Comorbidities Associated With Adult Inpatient Stays, 2019

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Highlights

- In 2019, 84.1 percent of all inpatient stays were complicated by one or more comorbidities. Half of those stays included three or more comorbidities.
- Hypertension (53.2 percent), diabetes (26.4 percent), and chronic respiratory (lung) disease (20.5 percent) were the most common comorbidities associated with inpatient stays.
- Depression was a comorbidity in over 10 percent of stays; drug abuse and alcohol abuse each were comorbidities in 5 percent of stays.
- The percentage of stays with three or more comorbidity diagnoses increased as community income decreased, increased with age, and was highest for stays with an expected payer of Medicare, for males, and for non-Hispanic Black and White patients.
- Inpatient stays with three or more comorbidities were longer, more costly, and more likely to result in an in-hospital death.

Introduction

Most inpatient stays are complicated by one or more comorbidities that affect patient care because they require clinical evaluation or therapeutic treatment, extend the length of stay, or increase nursing care and/or monitoring. Comorbidities are secondary diagnoses and distinct from the reason for the hospitalization (i.e., the principal diagnosis).[1,2] Understanding patterns in comorbidities associated with inpatient stays is important for several reasons. Comorbidities are key predictors of length of stay, cost, readmission, and mortality.[1,2] Identification of comorbidities helps hospitals allocate the necessary resources and staffing to address patient needs and improve their quality of care.

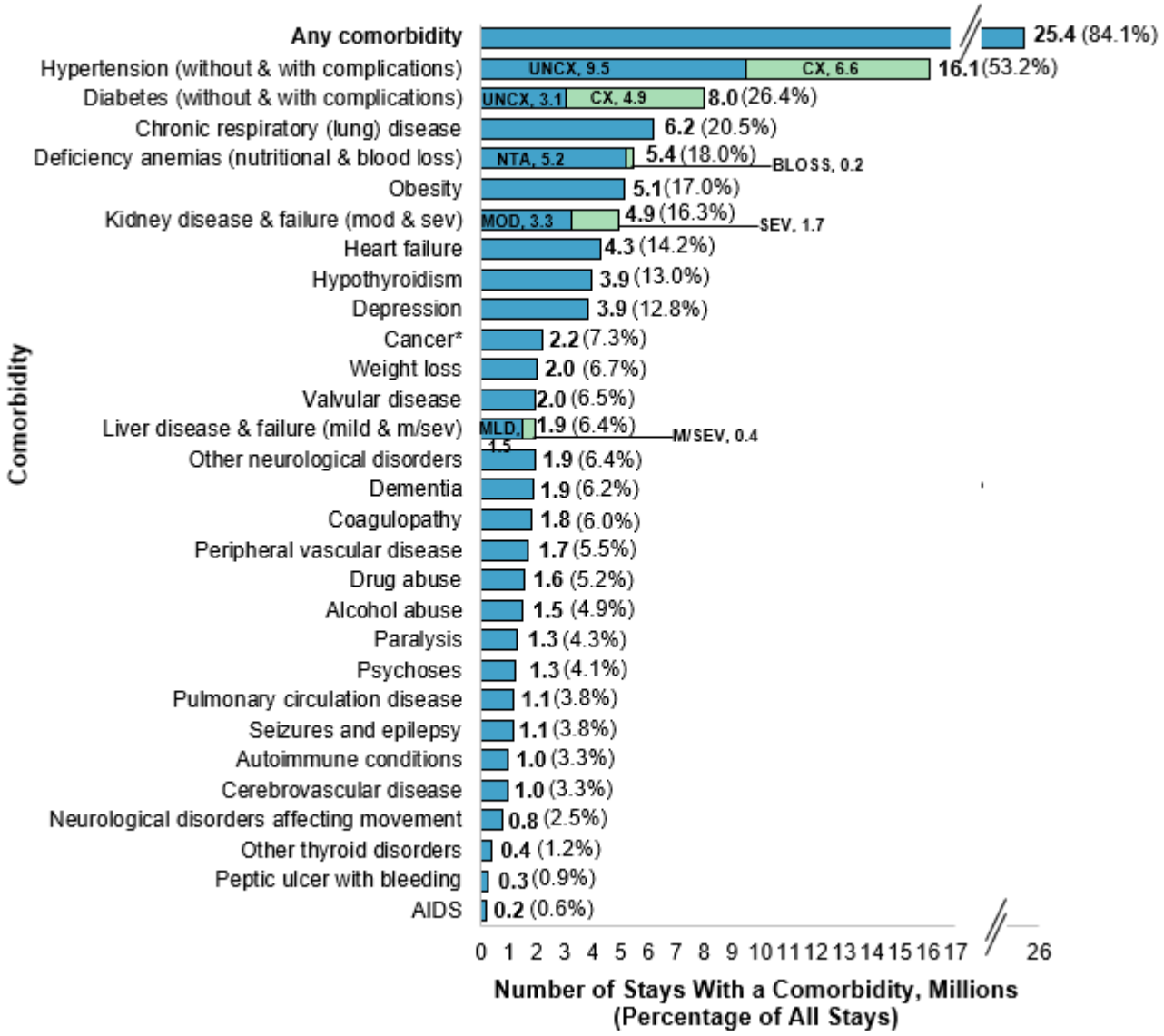
This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents statistics on 38 comorbidities, defined by the Elixhauser Comorbidity Software Refined for the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM), v2023.1.[3] Using weighted estimates of adult inpatient stays based on the 2019 National Inpatient Sample (NIS), the percentage of stays with any and specific types of comorbidities is shown. The percentage of stays with comorbidities is examined by patient characteristics and the reason for the hospital stay, and outcomes of inpatient stays with and without comorbidities are presented. Because of the large sample size of the NIS data, small differences can be statistically significant but not clinically important. Thus, only differences greater than or equal to 10 percent are discussed in the text.

