H·CUP HEALTHCARE COST AND UTILIZATION PROJECT

Agency for Healthcare Research and Quality

Changes in Hospitalizations and In-Hospital Deaths in the Initial Period of the COVID-19 Pandemic (April–December 2020), 38 States and DC

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Marc Roemer, M.S., and Jennifer Welch, M.P.H.

Introduction

In the United States in 2019, there were approximately 35.4 million hospitalizations, about 2 percent of which resulted in an in-hospital death.[1] At the start of the COVID-19 pandemic in April 2020, the number of hospitalizations declined substantially, with a 28 percent decrease in hospitalizations compared with April 2019, while the in-hospital mortality rate increased from 2.0 percent in April 2019 to 3.7 percent in April 2020.[2] Although studies have examined the change in the number of hospitalizations before versus during the COVID-19 pandemic for certain patient demographic groups and conditions,[3–6] little is known about the variation in the types of conditions resulting in hospitalization and changes in the in-hospital mortality rate.

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents data on hospitalizations based on the 2019 and 2020 State Inpatient Databases (SID) from 38 States plus the District of Columbia. The initial period of the COVID-19 pandemic (April–December 2020) is compared with the same months in the prior year. The number of inpatient stays and the rate of in-hospital deaths are presented for both time periods across all conditions and for COVID-19-related visits specifically in 2020. In addition, the variation in the percentage of COVID-19-related in-hospital deaths among the 38 States and DC is provided. The change in the number of inpatient stays and in-hospital deaths is presented by patient characteristics. Principal diagnoses with the largest decrease in hospitalizations in April–December of 2019 versus 2020 are examined, and the top principal diagnoses among COVID-19-related and non-COVID-related deaths are enumerated. Because the HCUP SID cover nearly the entire universe of hospital encounters in a State, small differences can be evident but not meaningful. Thus, only differences greater than or equal to 10 percent are discussed in the text.

This analysis is limited to inpatient stays in 38 States (Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Montana, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin) and the District of Columbia for which HCUP data were available for April–December 2019 and April–December 2020. These States accounted for 75 percent of the

