of SCD include repeated infections, painful swelling in hands and feet, acute chest syndrome, and stroke, to name a few.[7,8]

Advancements in the treatment of SCD complications among children have reduced mortality rates so that nearly 95 percent of individuals born with SCD in the United States reach 18 years of

Highlights

- In 2016, there were 134,000 sickle cell disease (SCD)-related inpatient hospital stays. Over three-fourths of these stays involved a pain crisis.
- Half of all SCD-related stays were for patients 18–34 years old, and nearly 90 percent were for Black patients. From 2000 to 2014, the number of SCD-related stays increased most for adults older than 64 years.
- Stays for patients with SCD were more likely to begin in the emergency department than were stays for patients without SCD (79.6 vs. 51.3 percent).
- SCD-related stays resulted in discharge against medical advice at a rate 4 times greater than non-SCD-related stays in 2016 (4.1 vs. 1.2 percent).
- In 2016, aggregate costs for inpatient stays for SCD totaled $811.4 million with an average length of stay of 5 days.
- One-third of stays for SCD had a 30-day readmission, compared with 12.5 percent of non-SCD-related stays.
- SCD-related stays were concentrated in a subset of U.S. hospitals in 2016. Only 85 hospitals (3.5 percent of all hospitals) had more than 300 SCD-related stays in 2016.
- Most SCD-related stays were for patients from metro areas and occurred at hospitals in metro areas. Half of SCD-related stays for patients from rural areas occurred at hospitals in metro areas.

[1] American Society of Hematology. Sickle Cell Disease. www.hematology.org/Patients/Anemia/Sickle-Cell.aspx. Accessed May 7, 2019.
[2] Centers for Disease Control and Prevention. Data & Statistics on Sickle Cell Disease. www.cdc.gov/ncbddd/sicklecell/data.html. Accessed May 7, 2019.
[3] Ibid.
[4] Centers for Disease Control and Prevention. What You Should Know About Sickle Cell Disease CDC Fact Sheet. www.cdc.gov/ncbddd/sicklecell/documents/SCD-factsheet_What-is-SCD.pdf. Accessed August 15, 2019.
[5] Ibid.
[6] Centers for Disease Control and Prevention. Complications and Treatment of Sickle Cell Disease. www.cdc.gov/ncbddd/sicklecell/treatments.html. Accessed August 15, 2019.
[7] Ibid.
[8] Centers for Disease Control and Prevention. What You Should Know About Sickle Cell Disease CDC Fact Sheet. Op cit.

age.[9,10,11] Although somewhat dated, the average life expectancy in 2005 for individuals with SCD was 42 years for females and 38 years for males.[12] Continued advancements in healthcare and treatment may also extend life expectancies of adults with SCD.[13] Receipt of high-quality and appropriate care and treatment can help relieve symptoms, reduce complications, and minimize organ damage.[14,15]

Limited knowledge of SCD treatment guidelines among healthcare professionals continues to pose a barrier to effective patient-provider relationships,[16] and this barrier contributes to lower quality of life for those with SCD. The Department of Health and Human Services has prioritized SCD research and education to break down barriers for those seeking treatment and funding, find a cure beyond bone marrow and stem cell transplants, educate providers on how to identify and treat patients in a pain crisis, and bridge the transition between SCD pediatric cases to adult care.[17]

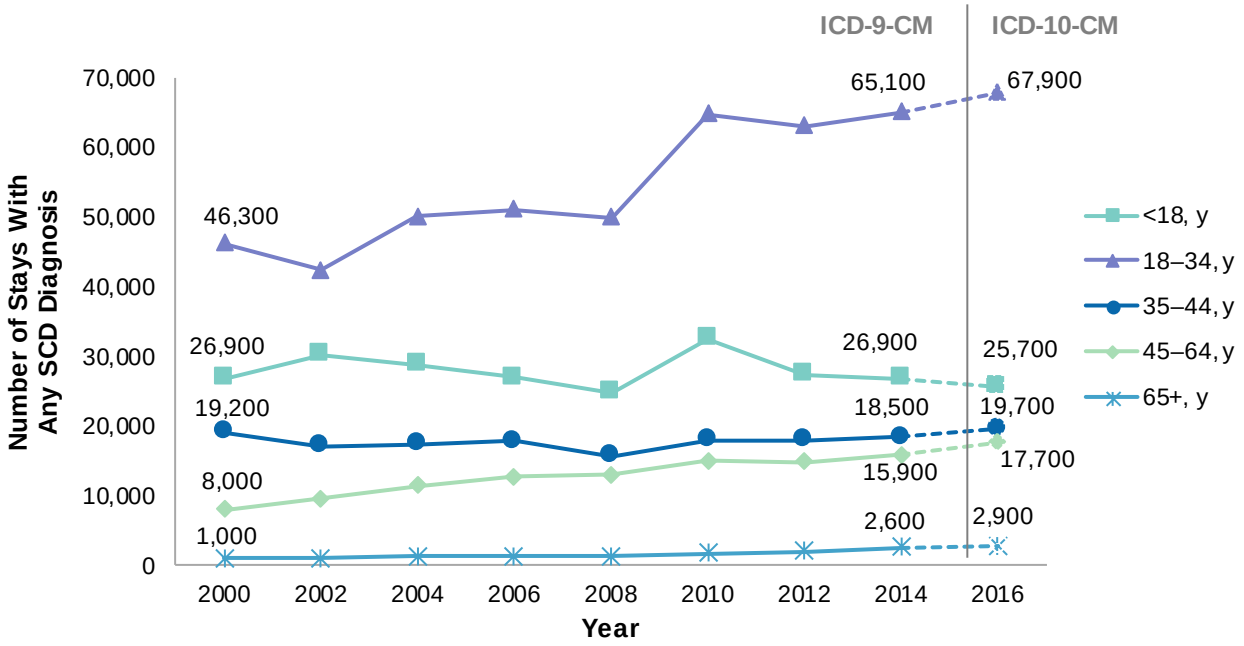
This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents statistics on inpatient stays among patients with SCD. Historical trends are presented by patient age from 2000 through 2016 using the National (Nationwide) Inpatient Sample (NIS). Characteristics of inpatient stays with and without SCD are examined in 2016, overall and by whether SCD (i.e., a principal diagnosis) or a secondary diagnosis (i.e., a condition that coexists at the time of the inpatient stay) was the reason for the stay. SCD-related stays are examined with respect to whether a pain crisis was present. Additionally, costs, length of stay, and 30-day all-cause readmission rates following stays involving SCD are provided. Finally, the location of inpatient hospital care for patients with SCD is shown. Because of the large sample size of the HCUP NIS, small differences can be statistically significant. Thus, only percentage differences greater than or equal to 10 percent are noted in the text. For further information on the methodology, see the Data Source and Definitions sections at the end of this Statistical Brief.