Findings

Types of comorbidities among hospital inpatient stays, 2019

Figure 1 displays the percentage of adult inpatient stays with a comorbidity in 2019. Comorbidities are secondary diagnoses and distinct from the reason for the inpatient stay (i.e., the principal diagnosis). Percentages shown in the figure total over 100 percent, as inpatient stays may include more than one comorbidity.

Figure 1. Number and percentage of adult inpatient stays with a comorbidity, 2019



Abbreviations: BLOSS, chronic blood loss anemia; CX, with complications; MLD, mild; MOD, moderate; M/SEV, moderate to severe; NTA, nutritional anemias; SEV, severe; UNCX, without complications.

Notes: Inpatient stays can be included in multiple comorbidity categories with the following exceptions: hypertension, diabetes, liver disease & failure, and kidney disease & failure. The bar for deficiency anemias is divided into nutritional and blood loss, respectively; the bars for diabetes are divided into without and with complications, respectively; the bars for hypertension are divided into uncomplicated and complicated, respectively; the bars for kidney disease and failure are divided into moderate and severe, respectively; and the bars for liver disease and failure are divided into mild and moderate to severe, respectively. If a stay had an indication of hypertension or diabetes with and without complications, it was categorized in the complicated group. If a stay had an indication of both mild disease and moderate to severe liver disease and failure, it was categorized as moderate to severe. If a stay had an indication of both moderate and severe kidney disease and failure, it was categorized as severe.

* The comorbidity of cancer includes leukemia (N=209,800); lymphoma (N=294,900); metastatic cancer (N=864,900); solid tumor without metastasis, malignant (N=823,600); and solid tumor without metastasis, in situ (N=9,200).

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

- **In 2019, 84.1 percent of adult inpatient stays were for patients with one or more comorbidities.**

  In 2019, 25.4 million inpatient stays (84.1 percent of all stays) were for patients with one or more comorbidities. The most common comorbidities were hypertension and diabetes. Approximately half of all stays (53.2 percent) were for patients with hypertension, and one in four stays (26.4 percent) were for patients with diabetes as a comorbid condition. Of the 16.1 million stays among patients with hypertension as a comorbid condition, 41.0 percent (6.6 million) involved hypertension with complications. Of the 8.0 million stays among patients with diabetes as a comorbid condition, 61.3 percent (4.9 million) were for diabetes with chronic complications.

- **Other than hypertension and diabetes, comorbidities reported for more than 15 percent of all adult inpatient stays included chronic respiratory (lung) disease, deficiency anemias due to nutrition and chronic blood loss, obesity, and kidney disease and failure.**

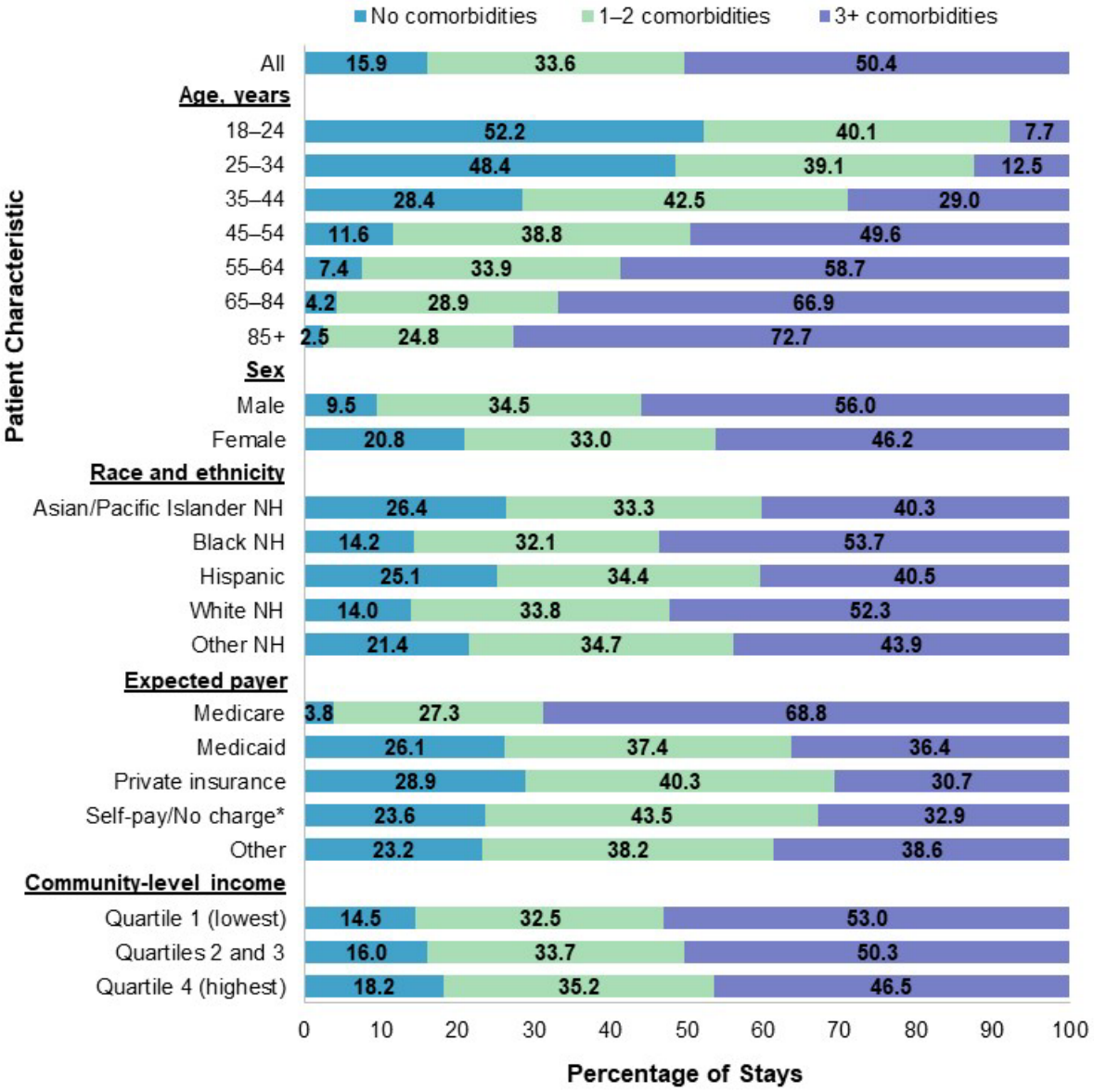
  After hypertension and diabetes, the most common types of comorbidities were chronic respiratory (lung) disease (20.5 percent), deficiency anemias due to nutrition and chronic blood loss (18.0 percent), obesity (17.0 percent), and kidney disease and failure (16.3 percent). Of the 4.9 million stays among patients with kidney disease and failure, 67.3 percent (3.3 million) had moderate kidney disease, defined as stage 3 or unspecified chronic kidney disease or unspecified kidney failure.