Highlights

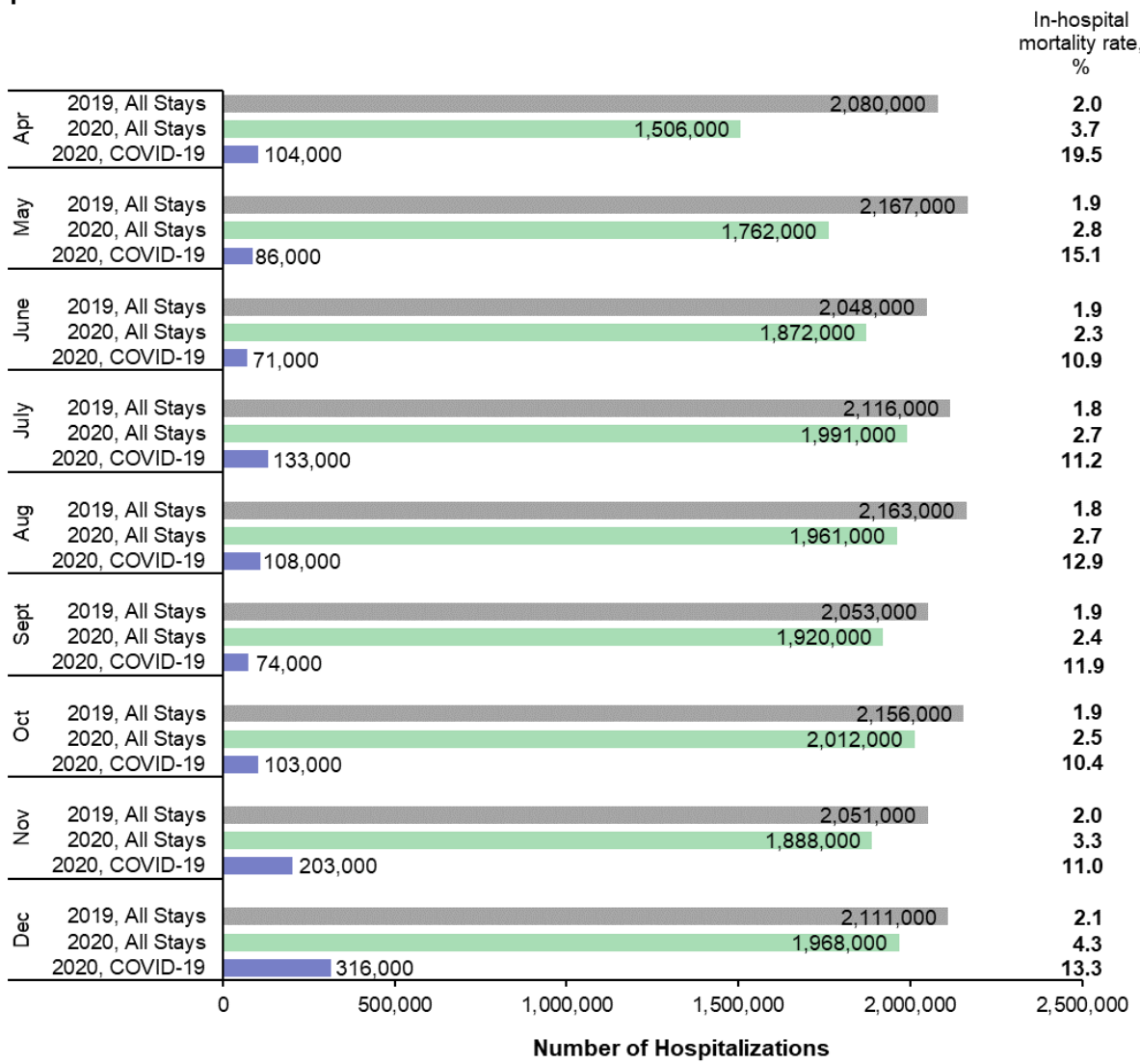
- The number of hospitalizations across 38 States and DC was lower each month in April–December 2020 versus the same month in 2019 (April: 1.5M vs. 2.1M), whereas the in-hospital mortality rate was higher (December: 4.3 vs. 2.1 percent).
- The monthly in-hospital mortality rate among COVID-19-related hospitalizations varied considerably by month and State, with the largest variation in April 2020 and the smallest in November 2020. The differences between States generally narrowed as the year progressed.
- The number of hospitalizations during April–December 2019 versus 2020 decreased by 10.9 percent (from 16.9M to 8.9M), while the number of all-cause in-hospital deaths increased 36.6 percent (from 365K to 498K). The in-hospital mortality rate increased from 1.9 to 2.9 percent.
- During April–December 2020, the highest all-cause in-hospital mortality rates were among patients aged 80 years and older (7.1 percent) and those aged 65–79 years (4.8 percent).
- Six of the top 10 principal diagnoses with the greatest percentage decrease in hospitalizations in April–December 2020 versus 2019 were respiratory conditions, including influenza, acute bronchitis, and asthma.

resident U.S. population in 2020.[7] Information contained in this Statistical Brief was primarily obtained from the HCUP Summary Trend Tables.[2] The HCUP Summary Trend Tables, accessed as downloadable tables, provide State-specific monthly trends in hospital utilization for the most recent HCUP data available. These tables were also used to create the HCUP Visualization of Inpatient Trends in COVID-19 and Other Conditions[8] and will be updated periodically as more data become available.

Findings

Hospitalization volume and percentage of in-hospital deaths in April–December 2019 and 2020
Figure 1 presents monthly information on hospitalization volume and the percentage of in-hospital deaths for all conditions in 2019, all conditions in 2020, and COVID-19-related hospitalizations in 2020. In total, there were 18,946,173 hospitalizations in April–December 2019 and 16,880,162 hospitalizations in April–December 2020 across 38 States and DC, a decrease of 10.9 percent. There were 1,198,585 COVID-19-related hospitalizations in April–December 2020. The in-hospital mortality rate was 1.9 percent during April–December 2019 and increased to 2.9 percent during April–December 2020.