[9] American Society of Hematology. Sickle Cell Disease. www.hematology.org/Patients/Anemia/Sickle-Cell.aspx. Accessed May 7, 2019.
[10] Quinn CT, Rogers ZR, McCavit TL, Buchanan GR. Improved survival of children and adolescents with sickle cell disease. Blood. 2010;115:3447–52.
[11] Lanzkron S, Carroll CP, Haywood C. Mortality rates and age at death from sickle cell disease: U.S., 1979–2005. Public Health Reports. 2013;128(2):110–6.
[12] Ibid.
[13] Hulihan M, Hassell KL, Raphael JL, Smith-Whitley K, Thorpe P. CDC grand rounds: improving the lives of persons with sickle cell disease. Morbidity and Mortality Weekly Report. 2017;66:1269–71.
[14] American Society of Hematology. Sickle Cell Disease. www.hematology.org/Patients/Anemia/Sickle-Cell.aspx. Accessed May 7, 2019.
[15] Centers for Disease Control and Prevention. Complications and Treatment of Sickle Cell Disease. www.cdc.gov/ncbddd/sicklecell/treatments.html. Accessed August 15, 2019.
[16] Elander J, Beach MC, Haywood Jr C. Respect, trust, and the management of sickle cell disease pain in hospital: comparative analysis of concern-raising behaviors, preliminary model, and agenda for international collaborative research to inform practice. Ethnicity & Health. 2011;16(4-5):405-21.
[17] U.S. Department of Health and Human Services Office of Minority Health. About Sickle Cell Disease. www.minorityhealth.hhs.gov/sicklecell/index.html. Accessed June 19, 2019.

Findings

Trends in inpatient stays involving SCD, 2000–2016
Figure 1 displays the number of inpatient stays with any SCD diagnosis by age group from 2000 through 2016.

Figure 1. Number of hospital inpatient stays among patients with SCD, by age in years, 2000–2016



Abbreviations: ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification; SCD, sickle cell disease; y, years

Note: The number of stays is rounded to the nearest hundred. On October 1, 2015, the United States transitioned from ICD-9-CM to ICD-10-CM/PCS. The vertical line and dotted trend line indicate a change in the coding scheme, which may result in a discontinuity of estimates. See HCUP-US for more information: ICD-10-CM/PCS Resources.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National (Nationwide) Inpatient Sample (NIS), 2000–2016

- **Most stays involving SCD were for patients aged 18–34 years. Between 2000 and 2014, the number of SCD-related stays for patients in this age group increased by 41 percent.**

  In most years from 2000 to 2016, approximately half of all stays involving SCD were for patients aged 18–34 years old. The number of stays for patients in this age group increased by 40.6 percent, from 46,300 in 2000 to 65,100 in 2014. In 2016 after the transition to the International Classification of Diseases, Tenth Revision, Clinical Modification Coding System, the number of inpatient stays for patients aged 18–34 years with SCD was 67,900.

- **The number of stays involving SCD for patients older than 45 years of age more than doubled between 2000 and 2014.**

  During the 2000–2014 time period, stays for patients older than 45 years of age represented 9–14 percent of all SCD-related stays. The number of stays with any SCD diagnosis for patients aged 45–64 years increased by 98.8 percent, from 8,000 in 2000 to 15,900 in 2014. In 2016, the number of inpatient stays for patients aged 45–64 years with SCD was 17,700. During the same period, the number of SCD-related stays for patients aged 65 years and older increased by 160.0 percent, from 1,000 to 2,600 stays. In 2016, the number of SCD-related inpatient stays for patients aged 65 years and older was 2,900.

Characteristics of inpatient stays involving SCD, 2016
Table 1 displays select characteristics of stays among patients with and without SCD in 2016.

Table 1. Characteristics of inpatient stays with and without a diagnosis of SCD, 2016

Characteristic	Any SCD diagnosis				No diagnosis of SCD
	Total	Principal diagnosis	Secondary diagnosis		
			With a pain crisis	Without a pain crisis	
All stays, N	**134,000**	**95,600**	**13,200**	**25,200**	**35,500,000**
SCD-related stays, %	**100.0**	**71.3**	**9.9**	**18.8**	**—**
Evidence of pain crisis, %	78.3	96.0	100.0	—	—
Age, years, %					
<18	19.2	19.0	9.6	25.0	15.3
18–34	50.7	55.2	57.0	30.2	16.3
35–44	14.7	14.7	16.1	14.1	8.0
45–64	13.2	10.5	16.2	21.9	24.7
65+	2.2	0.6	1.2	8.6	35.7
Race/ethnicity, %					
Black	87.5	88.7	89.7	81.7	14.2
Hispanic	3.9	3.6	3.2	5.4	11.7
White	1.7	1.0	1.3	4.7	62.3
Other	3.0	2.7	2.7	4.2	6.8
Missing[a]	3.9	4.0	3.1	4.0	5.1
Male, %	45.2	47.6	37.5	40.1	43.2
Admitted from the ED, %	79.6	84.5	77.7	62.1	51.3
Discharge disposition, %					
Home or home health care	91.7	93.6	88.3	86.6	80.9
Other hospital	3.6	1.7	6.3	9.1	15.9
Died	0.5	0.2	1.4	1.2	1.9
Against medical advice	4.1	4.4	4.0	3.0	1.2
Primary expected payer, %					
Medicare, 65+ years	1.8	0.5	1.0	7.4	31.8
Medicare, <65 years	23.9	25.0	28.8	17.3	7.8
Medicaid	49.6	50.9	44.8	47.0	23.0
Private insurance	18.3	17.8	18.1	20.3	30.1
Self-pay/no charge[b]	3.7	3.4	4.3	4.5	4.2
Other payers[c]	2.5	2.2	2.8	3.3	3.0
Community-level income, %					
Quartile 1 (lowest)	50.9	51.1	52.6	49.3	30.1
Quartile 2	21.7	22.0	20.8	20.9	25.0
Quartile 3	16.0	15.9	14.6	16.8	23.5
Quartile 4 (highest)	10.0	9.6	10.7	11.1	19.7
Location of patient residence, %					
Metro area	92.8	93.2	91.7	92.0	83.5
Rural, adjacent to metro area	4.8	4.7	4.8	5.3	10.5
Rural, remote area	2.0	1.9	3.1	2.0	5.5

Abbreviations: ED, emergency department; SCD, sickle cell disease; —, not applicable.

Note: The number of stays is rounded to the nearest hundred. Percentages may not add to 100 because of missing data (i.e., less than 2 percent for age, sex, discharge disposition, expected payer, community-level income, and location of residence).

[a] Additional information on missing data for race/ethnicity is discussed in the Definitions section of this Statistical Brief.

[b] Self-pay/no charge: includes self-pay, no charge, charity, and no expected payment.

[c] Other payers include Federal and local government programs (see Definitions section) and Workers' Compensation.

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

- **Over 70 percent of SCD-related stays had a principal SCD diagnosis. Nearly all stays for SCD and one-third of stays with a secondary diagnosis of SCD involved a pain crisis.**

  Of 134,000 stays involving SCD in 2016, 71.3 percent were for SCD specifically (i.e., SCD was the principal diagnosis). Nearly all stays with a principal diagnosis of SCD involved a pain crisis (96.0 percent).

  In 2016, there were 38,400 stays among patients with SCD for which another reason was documented as the principal diagnosis. One-third (34.4 percent) of stays with a secondary diagnosis of SCD involved an SCD pain crisis (13,200 out of 38,400 inpatient stays).