- **With respect to mental health and/or substance use disorders (MSUD), depression was a comorbidity for over 1 in 10 stays. Drug abuse and alcohol abuse were each noted as comorbidities for approximately 5 percent of stays.**

  Out of all stays, 12.8 percent (3.9 million) were for patients with depression as a comorbid condition. Other comorbidities related to mental health and/or substance use disorders included drug abuse (5.2 percent), alcohol abuse (5.2 percent), and psychoses (4.1 percent).

Hospital stays with and without comorbidities, by patient characteristics, 2019
Figure 2 displays the percentage of adult inpatient stays with no, one to two, or three or more comorbidities, overall and by patient characteristics in 2019.

Figure 2. Presence and number of comorbidities among adult inpatient stays, by patient characteristics, 2019



Abbreviation: NH, non-Hispanic

Note: Not shown are bars for 36,700 stays (<1% of total stays) missing expected payer and 699,500 stays (2.3% of all stays) missing race and ethnicity.

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

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

- **Half of all adult inpatient stays were for patients with three or more comorbidities, with variation in the percentage of stays noted by the characteristics of the patient.**

  In 2019, 50.4 percent of all stays were for patients with three or more comorbidities and 33.6 percent were for patients with one to two comorbidities. The presence and number of comorbidities differed by patient characteristics.

- The percentage of stays for patients with three or more comorbidities increased with age, from 7.7 percent among adults aged 18–24 years to 72.7 percent among adults aged 85 years or older.

- Stays among adult males were more likely to include three or more comorbidities compared with stays among adult females (56.0 vs. 46.2 percent). Only 9.5 percent of stays among males had no comorbidities, whereas 20.8 percent of stays among females had no comorbidities.

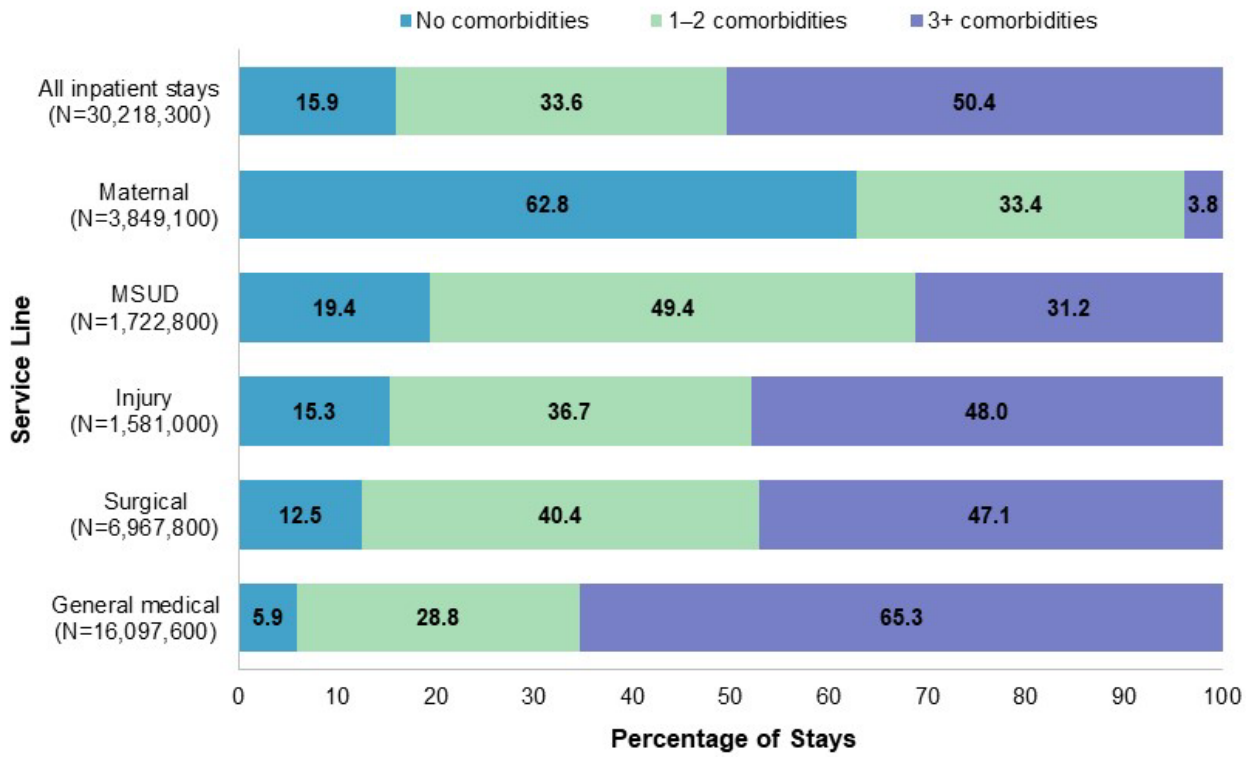
- Stays that were expected to be paid by public payers were more likely than those with an expected payer of private insurance to include three or more comorbidities. For instance, of adult stays with an expected payer of Medicare, 68.8 percent were for patients with three or more comorbidities and another 27.3 percent were for patients with one to two comorbidities (only 3.8 percent involved no comorbidities). Additionally, a greater percentage of Medicaid stays were for patients with three or more comorbidities, compared with stays expected to be paid by private insurance (36.4 vs. 30.7 percent).