Figure 1. Number of hospitalizations and in-hospital mortality rate by month, 38 States plus DC, April–December 2019 and 2020



Note: The number of inpatient stays is rounded to the nearest thousand.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2019 and 2020, 38 States plus DC

- **The number of hospitalizations was lower each month in April–December 2020 compared with the same month in 2019, while the all-cause in-hospital mortality rate was greater.**

  Across 38 States plus DC, the difference between 2020 and 2019 in the number of hospitalizations was largest in April, a 27.6 percent decrease (from 2.1 million in April 2019 to 1.5 million in April 2020). The largest increase in the all-cause in-hospital mortality rate compared with the same month in 2019 was observed in December 2020, when the rate more than doubled from 2.1 percent to 4.3 percent.

- **The number of monthly COVID-19-related hospitalizations in 2020 was more than three times higher in December (316,000) than in April (104,000).**

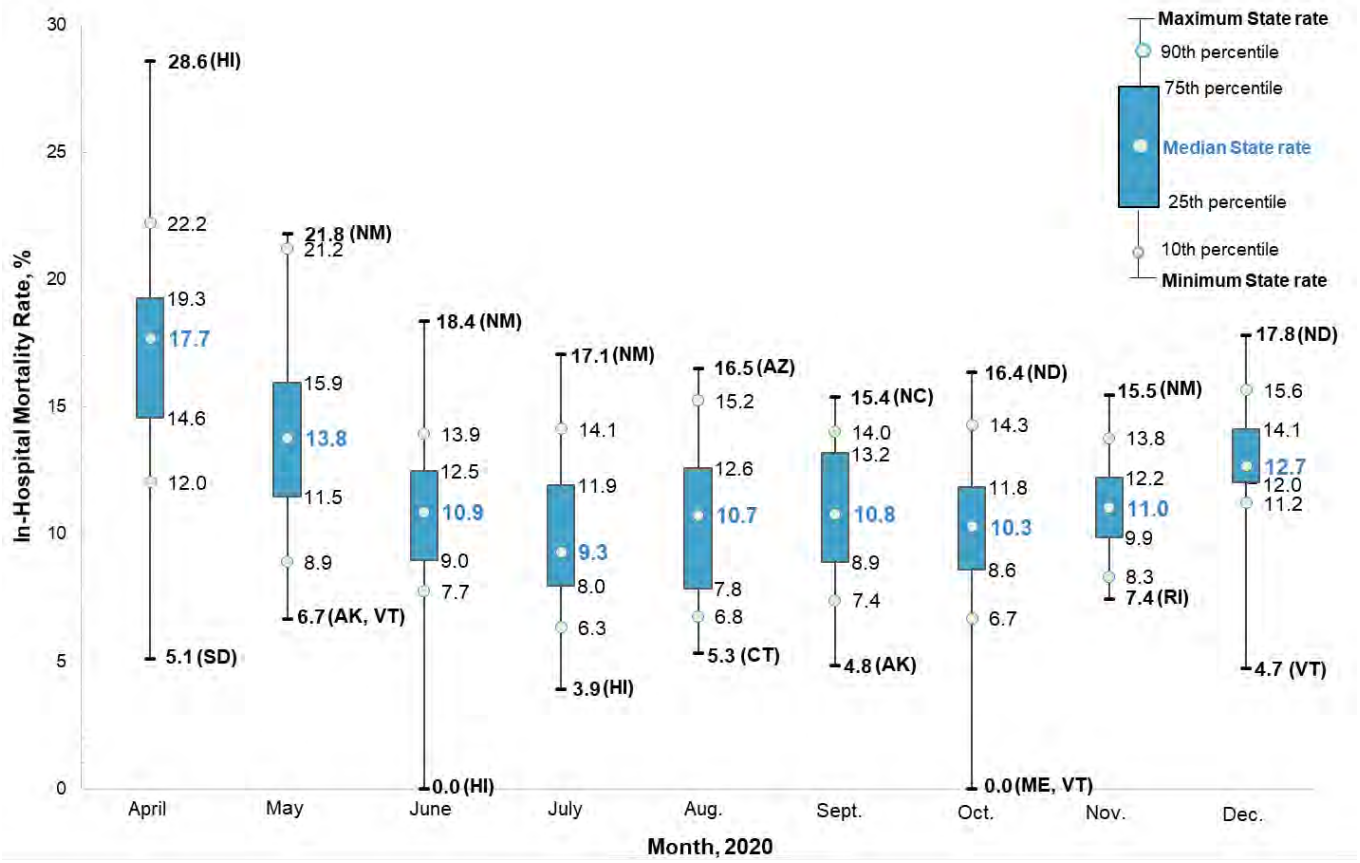
  Across 38 States plus DC, the number of COVID-19-related hospitalizations in 2020 fluctuated during April through October, ranging from 71,000 in June to 133,000 in July, and then increased to 203,000 in November and 316,000 in December.