- **More than half of stays involving SCD were for patients aged 18–34 years old, and one in five stays involving SCD were for children younger than 18 years old.**

  Over half (50.7 percent) of stays involving SCD were for patients aged 18–34 years, and nearly one-fifth (19.2 percent) of stays involving SCD were for patients less than 18 years old. Over one-tenth of the stays were for patients aged 35–44 years (14.7 percent) and 45–64 years (13.2 percent), and 2.2 percent were for patients aged 65 years and older.

- **Nearly 90 percent of stays involving SCD were for Black patients.**

  Black patients accounted for 88.7 percent of stays with a principal diagnosis of SCD (nearly all of which involved a pain crisis) and 89.7 percent of stays with a secondary diagnosis of SCD with a pain crisis. Black patients accounted for 81.7 percent of stays with a secondary diagnosis of SCD without a pain crisis.

- **Stays for patients with SCD were more likely to begin in the emergency department (ED) and result in discharge against medical advice (AMA) than were stays for patients without SCD.**

  Approximately 80 percent of stays for patients with SCD began in the ED, compared with only half (51.3 percent) of stays for patients without SCD. The prevalence of ED admissions was higher among stays with a principal diagnosis of SCD (84.5 percent) and among stays with a secondary diagnosis of SCD with a pain crisis (77.7 percent) than it was for stays with a secondary diagnosis of SCD without a pain crisis (62.1 percent).

  Most stays involving SCD resulted in discharge home or to home health care (91.7 percent). Although less frequent, discharges AMA were more common among stays for patients with SCD (4.1 percent) than among stays for patients without SCD (1.2 percent). The prevalence of discharges AMA was higher among stays with a principal diagnosis of SCD or with a secondary diagnosis of SCD with a pain crisis (4.4 and 4.0 percent, respectively) than it was for stays with a secondary diagnosis of SCD without a pain crisis (3.0 percent).

- **Three-fourths of stays involving SCD had a public expected payer.**

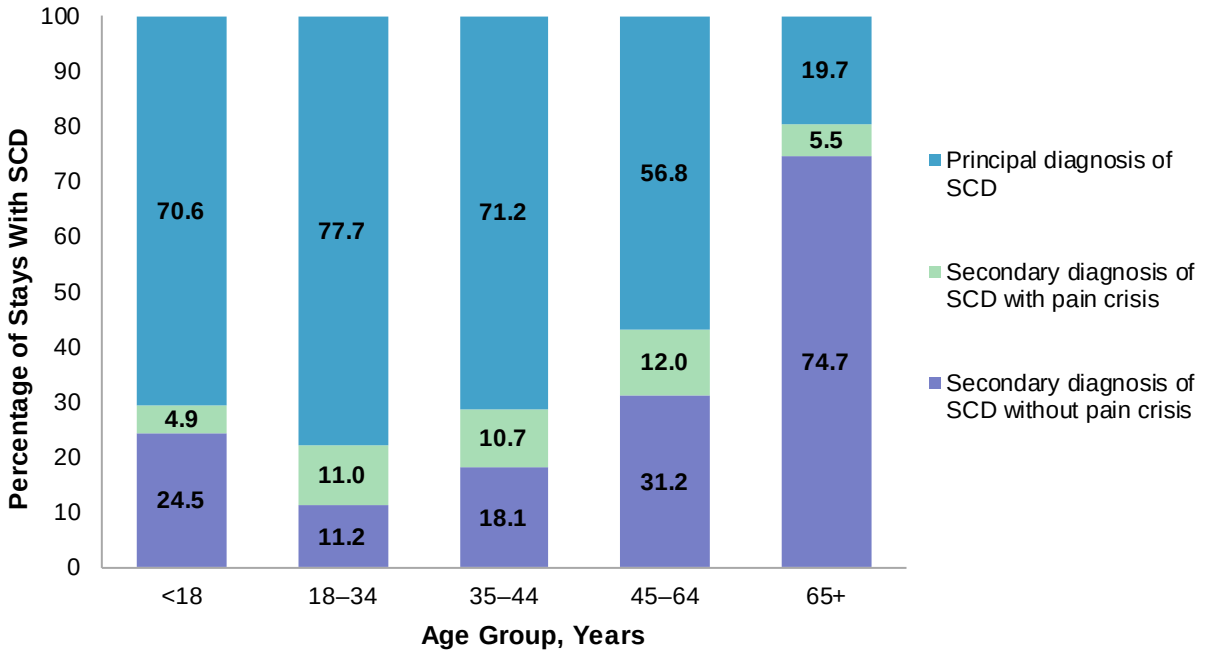
  In 2016, three-fourths of stays involving SCD had a public expected payer (Medicare: 25.7 percent; Medicaid: 49.6 percent). This was consistent across stays with either a principal or a secondary SCD diagnosis. In comparison, nearly two-thirds of stays for patients without SCD had a public expected payer (Medicare: 39.6 percent; Medicaid: 23.0 percent).

- **The majority of stays involving SCD were for patients from the lowest income communities and those living in metro areas.**

  Half of all stays (50.9 percent) involving SCD were for patients living in the lowest income communities (quartile 1), and over 90 percent were for patients residing in metro areas. Less than one-third of all stays (30.1 percent) without SCD were for patients living in the lowest income communities, and 83.5 percent were for patients residing in metro areas.

Figure 2 displays stays by principal and secondary SCD diagnosis with and without a pain crisis in 2016, by patient age.

Figure 2. SCD-related stays by age group, 2016



Abbreviation: SCD, sickle cell disease

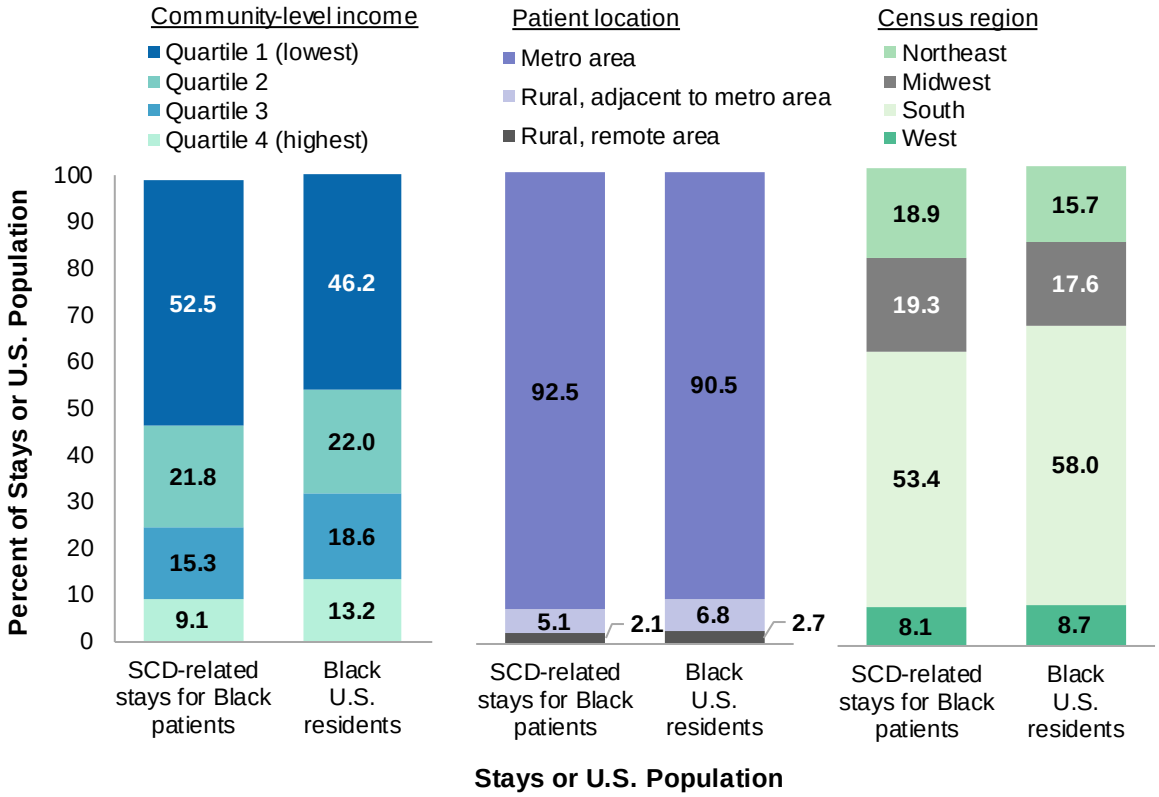
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016