- Adult stays among Black non-Hispanic (NH) (53.7 percent) and White NH (52.3 percent) patients were more likely to have diagnoses of three or more comorbidities compared with stays among Asian/Pacific Islander NH (40.3 percent) and Hispanic (40.5 percent) patients.

- The percentage of stays for adult patients with three or more comorbidities increased as community-level income decreased: 46.5 percent in income quartile 4 (highest) versus 53.0 percent in income quartile 1 (lowest).

Reasons for hospital stays with and without comorbidities, 2019
Figure 3 displays the percentage of adult inpatient stays with no, one to two, or three or more comorbidities by hospital service line (i.e., general reason for the stay) in 2019. Comorbidities are secondary diagnoses and distinct from the reason for the inpatient stay (i.e., the principal diagnosis).

Figure 3. Presence and number of comorbidities among adult inpatient stays, by hospital service line, 2019



Abbreviation: MSUD, mental health and/or substance use disorders

Notes: Numbers of stays are rounded to the nearest 100. Percentages are calculated from unrounded values.

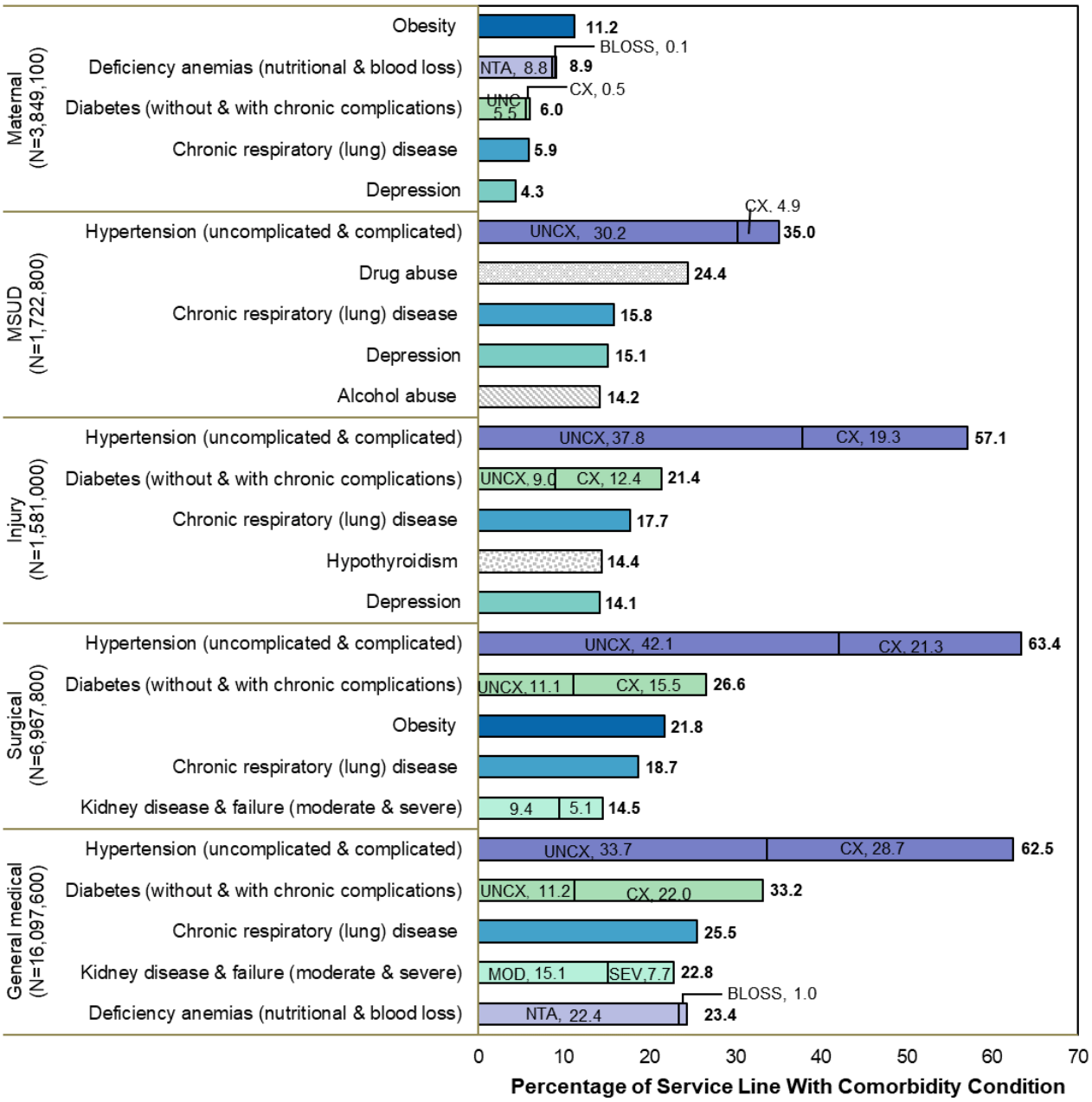
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

- **The presence and number of comorbidities differed by reason for the hospital stay.**

  When the reason for the stay was examined broadly, as defined by hospital service line, the distribution of stays involving no, one to two, or three or more comorbidities differed. Most maternal stays—which constituted 3.8 million, or 12.7 percent, of all adult stays—involved no comorbidities (62.8 percent). The percentage of stays involving no comorbidities was less than 20 percent for all other service lines (MSUD [19.4 percent], injury [15.3 percent], surgical [12.5 percent], and general medical [5.9 percent]). The percentage of stays involving three or more comorbidities was highest for general medical stays (65.3 percent), which constituted 16.1 million, or 53.3 percent, of all adult stays. This was followed by surgical and injury-related stays (47–48 percent involved three or more comorbidities), MSUD stays (31.2 percent), and maternal stays (3.8 percent).