- **The mortality rate among COVID-19-related hospitalizations was greater than 10 percent in every month between April and December 2020.**

  The in-hospital mortality rate among COVID-19-related hospitalizations was at its highest at 19.5 percent in April and then decreased to 10.9 percent in June; it ranged between 10.4 and 12.9 percent during July through November and increased to 13.3 percent in December.

Figure 2 displays the distribution (i.e., minimum and maximum values, the interquartile range from the 25th to the 75th percentiles as well as the 10th and 90th percentiles) of the monthly COVID-19-related in-hospital mortality rate among 38 States plus DC included in this Statistical Brief. The median percentage among 38 States plus DC is also presented.

Figure 2. Variation in State-level COVID-19-related in-hospital mortality rate, by month, 38 States plus DC, April–December 2020



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2020, 38 States plus DC

- **The rate of COVID-19-related in-hospital deaths varied considerably by month and State.**

  April 2020 showed the highest variability in the in-hospital mortality rate across 38 States and DC; Hawaii had the highest rate of COVID-19-related in-hospital deaths at 28.6 percent, which was over five times higher than the lowest rate, in South Dakota (5.1 percent). In November 2020 the differential between the States with the highest and lowest rates was smallest; New Mexico had the highest rate of COVID-19-related in-hospital deaths at 15.5 percent, which was only two times higher than the lowest rate, in Rhode Island (7.4 percent).

  While there was considerable variability within and by month, the range between the 10th and 90th percentiles narrowed from 12.3 percentage points in May to 4.4 percentage points in December.

Table 1 presents information on the number of hospitalizations and all-cause in-hospital deaths and the percentage change in each by select patient characteristics for April–December 2019 versus April–December 2020 across 38 States plus DC.

Table 1. Number of hospitalizations, number of in-hospital deaths, and percentage change, by patient characteristic, 38 States plus DC, April–December 2019 and 2020

Patient characteristic	Number of hospitalizations (in thousands)			Number of all-cause in-hospital deaths (in thousands)		
	Apr–Dec 2019	Apr–Dec 2020	Percent change	Apr–Dec 2019	Apr–Dec 2020	Percent change
Total across 38 States and DC	18,946	16,880	–10.9	365	498	36.6
Age group, years						
0–17	2,909	2,540	–12.7	10	10	–6.9
18–44	4,611	4,311	–6.5	22	29	32.3
45–64	4,460	3,982	–10.7	86	119	38.4
65–79	4,434	3,901	–12.0	131	188	43.5
80+	2,532	2,147	–15.2	116	153	32.0
Sex						
Male	8,295	7,525	–9.3	193	277	43.4
Female	10,651	9,355	–12.2	172	221	28.8
Race and ethnicity						
Black, non-Hispanic	2,852	2,586	–9.3	51	76	49.1
Hispanic	2,395	2,255	–5.8	31	61	95.5
White, non-Hispanic	11,745	10,207	–13.1	246	308	24.9
Other, non-Hispanic	1,388	1,255	–9.6	26	37	44.7
Urban-rural location of patient's residence						
Large metro	9,902	8,793	–11.2	181	249	37.7
Medium and small metro	5,812	5,224	–10.1	113	154	36.4
Rural	3,189	2,834	–11.1	69	93	34.2
Community-level income						
Quartile 1 (lowest)	5,656	5,046	–10.8	113	165	46.4
Quartiles 2 and 3	9,153	8,227	–10.1	174	236	36.1
Quartile 4 (highest)	3,804	3,328	–12.5	72	88	23.0

Abbreviation: metro, metropolitan

Notes: Other non-Hispanic races and ethnicities include Asian/Pacific Islander, American Indian/Alaska Native, and Other. Information on race and ethnicity is unavailable from some States; the missing data amounts to 3.0% for inpatient stays in 2019 and 3.4% for inpatient stays in 2020. Less than 2% of inpatient stays are missing information on community-level income in both 2019 and 2020. The percentage of missing information is no more than 0.3% for age, sex, and urban-rural location of patient's residence. The number of inpatient stays is rounded to the nearest thousand. Percent change is calculated from unrounded values.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2019 and 2020, 38 States plus DC