- **SCD-related stays with a principal diagnosis of SCD and those with a secondary diagnosis of SCD with pain crisis were most frequently for patients aged 18–34 years and less frequently for patients aged 65 years and over.**

  The majority (88.7 percent) of SCD-related stays for patients aged 18–34 years had a principal diagnosis of SCD (77.7 percent) or a secondary diagnosis of SCD with pain crisis (11.0 percent) compared with only 25.2 percent among patients aged 65 years and older. The percentage of SCD-related stays with a principal diagnosis of SCD or a secondary diagnosis of SCD with pain crisis for patients younger than 65 years old ranged from 68.8 to 88.7 percent. SCD-related stays for which SCD was a secondary diagnosis, and not a principal diagnosis, were less common for younger (<65 years) than for older (65+ years) patients (22.2–43.2 percent vs. 80.2 percent).

Figure 3 presents the distribution of SCD-related stays for Black patients by patient community-level income, location, and census region of residence, compared with the distribution among Black residents in the U.S. population overall, in 2016. The figure focuses on the Black population because Black patients constituted nearly 90 percent of stays involving SCD in 2016 (see Table 1).

Figure 3. Distribution of SCD-related stays for Black patients by community-level income, location, and region of residence, compared with Black residents in the U.S. population, 2016



Abbreviation: SCD, sickle cell disease

Note: Percentages may not add to 100 because of missing data.

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

- **Most SCD-related stays for Black patients were for patients from low-income communities, metro areas, and the South.**

  In 2016, the majority of SCD-related stays for Black patients were for patients who resided in the lowest-income communities (quartile 1: 52.5 percent), patients from metro areas (92.5 percent), and patients who lived in the South (53.4 percent).

  Compared with the distribution of SCD-related stays for Black patients, a lower percentage of Black residents in the U.S. population lived in the lowest income communities (46.2 percent of Black residents vs. 52.5 percent of SCD-related stays for Black patients) and a higher percentage lived in the highest income communities (13.2 percent of Black residents vs. 9.1 percent of SCD-related stays for Black patients). Higher percentages of Black residents lived in rural areas (rural, adjacent to metro: 6.8 percent of Black residents vs. 5.1 percent of SCD-related stays for Black patients; rural, remote: 2.7 percent of Black residents vs. 2.1 percent of SCD-related stays for Black patients); and a lower percentage lived in the Northeast (15.7 percent of Black residents vs. 18.9 percent of SCD-related stays for Black patients).

Table 2 presents the Major Diagnostic Category for inpatient stays with a secondary diagnosis of SCD in 2016.

Table 2. Reasons for stays with a secondary diagnosis of SCD, 2016

Rank	Major Diagnostic Category	N	%
1	Diseases and disorders of the respiratory system	5,500	14.3
2	Infectious and parasitic diseases	5,100	13.2
3	Pregnancy, childbirth and the puerperium	4,900	12.8
4	Diseases and disorders of the circulatory system	3,900	10.1
5	Diseases and disorders of the digestive system	2,600	6.9

Abbreviation: SCD, sickle cell disease

Note: The number of stays is rounded to the nearest hundred. Percentages are based on unrounded values.

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

- **Among stays with a secondary diagnosis of SCD, the leading reason for hospitalization was diseases of the respiratory system.**

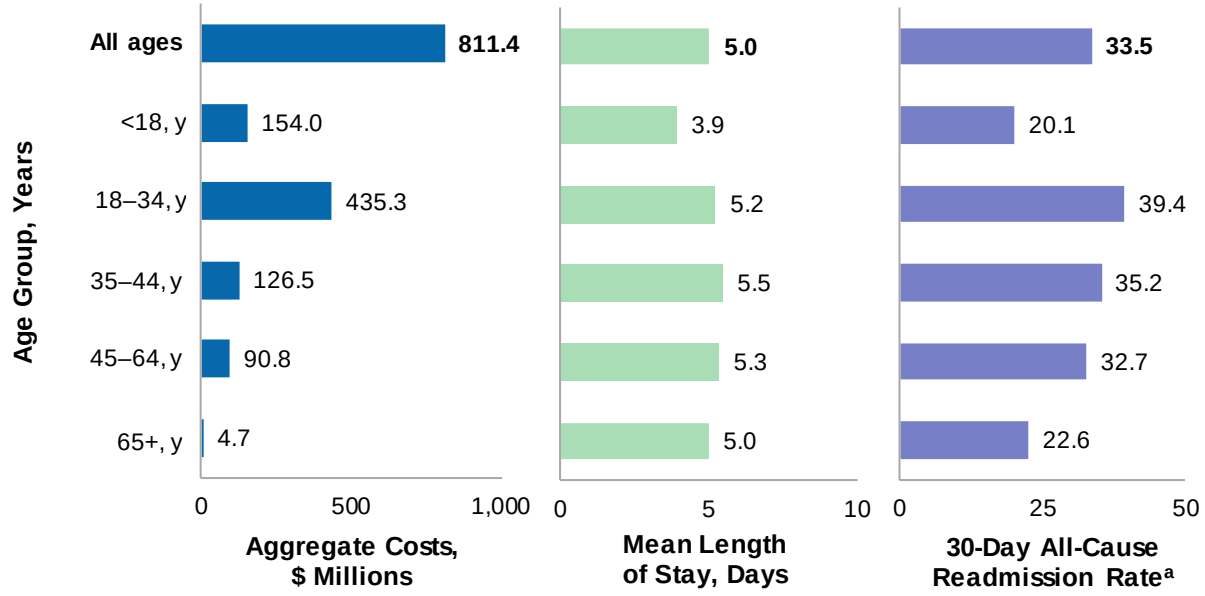
  The leading reason for stays for patients with a secondary diagnosis of SCD was respiratory system-related illnesses, constituting 14.3 percent of those stays.

- **Infectious and parasitic diseases and pregnancy were the second and third leading reasons for hospitalization among inpatient stays for patients with a secondary diagnosis of SCD.**

  Infectious and parasitic diseases and pregnancy were the second and third most common reasons for stays for patients with a secondary diagnosis of SCD, constituting 13.2 and 12.8 percent of those stays, respectively.