Figure 4 displays the five leading types of comorbid conditions within each hospital service line in 2019. The Appendix lists the number and percentage of inpatient stays by all comorbidities and service lines. Comorbidities are secondary diagnoses and distinct from the reason for the inpatient stay (i.e., the principal diagnosis).

Figure 4. Top five comorbid conditions by type of comorbidity and service line, 2019



Abbreviations: BLOSS, chronic blood loss anemia; CX, with complications; MOD, moderate; MSUD, mental health and/or substance use disorders; NTA, nutritional anemias; SEV, severe; UNCX, without complications

Notes: Numbers of stays are rounded to the nearest 100. Percentages are calculated from unrounded values. The bar for deficiency anemias is divided into nutritional and blood loss, respectively; the bars for diabetes are divided into without and with complications, respectively; the bars for hypertension are divided into uncomplicated and complicated, respectively; and the bars for kidney disease and failure are divided into moderate and severe, respectively.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

- **Chronic respiratory (lung) disease was the only comorbidity that was a leading comorbidity across all hospital service lines.**

  Chronic respiratory (lung) disease was the only comorbidity that was among the leading five comorbidities in all hospital service lines. This disease was the most common for general medical stays (25.5 percent), followed by surgical (18.7 percent), injury (17.7 percent), MSUD (15.8 percent), and maternal (5.9 percent) stays.

- **The leading comorbidities for stays varied by hospital service line.**

  Hypertension and diabetes were each a leading comorbidity in four of the five hospital service lines. Hypertension with and without complications was the leading type of comorbidity for stays in the surgical (63.4 percent), general medical (62.5 percent), injury (57.1 percent), and MSUD (35.0 percent) service lines. Complicated hypertension was involved in a greater percentage of general medical stays (28.7 percent), compared with surgical and injury stays (about one-fifth) and MSUD stays (4.9 percent).

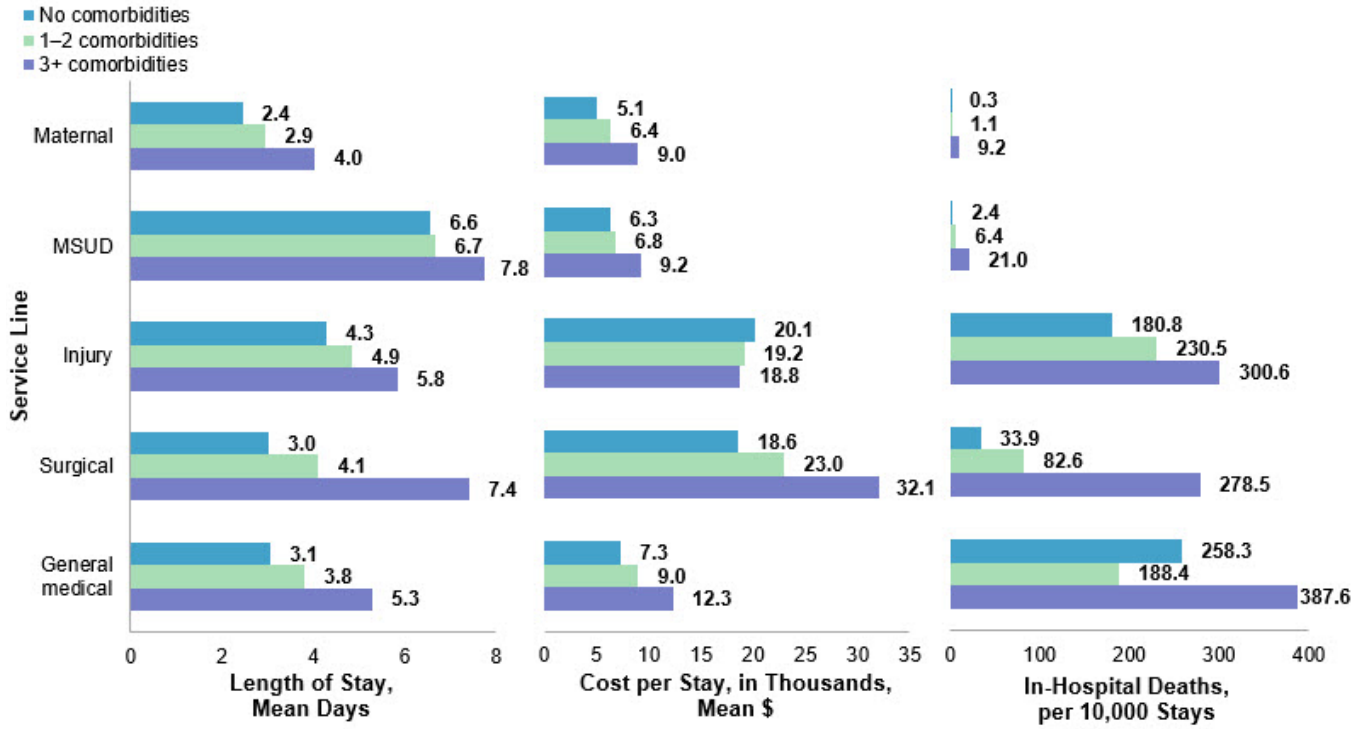
  Diabetes with and without chronic complications was the second leading type of comorbidity for stays in the general medical (33.2 percent), surgical (26.6 percent), and injury (21.4 percent) service lines. In each of these service lines, diabetes with chronic complications was more common than diabetes without chronic complications. Diabetes also was the third leading comorbidity for maternal stays (6.0 percent), but a small percentage of these stays involved chronic complications (0.5 percent).

  Depression was a leading comorbidity for stays in the MSUD (15.1 percent), injury (14.1 percent), and maternal (4.3 percent) service lines.