- **The number of hospitalizations decreased for all patient characteristics during April–December 2020, while the number of all-cause in-hospital deaths increased for all patient characteristic groups except for children (ages 0-17).**

  By patient age, the number of hospitalizations decreased across all categories, with the greatest decrease occurring among patients aged 80+ years (15.2 percent) and the smallest decrease occurring among patients aged 18–44 years (6.5 percent). The number of all-cause in-hospital deaths increased in all age categories in 2020 compared with 2019, except for patients aged 0–17 years, among whom it decreased by almost 7 percent. The greatest increase in the number of in-hospital deaths occurred among patients aged 65–79 years (43.5 percent).

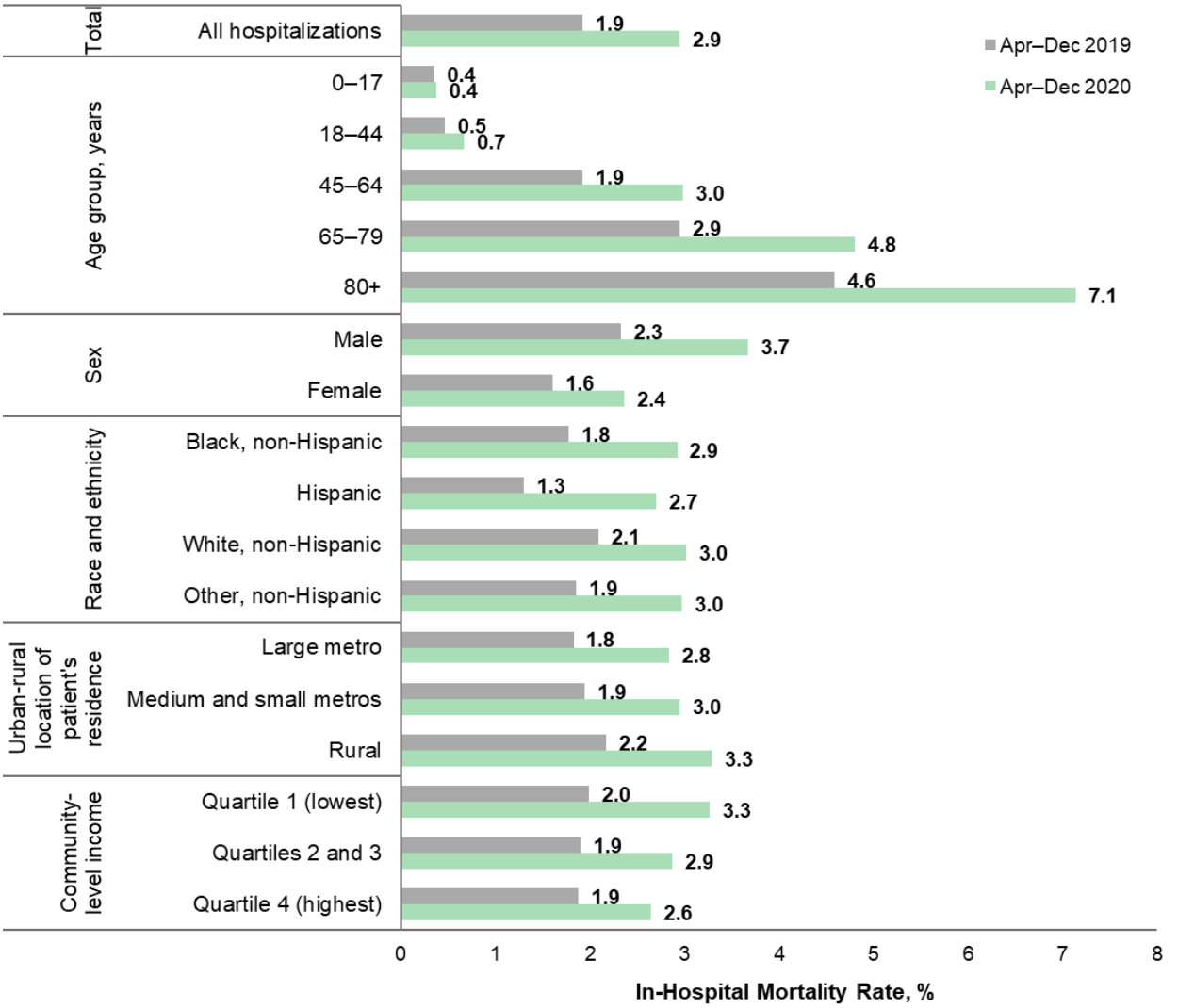
By patient sex, the number of hospitalizations decreased for females (12.2 percent) and the number of in-hospital deaths increased by 28.8 percent. While the number of hospitalizations decreased less for males (9.3 percent) than for females (12.2 percent), the number of in-hospital deaths increased more among males (43.4 percent) than among females (28.8 percent).