Resource use and readmission rates among stays for patients with SCD, 2016
Figure 4 displays aggregate costs and mean length of stay for inpatient stays for patients with a principal diagnosis of SCD in 2016, by age group. The figure also shows the 30-day all-cause readmission rate following the index stay for patients with a principal diagnosis of SCD.

Figure 4. Costs, length of stay, and readmissions among stays for patients with a principal SCD diagnosis, by age group, 2016



Abbreviation: SCD, sickle cell disease; y, years

[a] Per 100 index stays with a principal diagnosis of SCD.

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

- **In aggregate, stays for SCD cost over $800 million in 2016.**

  In 2016, the aggregate cost of inpatient hospital stays for patients with a principal diagnosis of SCD was $811.4 million. Most costs were incurred by patients aged 18–34 years ($435.3 million, 53.6 percent), followed by patients aged less than 18 years ($154.0 million, 19.0 percent).

- **Among stays for SCD, the mean length of stay was around 5 days for adults and was approximately 1 day shorter for children.**

  The mean length of stay for children aged less than 18 years with a principal diagnosis of SCD was approximately 1 day shorter than the mean length of stay for all other age groups (3.9 days vs. 5.0 days or longer on average).

- **Adults aged 18–44 years had higher-than-average readmission rates following an index visit of SCD.**

  The 30-day all-cause readmission rate following index stays for SCD was highest among adults aged 18–34 years (39.4 percent) and lowest among children aged less than 18 years (20.1 percent). Additional detail on readmission rates is presented below.

Table 3 displays the all-cause 30-day readmission rates following initial (i.e., index) inpatient stays among patients with and without SCD in 2016. Readmission rates are provided for each of the patient and hospital characteristics based on the index stay.

Table 3. All-cause readmission rates following inpatient stays with and without a diagnosis of SCD, 2016

Characteristic at index stay	Any SCD diagnosis at index stay				No diagnosis of SCD at index stay
	Total	Principal diagnosis	Secondary diagnosis		
			With a pain crisis	Without a pain crisis	
All stays	31.1	33.5	32.9	21.0	12.5
Age, years					
<18	18.7	20.1	16.2	14.6	4.5
18–34	37.2	39.4	37.4	22.5	7.8
35–44	32.7	35.2	31.0	24.0	12.3
45–64	30.1	32.7	30.3	25.3	15.9
65+	21.6	22.6	29.3	20.6	15.9
Sex					
Male	31.4	33.9	28.4	21.8	14.2
Female	30.9	33.3	35.4	20.5	11.2
Admitted from the ED					
Yes	32.2	34.0	32.1	23.0	16.4
No	26.2	30.4	36.0	17.4	7.8
Discharge disposition					
Home or home health care	30.7	33.1	32.3	20.2	11.3
Other hospital	30.3	33.5	32.8	27.6	18.5
Against medical advice	46.6	48.5	49.1	35.0	26.5
Primary expected payer					
Medicare, 65+ years	21.2	20.6	27.5	21.0	16.1
Medicare, <65 years	37.3	38.9	36.4	29.8	21.0
Medicaid	31.7	34.1	35.0	20.3	11.1
Private insurance	23.5	26.0	25.6	14.6	7.9
Self-pay/no charge[a]	22.4	24.7	14.3	19.8	10.8
Other payers[b]	30.8	33.7	28.9	23.3	9.8
Community-level income					
Quartile 1 (lowest)	32.6	35.1	33.3	22.4	13.9
Quartile 2	31.2	33.9	32.7	19.8	12.5
Quartile 3	28.6	30.6	33.1	19.0	11.8
Quartile 4 (highest)	27.4	29.0	30.7	20.7	11.0
Location of patient residence					
Metro area	31.3	33.7	33.1	21.1	12.6
Rural, adjacent to metro area	29.4	31.5	30.5	20.6	12.3
Rural, remote area	29.5	32.7	32.0	15.8	11.3
Hospital census region					
Northeast	31.6	34.5	31.4	20.7	13.0
Midwest	31.9	34.2	37.8	20.7	12.3
South	30.8	33.2	31.9	20.7	12.8
West	31.2	32.8	33.9	24.1	11.6

Abbreviation: SCD, sickle cell disease; ED, emergency department

Note: Other discharge dispositions and missing data categories are not shown (i.e., less than 2 percent for age, sex, discharge disposition, expected payer, community-level income, and location of residence).

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

[b] Other payers include Federal and local government programs (see Definitions section) and Workers' Compensation.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), Nationwide Readmissions Database (NRD), 2016

- **One-third of inpatient stays for SCD had a readmission within 30 days.**

  Among index stays with a principal diagnosis of SCD, 33.5 percent resulted in readmission for any cause within 30 days. The readmission rate was similar for index stays with a secondary diagnosis of SCD with a pain crisis (32.9 percent) and lower for those with a secondary SCD diagnosis without a pain crisis (21.0 percent). Overall, the readmission rate following stays involving any diagnosis of SCD was 2.5 times higher than the rate following index stays without SCD (31.1 vs. 12.5 percent).

- **Among index stays involving SCD, readmission rates were higher for patients admitted from the ED than for those admitted in other ways.**

  Of index stays that were admitted from the ED with any SCD diagnosis, 32.2 percent resulted in readmission within 30 days. In comparison, the readmission rate was 26.2 percent among index stays involving SCD that were admitted in other ways (e.g., directly by a physician). However, among index stays with a secondary SCD diagnosis with a pain crisis, the readmission rate was lower for patients admitted from the ED (32.1 percent) than for those admitted in other ways (36.0 percent).

- **Nearly half of all SCD-related index stays that resulted in a discharge AMA had a readmission within 30 days.**

  The all-cause 30-day readmission rate was 46.6 percent following SCD-related stays that were discharged AMA (ranging from 35.0 to 49.1 percent, depending on the whether the index stay was for a principal SCD diagnosis or a secondary SCD diagnosis with or without a pain crisis), compared with SCD-related stays initially resulting in a discharge to home/home health care or another hospital (ranging from 20.2 to 33.5 percent, depending on whether the index stay was for a principal SCD diagnosis or a secondary SCD diagnosis with or without a pain crisis).

- **Among index stays involving SCD, across expected payers readmission rates were highest for patients aged less than 65 years with Medicare as the expected payer.**

  Among SCD-related stays for which Medicare was the expected payer, the all-cause 30-day readmission rate for patients aged less than 65 years was 1.8 times the rate for older patients (37.3 percent vs. 21.2 percent). The readmission rate was 31.7 percent following SCD-related stays for which Medicaid was the expected payer and 22–24 percent following SCD-related stays for which the expected payer was private insurance or self-pay/no charge.[18]