  Kidney disease and failure was a leading comorbidity for general medical and surgical stays. Kidney disease and failure was a comorbid diagnosis for 22.8 percent of general medical stays and 14.5 percent of surgical stays. For stays in both service lines, moderate kidney disease and failure (defined as stage 3 or unspecified chronic kidney disease or unspecified kidney failure) was more common than severe disease.

Outcomes of adult inpatient stays with and without comorbidities, by reason for the stay, 2019
Figure 5 presents the mean length of stay, mean hospital cost per stay, and in-hospital mortality rate for stays with and without comorbidities, by hospital service line (i.e., general reason for the stay). Estimates for stays with no, one to two, and three or more comorbidities are shown separately.

Figure 5. Outcomes of adult inpatient stays with and without comorbidities, by service line, 2019



Abbreviation: MSUD, mental health and/or substance use disorders

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

- **The mean length of stay, mean cost per stay, and in-hospital death rate generally increased with the number of comorbidities.**

  For the maternal, surgical, and general medical service lines, mean length of stay and cost per stay were lowest among stays for adult patients with no comorbidities, followed by stays for patients with one to two comorbidities, and they were highest among stays for patients with three or more comorbidities. For stays related to injuries, this pattern was observed for mean length of stay, but mean cost per stay was similar regardless of the number of comorbidities. Mean length and cost per stay also were highest among MSUD stays for patients with three or more comorbidities but were similar for patients with no and one to two comorbidities.

  Mean length of stay was highest (over 7 days) for MSUD and surgical inpatient stays among adult patients with three or more comorbidities. Mean cost per stay was highest ($32,100) in the surgical service line for patients with three or more comorbidities.

  The in-hospital death rate also increased with the number of comorbidities, except for general medical stays. The in-hospital death rate among general medical stays for adult patients with no comorbidities (258.3 per 10,000 stays) was higher than the rate for patients with one to two comorbidities (188.4 per 10,000). Still, general medical patients with three or more comorbidities had the highest in-hospital death rate of all the categories (387.6 per 10,000). The differential in the in-hospital death rate between surgical stays for patients with three or more comorbidities (278.5 per 10,000) and those among patients with fewer or no comorbidities was substantial: over three times higher than the rate for surgical patients with one to two comorbidities and over eight times higher than the rate for surgical patients with no comorbidities.

Appendix. Number and percentage of inpatient stays by type of comorbid condition and service line, 2019

Elixhauser Comorbidity Software Refined (v2023.1) condition	Service Line									
	Maternal		MSUD		Injury		Surgical		General medical	
	N	%	N	%	N	%	N	%	N	%
Acquired immune deficiency syndrome	3,000	0.1	21,800	1.3	8,200	0.5	32,200	0.5	126,700	0.8
Alcohol abuse	7,500	0.2	244,200	14.2	151,100	9.6	174,700	2.5	916,100	5.7
Deficiency anemias specific to nutritional anemias	337,700	8.8	119,600	6.9	203,200	12.9	962,800	13.8	3,631,900	22.6
Deficiency anemia due to chronic blood loss	5,700	0.1	1,900	0.1	8,700	0.5	50,400	0.7	160,500	1.0
Autoimmune conditions	16,500	0.4	20,700	1.2	51,000	3.2	254,200	3.6	645,900	4.0
Leukemia	500	0.0	1,700	0.1	7,000	0.4	31,200	0.4	169,400	1.1
Lymphoma	400	0.0	2,000	0.1	8,100	0.5	45,300	0.7	239,000	1.5
Metastatic cancer	500	0.0	2,800	0.2	14,000	0.9	203,200	2.9	644,400	4.0
Solid tumor without metastasis, in situ	900	0.0	100	0.0	200	0.0	3,400	0.0	4,600	0.0
Solid tumor without metastasis, malignant	1,500	0.0	8,300	0.5	24,900	1.6	150,900	2.2	638,100	4.0
Cerebrovascular disease	1,800	0.0	18,500	1.1	60,200	3.8	203,200	2.9	702,500	4.4
Heart failure	4,600	0.1	48,200	2.8	185,100	11.7	918,600	13.2	3,136,800	19.5
Coagulopathy	77,700	2.0	69,000	4.0	85,100	5.4	284,000	4.1	1,294,500	8.0
Dementia	100	0.0	44,900	2.6	197,600	12.5	183,600	2.6	1,458,400	9.1
Depression	166,400	4.3	260,900	15.1	223,600	14.1	869,300	12.5	2,342,300	14.6
Diabetes with chronic complications	18,900	0.5	84,900	4.9	195,800	12.4	1,078,500	15.5	3,535,700	22.0
Diabetes without chronic complications	211,800	5.5	131,700	7.6	142,900	9.0	775,400	11.1	1,809,600	11.2
Drug abuse	108,000	2.8	421,200	24.4	120,400	7.6	168,700	2.4	757,600	4.7
Hypertension, complicated	78,500	2.0	84,000	4.9	304,600	19.3	1,487,200	21.3	4,624,300	28.7
Hypertension, uncomplicated	29,000	0.8	519,800	30.2	597,900	37.8	2,933,900	42.1	5,429,100	33.7
Liver disease, mild	35,200	0.9	146,700	8.5	62,800	4.0	295,400	4.2	955,400	5.9
Liver disease and failure, moderate to severe	400	0.0	13,300	0.8	12,000	0.8	54,800	0.8	364,200	2.3
Chronic respiratory (lung) disease	225,800	5.9	271,600	15.8	280,300	17.7	1,300,900	18.7	4,108,600	25.5
Neurological disorders affecting movement	1,900	0.0	31,800	1.8	53,500	3.4	155,700	2.2	510,900	3.2
Other neurological disorders	76,200	2.0	54,100	3.1	103,400	6.5	273,900	3.9	1,412,500	8.8
Seizures and epilepsy	24,600	0.6	134,600	7.8	79,700	5.0	166,200	2.4	731,700	4.5
Obesity	430,600	11.2	150,600	8.7	160,700	10.2	1,515,700	21.8	2,876,800	17.9
Paralysis	2,500	0.1	19,000	1.1	57,200	3.6	241,500	3.5	967,800	6.0
Peripheral vascular disease	2,300	0.1	16,900	1.0	80,100	5.1	498,100	7.1	1,066,600	6.6
Psychoses	49,100	1.3	134,500	7.8	86,800	5.5	184,500	2.6	798,300	5.0
Pulmonary circulation disease	2,200	0.1	4,700	0.3	37,600	2.4	197,500	2.8	907,300	5.6
Kidney disease and failure, moderate	4,300	0.1	40,500	2.3	147,100	9.3	651,900	9.4	2,429,800	15.1

Elixhauser Comorbidity Software Refined (v2023.1) condition	Service Line									
	Maternal		MSUD		Injury		Surgical		General medical	
	N	%	N	%	N	%	N	%	N	%
Kidney disease and failure, severe	1,300	0.0	10,600	0.6	55,400	3.5	355,700	5.1	1,237,000	7.7
Hypothyroidism	150,500	3.9	134,500	7.8	227,300	14.4	931,600	13.4	2,494,100	15.5
Other thyroid disorders	27,300	0.7	12,200	0.7	18,900	1.2	79,800	1.1	220,600	1.4
Peptic ulcer with bleeding	800	0.0	5,900	0.3	7,200	0.5	51,700	0.7	197,400	1.2
Valvular disease	9,700	0.3	15,700	0.9	89,000	5.6	420,000	6.0	1,418,300	8.8
Weight loss	3,200	0.1	49,700	2.9	82,300	5.2	359,500	5.2	1,516,600	9.4

Abbreviation: MSUD, mental health and/or substance use disorders

Notes: Numbers of stays are rounded to the nearest 100. Percentages are calculated from unrounded values. The Elixhauser Comorbidity Software Refined for ICD-10-CM adds 38 data elements to the dataset, one for each comorbidity measure. Table 1 of the User Guide provides information on the data element names used by the software tool.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2019

References

[1] Moore BJ, White S, Washington R, Coenen N, Elixhauser A. Identifying increased risk of readmission and in-hospital mortality using hospital administrative data: the AHRQ Elixhauser Comorbidity Index. Medical Care. 2017;55(7):698–705.
[2] Elixhauser A, Steiner C, Harris DR, Coffey RM. Comorbidity measures for use with administrative data. Medical Care. 1998;36(1):8–27.
[3] Agency for Healthcare Research and Quality. Elixhauser Comorbidity Software Refined for ICD-10-CM. Healthcare Cost and Utilization Project (HCUP). October 2021. www.hcup-us.ahrq.gov/toolssoftware/comorbidityicd10/comorbidity_icd10.jsp. Accessed September 6, 2022.

About Statistical Briefs

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

Data Source

The estimates in this Statistical Brief are based upon data from the HCUP 2019 National Inpatient Sample (NIS).

Definitions

ICD-10-CM Diagnoses
The *principal diagnosis* is that condition established after study to be chiefly responsible for the patient's admission to the hospital. *Secondary diagnoses* are conditions that coexist at the time of admission that require or affect patient care treatment received or management, or that develop during the inpatient stay. *All-listed diagnoses* include the principal diagnosis plus the secondary conditions.

ICD-10-CM is the International Classification of Diseases, Tenth Revision, Clinical Modification. There are over 70,000 ICD-10-CM diagnosis codes.

Case definition
This analysis was limited to adult inpatient stays (ages 18 years and older). The Elixhauser Comorbidity Software Refined for ICD-10-CM, v2023.1, was used to identify comorbidities. This software tool assigns 38 data elements that identify different preexisting comorbid conditions based on secondary diagnoses listed on hospital administrative data. Indication that the diagnosis was present on admission (POA) was used to identify the 18 comorbidity measures that require that information; the other 20 comorbidities are assumed to be present on admission. About 1.5 percent of the records in the 2019 NIS do not include POA indicators; for these discharges, the 18 comorbidity measures could not be determined.

By identifying comorbidities solely by the secondary diagnoses, some comorbidities may be missed because the principal diagnosis is an ICD-10-CM "combination" code that includes information on more than one condition. For example, the ICD-10-CM code I11.0, *Hypertensive heart disease with heart failure*, is often reported as a principal diagnosis and indicates heart failure with a comorbid condition of hypertension. In this case, using only secondary diagnoses to identify comorbid conditions will not identify hypertension as a comorbidity.

In some cases, ICD-10-CM coding rules require that two diagnosis codes be reported in tandem for certain conditions. For example, the type of heart failure (ICD-10-CM code I50.-) is required to be reported as a secondary diagnosis when hypertensive heart disease (ICD-10-CM code I11.-) is the principal diagnosis. To eliminate instances of paired codes identifying comorbidities, the SAS® program for the Elixhauser Comorbidity Software Refined for ICD-10-CM was modified such that a comorbidity is

only identified if it is not simultaneously identified as a principal diagnosis. Additional details on possible modifications to the Elixhauser Comorbidity Software Refined for ICD-10-CM are available in the User Guide available on the HCUP User Support (HCUP-US) website.

For the Statistical Brief, related comorbid conditions were grouped together such that the 38 individual comorbidities from the Elixhauser Comorbidity Software Refined are displayed as 29 conditions. Hypertension includes hypertension with and without complications. Diabetes includes diabetes with and without chronic complications. Deficiency anemias include nutritional anemias as well as those from chronic blood loss. Liver disorders include mild forms of liver disease (e.g., alcoholic fatty liver, toxic liver disease, hepatic fibrosis, infarction of the liver, unspecified liver disease) and moderate to severe liver disease and failure (e.g., viral hepatitis with hepatic coma, hepatic failure, and esophageal and gastric varices). Kidney disease and failure includes moderate (e.g., stage 3 or unspecified chronic kidney disease or unspecified kidney failure) and severe (e.g., stage 5 chronic kidney disease or end-stage renal disease) forms of the disease. Cancer includes the five different cancer comorbidities (i.e., leukemia, lymphoma, metastatic cancer, malignant solid tumor without metastasis, in situ solid tumor without metastasis).