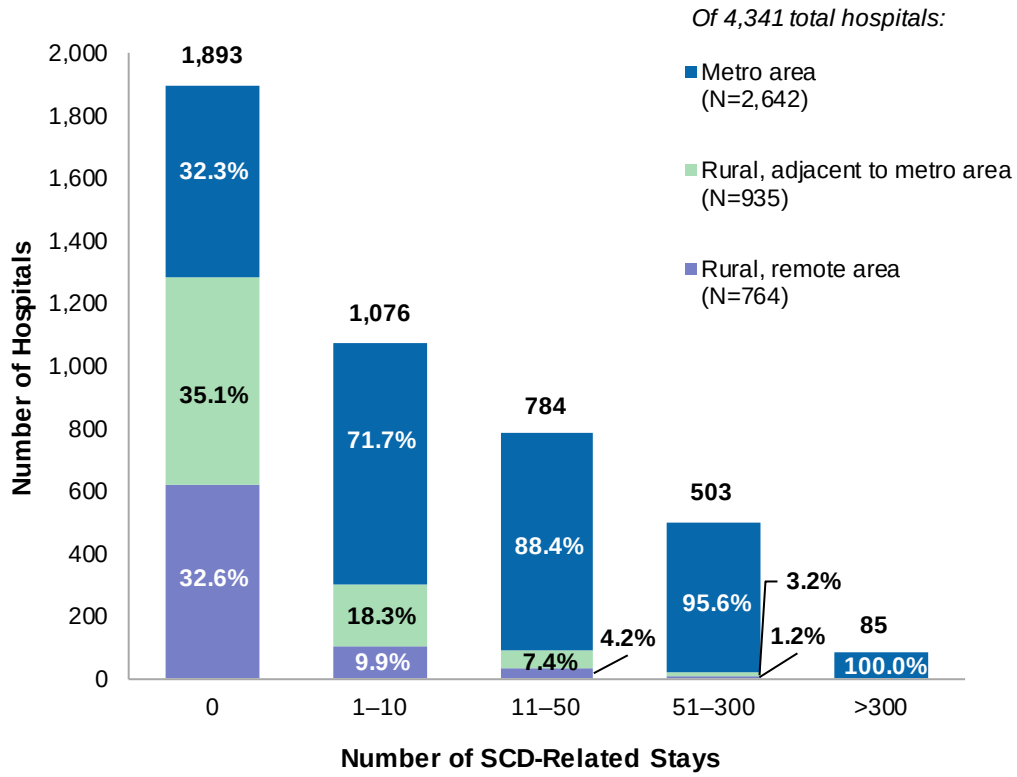
- **Readmission rates following SCD-related stays decreased as community-level income increased.**

  The readmission rate following SCD-related index stays was highest for patients from the lowest income communities (quartile 1: 32.6 percent) and lowest for patients from the highest income communities (quartile 4: 27.4 percent).

[18] Self-pay/no charge: includes self-pay, no charge, charity, and no expected payment.

Location of inpatient hospital care for patients with SCD, 2016
In Figure 5, community hospitals are categorized according to their annual number of SCD-related inpatient stays in 2016. These hospitals are then described in terms of their location. Figure 5 is based on an analysis of 4,341 hospitals across 46 States and the District of Columbia in 2016.

Figure 5. Hospital location, by annual number of stays with SCD, 2016



Abbreviation: SCD, sickle cell disease

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) for 46 States and the District of Columbia, 2016

- **SCD-related hospital stays were concentrated in a subset of U.S. hospitals in 2016.**

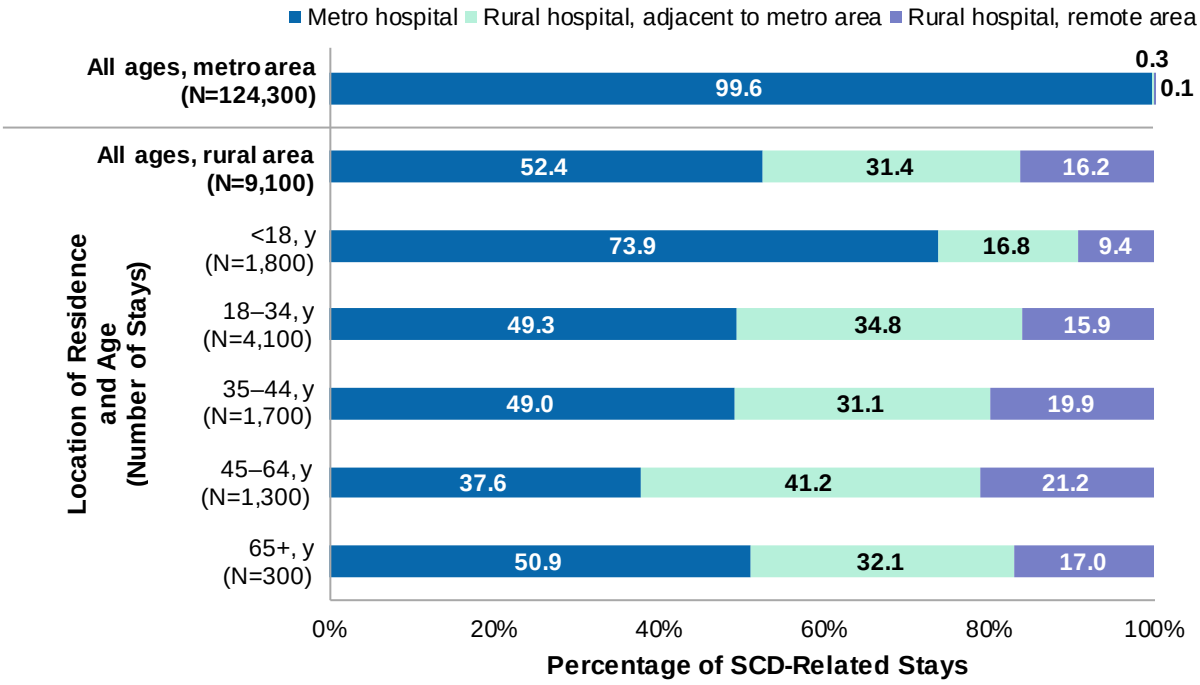
  In 2016, there were 2,448 hospitals that treated patients with SCD (56.4 percent of hospitals across 46 States and the District of Columbia). Among these hospitals, the largest proportion of hospitals were those with 1–10 SCD-related stays during 2016 (1,076 or 44.0 percent). Another 784 hospitals (32.0 percent of hospitals with any SCD-related stays) had 11–50 stays during the year (i.e., on average, approximately 1–4 stays per month). During 2016, 503 hospitals (20.5 percent of hospitals with any SCD-related stays) had 51–300 stays, and only 85 hospitals (3.5 percent) had more than 300 SCD-related stays.

- **Over 40 percent of hospitals (N=1,893) did not have any stays for patients with SCD in 2016**.

  Two out of five hospitals (43.6 percent of U.S. hospitals) did not have any stays for patients with SCD. Hospitals with no stays for patients with SCD were more likely to be in rural, remote areas (32.6 percent) and rural areas adjacent to metro areas (35.1 percent) compared with those hospitals that had at least one stay for a patient with SCD (rural, remote: 0 to 9.9 percent; rural, adjacent to metro: 0 to 18.3 percent).

Figure 6 shows the distribution of SCD-related stays for patients in each age group from metro and rural areas treated at hospitals in metro and rural areas in 2016. Rural location of patient residence combines both rural locations adjacent to metro areas and remote areas.

Figure 6. The percentage of SCD-related stays at hospitals in metropolitan and rural areas, by location of patient residence and age, 2016



Abbreviations: SCD, sickle cell disease; y, years

Note: SCD was defined based on all-listed diagnoses.

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

- **Nearly all SCD-related stays for patients who resided in metro areas were treated at hospitals in metro areas.**

  Of SCD-related stays for patients from metro areas, 99.6 percent occurred at hospitals that also were in metro areas. Table 1 demonstrates that the majority of SCD-related stays were for patients from metro areas (124,300, or 92.8 percent of all SCD-related stays).