Of the 30.2 million adult inpatient stays in 2019 (based on the 2019 NIS), half (50.4 percent) had three or more of the 38 possible comorbidities.

Table 1. Percentage of adult inpatient stays by number of comorbidities, 2019

Number of comorbidities	Percentage of adult inpatient stays, 2019
0	15.9
1	16.4
2	17.2
3	16.0
4	13.0
5	9.4
6	6.0
7	3.4
8–16	2.7

Types of hospitals included in the HCUP National Inpatient Sample

The National 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 center hospitals. Excluded are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. Beginning in 2012, long-term acute care hospitals are also excluded. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay will be included in the NIS.

Unit of analysis

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

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).[a] *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

[a] Agency for Healthcare Research and Quality. Cost-to-Charge Ratio Files. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality. Updated November 2021. www.hcup-us.ahrq.gov/db/state/costtocharge.jsp. Accessed March 9, 2022.

and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred dollars.

Service line
Each discharge was assigned hierarchically into a single hospital service line based on the following order: maternal, mental health and/or substance use disorders, injury, surgical, and medical. Neonatal discharges are typically included in the hierarchy for service line. For the purposes of this Statistical Brief focused on discharges for patients aged 18 years and older, neonatal discharges are excluded from the hierarchy.

The service lines are defined by major diagnostic categories (MDCs), Medicare Severity Diagnosis-Related Group (MS-DRGs), and Clinical Classifications Software Refined (CCSR) for ICD-10-CM diagnoses. MDCs assign ICD-10-CM principal diagnosis codes to 1 of 25 general diagnosis categories. MS-DRGs comprise a patient classification system that categorizes patients into groups that are clinically coherent and homogeneous with respect to resource use. MS-DRGs group patients according to diagnosis, type of treatment (procedure), age, and other relevant criteria. Each hospital stay has one assigned MS-DRG. The CCSR for ICD-10-CM aggregates more than 70,000 ICD-10-CM diagnosis codes into over 530 clinical categories across 21 body systems. The five hospital service lines are defined as follows:

- Maternal discharges are defined using the following MDC:
    - MDC 14: Pregnancy, Childbirth and Puerperium
- Mental health and/or substance use disorder discharges are defined using the following MDCs:
    - MDC 19: Mental Diseases and Disorders
    - MDC 20: Alcohol/Drug Use or Induced Mental Disorders
- Injury discharges are identified using the following screen:
    - CCSR categories for the principal ICD-10-CM diagnosis: INJ001–INJ027 and INJ032
- Surgical discharges are identified by a surgical MS-DRG. The MS-DRG grouper first assigns the discharge to an MDC based on the principal diagnosis. For each MDC, there is a list of procedure codes that qualify as operating room procedures. If the discharge involves an operating room procedure, it is assigned to one of the surgical MS-DRGs within the MDC category.
- All other discharges that are not assigned to a surgical MS-DRG are identified as a medical discharge. If the MS-DRG indicated the information on the record was ungroupable (i.e., not identifiable as medical or surgical), then the discharge was assumed to be medical. This rarely occurred (less than 0.1 percent of total discharges).

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.[b] The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign.

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

- Medicare: includes fee-for-service and managed care Medicare
- Medicaid: includes fee-for-service and managed care Medicaid
- Private insurance: includes commercial nongovernmental payers, regardless of the type of plan (e.g., private health maintenance organizations [HMOs], preferred provider organizations [PPOs])
- Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment

[b] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed March 9, 2022.

- Other payers: includes other Federal and local government programs (e.g., TRICARE, CHAMPVA, Indian Health Service, Black Lung, Title V) and Workers' Compensation

Hospital stays that were expected to be billed to the State Children's Health Insurance Program (SCHIP) are included under Medicaid.

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

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 and ethnicity data element, while also retaining the original race and ethnicity data. This Statistical Brief reports race and ethnicity for the following categories: Asian/Pacific Islander non-Hispanic (NH), Black NH, Hispanic, White NH, and other NH race/ethnicity, including American Indian/Alaska Native.

About HCUP

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

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

Alaska Department of Health
Alaska Hospital and Healthcare Association
Arizona Department of Health Services
Arkansas Department of Health
California Department of Health Care Access and Information
Colorado Hospital Association
Connecticut Hospital Association
Delaware Division of Public Health
District of Columbia Hospital Association
Florida Agency for Health Care Administration
Georgia Hospital Association
Hawaii Laulima Data Alliance
Hawaii University of Hawai'i at Hilo
Illinois Department of Public Health
Indiana Hospital Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family 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 Health Authority
Pennsylvania Health Care Cost Containment Council
Rhode Island Department of Health
South Carolina Revenue and Fiscal Affairs Office
South Dakota Association of Healthcare

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
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
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 96 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 2019 NIS is 7,083,805 (weighted, this represents 35,419,023 inpatient stays).

For More Information

For other information on characteristics of hospital stays, refer to the Hospital Overview HCUP Statistical Briefs topic area located at https://www.hcup-us.ahrq.gov/reports/statbriefs/sbtopic.jsp.

For additional HCUP statistics, visit:

- HCUP Fast Stats at https://datatools.ahrq.gov/hcup-fast-stats for easy access to the latest HCUP-based statistics for healthcare information topics
- HCUPnet, HCUP's interactive query system, at https://datatools.ahrq.gov/hcupnet
- HCUP Summary Trend Tables at www.hcup-us.ahrq.gov/reports/trendtables/summarytrendtables.jsp for monthly information on hospital utilization

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), 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 September 2022. www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed November 16, 2022.

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Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/reports/statbriefs/sb303-Comorbidities-Adult-Hospitalizations-2019.pdf.

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

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