- **Half of SCD-related stays for patients from rural areas occurred at hospitals in metro areas.**

  Of SCD-related stays for patients from rural areas, 52.4 percent were at hospitals in metro areas, suggesting that the patient traveled to receive care; 31.4 percent were at hospitals in rural areas, adjacent to metro areas; and 16.2 percent were at rural, remote hospitals.

- **Among SCD-related stays for patients from rural areas, stays for children were more likely to occur at hospitals in metro areas than were stays for adults.**

  Among SCD-related stays for patients aged less than 18 years from rural areas, 73.9 percent required travel because the patients were treated at hospitals in metro areas. In contrast, among SCD-related stays for adult patients from rural areas, 37.6–50.9 percent of stays were at hospitals in metro areas.

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 2016 National Inpatient Sample (NIS), the 2016 Nationwide Readmissions Database (NRD), and the 2016 State Inpatient Databases (SID). Historical data were drawn from the 2000–2014 National (Nationwide) Inpatient Sample (NIS). Supplemental sources included population denominator data for use with HCUP databases, derived from Claritas, a vendor that produces population estimates and projections based on data from the U.S. Census Bureau.[19]

Definitions

Diagnoses, ICD-9-CM, ICD-10-CM, and Major Diagnostic Categories (MDCs)
The *principal diagnosis* is that condition established after study to be chiefly responsible for the patient's admission to the hospital (i.e., referred to as *stays for sickle cell disease [SCD]* or *stays principally for SCD*). *Secondary diagnoses* are concomitant conditions that coexist at the time of admission or develop during the stay *(i.e.,* referred to as *stays with a secondary SCD diagnosis* on the record*)*. *All-listed diagnoses* include the principal diagnosis plus these additional secondary conditions (i.e., referred to as *SCD-related stays* or *stays that involved SCD* or *stays for patients with SCD*).

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

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

Major Diagnosis Categories (MDCs) assign ICD-9-CM and ICD-10-CM principal and secondary diagnosis codes to categories 1 through 23; only the principal diagnosis code is used to assign MDC's 24 or 25.[20]

[19] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed January 4, 2019.
[20] Centers for Medicare and Medicaid Services. ICD-10-CM/PCS MS-DRG v36.0 Definitions Manual. www.cms.gov/ICD10Manual/version36-fullcode-cms/fullcode_cms/P0030.html. Accessed August 15, 2019.

Case definition
The ICD-9-CM and ICD-10-CM codes defining sickle cell disease include the codes listed in Table 4. Sickle cell trait is not included in the definition of sickle cell disease in this Brief.

Table 4. Definition of sickle cell disease

ICD-9-CM code	Description	Presence of crisis
282.42	Sickle-cell thalassemia with crisis	With crisis
282.62	Hb-SS disease with crisis	With crisis
282.64	Sickle-cell/Hb-C disease with crisis	With crisis
282.69	Other sickle-cell disease with crisis	With crisis
282.41	Sickle-cell thalassemia without crisis	Without crisis
282.60	Sickle-cell disease, unspecified	Without crisis
282.61	Hb-SS disease without crisis	Without crisis
282.63	Sickle-cell/Hb-C disease without crisis	Without crisis
282.68	Other sickle-cell disease without crisis	Without crisis
ICD-10-CM code	**Description**	**Presence of crisis**
D57.00	Hb-SS disease with crisis, unspecified	With crisis
D57.01	Hb-SS disease with acute chest syndrome	With crisis
D57.02	Hb-SS disease with splenic sequestration	With crisis
D57.211	Sickle-cell/Hb-C disease with acute chest syndrome	With crisis
D57.212	Sickle-cell/Hb-C disease with splenic sequestration	With crisis
D57.219	Sickle-cell/Hb-C disease with crisis, unspecified	With crisis
D57.411	Sickle-cell thalassemia with acute chest syndrome	With crisis
D57.412	Sickle-cell thalassemia with splenic sequestration	With crisis
D57.419	Sickle-cell thalassemia with crisis, unspecified	With crisis
D57.811	Other sickle-cell disorders with acute chest syndrome	With crisis
D57.812	Other sickle-cell disorders with splenic sequestration	With crisis
D57.819	Other sickle-cell disorders with crisis, unspecified	With crisis
D57.1	Sickle-cell disease without crisis	Without crisis
D57.20	Sickle-cell/Hb-C disease without crisis	Without crisis
D57.40	Sickle-cell thalassemia without crisis	Without crisis
D57.80	Other sickle-cell disorders without crisis	Without crisis

Abbreviations: Hb-C, hemoglobin C; Hb-SS, hemoglobin sickle cell

In Figure 1, the definition of sickle cell disease was based on all-listed diagnoses. The number of diagnosis fields available in the NIS increased from 15 in 2000 to 30 in 2014 and 2016.

Readmissions
The 30-day readmission rate is defined as the number of admissions for which there was at least one subsequent hospital admission within 30 days, divided by the total number of admissions from January through November of the same year. That is, when patients are discharged from the hospital, if that same patient is admitted to the same or a different hospital during the 30-day period (for any cause) then the admission is counted as a readmission. No more than one readmission is counted within the 30-day period, because the outcome measure assessed is "percentage of admissions that are readmitted." If a patient was transferred to a different hospital on the same day or was transferred within the same hospital, the two events were combined as a single stay and the second event was not counted as a readmission; that is, transfers were not considered a readmission.

Every qualifying hospital stay is counted as a separate initial (starting point) admission, or an index stay. Thus, a single patient can be counted multiple times during the course of the January through November observation period. In addition, initial admissions do not require a prior "clean period" with no hospitalizations; that is, a hospital stay may be a readmission for a prior stay and the initial admission for a subsequent readmission. Admissions were disqualified from the analysis as initial admissions if they could not be followed for 30 days for one of the following reasons: (1) the patient died in the hospital, (2) information on length of stay was missing, or (3) the patient was discharged in December.

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 Readmissions Database
The Nationwide Readmissions Database (NRD) 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 NRD includes obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded are long-term care facilities such as rehabilitation, long-term acute care, 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 will be included in the NRD.

Types of hospitals included in HCUP State Inpatient Databases
This analysis used State Inpatient Databases (SID) limited to data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay was included in the analysis.

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

Costs and charges
Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services (CMS).[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.

How HCUP estimates of costs differ from National Health Expenditure Accounts
There are a number of differences between the costs cited in this Statistical Brief and spending as measured in the National Health Expenditure Accounts (NHEA), which are produced annually by CMS.[22] The largest source of difference comes from the HCUP coverage of inpatient treatment only in contrast to the NHEA inclusion of outpatient costs associated with emergency departments and other hospital-based outpatient clinics and departments as well. The outpatient portion of hospitals' activities has been growing steadily and may exceed half of all hospital revenue in recent years. On the basis of the

[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 September 2018. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed January 4, 2019.
[22] For additional information about the NHEA, see Centers for Medicare & Medicaid Services (CMS). National Health Expenditure Data. CMS Web site. Updated April 2018. www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=/NationalHealthExpendData/. Accessed January 4, 2019.

American Hospital Association Annual Survey, 2014 outpatient gross revenues (or charges) were about 46 percent of total hospital gross revenues.[23]

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

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

As noted in HCUP Methods Series: *Missing Data Methods for the NIS and the SID* Report # 2015-01,[24] race/ethnicity is systematically missing from the NIS for a portion of the discharges (5.0 percent of discharges in 2016). To determine whether there was a bias in the distribution of race/ethnicity, the estimates of SCD-related hospital stays by race/ethnicity using the 2016 NIS were compared to the estimates of SCD-related hospital stays by race/ethnicity using an analytic file of a weighted sample of hospitals with nonmissing race/ethnicity data from the HCUP State Inpatient Databases (SID). This analytic file is also used for the National Healthcare Quality and Disparities Report (NHQR/NHDR).

In the 2016 NIS, used for Table 1 and Figure 2, the distribution of race/ethnicity across all stays was as follows: Black, 14.4 percent; Hispanic, 11.6 percent; White, 62.0 percent; Other, 6.8 percent; missing, 5.1 percent. The race/ethnicity distribution across all SCD-related stays was as follows: Black, 87.5 percent; Hispanic, 3.9 percent; White, 1.7 percent; Other, 3.0 percent; missing, 3.9 percent. In the 2016 NHQR/NHDR, the distribution of race/ethnicity across all stays was as follows: Black, 15.2 percent; Hispanic, 12.1 percent; White, 64.6 percent; Other, 6.3 percent; missing, 1.8 percent. Using the NHQR/NHDR, the race/ethnicity distribution across SCD-related stays was as follows: Black, 91.8 percent; Hispanic, 3.6 percent; White, 1.7 percent; Other, 2.3 percent; missing, 0.6 percent.

Hospital location and location of patient's residence

Hospital location and place of residence are based on the rural-urban continuum codes (RUCC) for U.S. counties developed by the United States Department of Agriculture (USDA).[25] For this Statistical Brief, we collapsed the RUCC categories into the following categories:

[23] American Hospital Association. TrendWatch Chartbook, 2016. Table 4.2. Distribution of Inpatient vs. Outpatient Revenues, 1994–2014. www.aha.org/system/files/2018-01/2016-chartbook.pdf. Accessed January 4, 2019.

[24] Houchens R. Missing Data Methods for the NIS and the SID. 2015. HCUP Methods Series Report #2015-01 ONLINE. January 22, 2015. U.S. Agency for Healthcare Research and Quality. www.hcup-us.ahrq.gov/reports/methods/methods.jsp. Accessed June 26, 2019.

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

Metro:

- Counties in metro areas of 1 million population or more
- Counties in metro areas of 250,000 to 1 million population
- Counties in metro areas of fewer than 250,000 population

Rural (nonmetro), adjacent to metro area:

- Urban population of 20,000 or more, adjacent to a metro area
- Urban population of 2,500 to 19,999, adjacent to a metro area
- Completely rural or less than 2,500 urban population, adjacent to a metro area

Rural (nonmetro), remote area:

- Urban population of 20,000 or more, not adjacent to a metro area
- Urban population of 2,500 to 19,999, not adjacent to a metro area
- Completely rural or less than 2,500 urban population, not adjacent to a metro area

Community-level income
Community-level income is based on the median household income of the patient's ZIP Code of residence. Quartiles are defined so that the total U.S. population is evenly distributed. Cut-offs for the quartiles are determined annually using ZIP Code demographic data obtained from Claritas, a vendor that produces population estimates and projections based on data from the U.S. Census Bureau.[26] The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign.

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

- Expected payer for patients aged less than 65 years:
    - Medicare: includes fee-for-service and managed care Medicare
    - Medicaid: includes fee-for-service and managed care Medicaid
    - Private Insurance: includes commercial nongovernmental payers, regardless of the type of plan (e.g., private health maintenance organizations [HMOs] and preferred provider organizations [PPOs])
    - Self-pay/no charge: includes self-pay, no charge, charity, and no expected payment
    - Other payers: includes other Federal and local government programs (e.g., TRICARE, CHAMPVA, Indian Health Service, Black Lung, Title V) and Workers' Compensation

- Expected payer for patients aged 65 years old or older:
    - Medicare: includes fee-for-service and managed care Medicare
    - Non-Medicare: includes all other expected payer categories, as described above (i.e., Medicaid, private insurance, self-pay/no charge, other payers).

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

For this Statistical Brief, when more than one payer is listed for a hospital discharge, the first-listed payer is used.

[26] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed January 4, 2019.

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

Admission source or point of origin
Admission source (now known as the patient's point of origin) indicates where the patient was located prior to admission to the hospital. Emergency admission indicates that the patient was admitted to the hospital through the emergency department.

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

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 unweighted sample size for the 2016 NIS is 7,135,090 (weighted, this represents 35,675,421 inpatient stays). The unweighted sample size for the 2000 NIS is 7,450,992 (weighted, this represents 36,417,565 inpatient stays).

About the NRD

The HCUP Nationwide Readmissions Database (NRD) is a calendar-year, discharge-level database constructed from the HCUP State Inpatient Databases (SID) with verified patient linkage numbers that can be used to track a person across hospitals within a State. The 2016 NRD is available for purchase through the HCUP Central Distributor. The NRD is designed to support various types of analyses of national readmission rates. The database includes discharges for patients with and without repeat hospital visits in a year and those who have died in the hospital. Repeat stays may or may not be related.

The criteria to determine the relationship between hospital admissions are left to the analyst using the NRD. The NRD was constructed as a sample of convenience consisting of 100 percent of the eligible discharges. Discharge weights for national estimates are developed using the target universe of community hospitals (excluding rehabilitation and long-term acute care hospitals) in the United States. Over time, the sampling frame for the NRD will change; thus, the number of States contributing to the NRD will vary from year to year. The NRD is intended for national estimates only; no regional, State-, or hospital-specific estimates can be produced. The unweighted sample size for the 2016 NRD is 17,197,683 (weighted, this represents 35,660,906 inpatient stays).

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.

For More Information

For other information on blood or hematology conditions, refer to the HCUP Statistical Briefs located at www.hcup-us.ahrq.gov/reports/statbriefs/sb_blood.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 care 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 Inpatient Sample (NIS), the Nationwide Readmissions Databases (NRD), and the State Inpatient Databases (SID), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the National (Nationwide) Inpatient Sample (NIS). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated August 2018. www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed January 4, 2019.

Agency for Healthcare Research and Quality. Overview of the Nationwide Readmissions Database (NRD). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated August 2018. www.hcup-us.ahrq.gov/nrdoverview.jsp. Accessed January 4, 2019.

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 July 2018. www.hcup-us.ahrq.gov/sidoverview.jsp. Accessed January 4, 2019.

Suggested Citation

Fingar KR (IBM Watson Health), Owens PL (AHRQ), Reid LD (AHRQ), Mistry K (AHRQ), Barrett ML (M.L. Barrett, Inc.). Characteristics of Inpatient Hospital Stays Involving Sickle Cell Disease, 2000–2016. HCUP Statistical Brief #251. September 2019. Agency for Healthcare Research and Quality, Rockville, MD. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb251-Sickle-Cell-Disease-Stays-2016.pdf.

Acknowledgments

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

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This Statistical Brief was posted online on September 3, 2019.