By patient race and ethnicity, hospitalizations decreased the most for White non-Hispanic individuals (13.1 percent), while the number of in-hospital deaths for this group increased by almost 25 percent. Hispanic individuals had the smallest decrease in hospitalizations compared with the other race and ethnicity categories (5.8 percent) and the largest increase in in-hospital deaths (95.5 percent).

By community-level income, hospitalizations decreased evenly across the three categories. In-hospital deaths increased across all categories, the most for the lowest community-level income quartile (46.4 percent) and the least for the highest community-level income quartile (23.0 percent).

Figure 3 displays the all-cause in-hospital mortality rate by patient characteristic in April through December 2019 and 2020 across 38 States plus DC.

Figure 3. All-cause in-hospital mortality rate, by patient characteristic, 38 States plus DC, April–December 2019 and 2020



Abbreviation: metro, metropolitan

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2019 and 2020, 38 States plus DC

- **In April–December 2020, the highest all-cause in-hospital mortality rates were among patients aged 80 years and older (7.1 percent) and those aged 65–79 years (4.8 percent).**

  The all-cause in-hospital mortality rate across 38 States plus DC increased for all patient characteristic groups in April–December 2020 compared with the same months in 2019, except for the 0-17 year old age group. The overall in-hospital mortality rate increased from 1.9 percent during April–December 2019 to 2.9 percent during April–December 2020, a 52.6 percent change.

  The largest increase in the in-hospital mortality rate during this period occurred among Hispanic patients (1.3 to 2.7 percent, a 107.7 percent change), Black non-Hispanic patients (1.8 to 2.9 percent, a 61.1 percent change), and patients residing in the lowest income communities (2.0 to 3.3 percent, a 65.0 percent change). The all-cause in-hospital mortality rate for April–December 2020 among males (3.7 percent) was higher than among females (2.4 percent).

Changes in hospitalizations by condition in April–December 2019 and 2020

Table 2 presents information on hospitalizations in April–December 2019 and 2020 by condition. The table lists the top 10 principal diagnoses with the greatest decrease in the number of hospitalizations and those with the greatest percentage decrease in the number of hospitalizations. Conditions listed have at least 10,000 hospitalizations in 2019. The table displays the condition chiefly responsible for the hospitalization (principal diagnosis) and all-listed conditions that coexisted at the time of the hospitalization.

Table 2. Top 10 conditions ranked by the greatest decrease in number of hospitalizations and greatest percentage decrease in hospitalizations, 38 States plus DC, April–December 2019 and 2020

	Number of hospitalizations based on *principal* diagnosis (in thousands)			Number of hospitalizations based on *all-listed* diagnoses (in thousands)		
Conditions with the greatest decrease in number of hospitalizations based on the principal diagnosis						
Condition (CCSR category)	**Apr–Dec 2019**	**Apr–Dec 2020**	**Difference**	**Apr–Dec 2019**	**Apr–Dec 2020**	**Difference**
Osteoarthritis (MUS006)*	552	261	–290	1,770	1,265	–505
Pneumonia (RSP002)	363	230	–133	1,338	1,893	555
COPD (RSP008)*	257	133	–124	2,576	2,092	–484
Heart failure (CIR019)	618	496	–122	3,022	2,668	–354
Liveborn (PNL001)	2,045	1,947	–98	2,048	1,948	–100
Respiratory failure; insufficiency; arrest (RSP012)	278	182	–96	2,187	2,512	325
Cardiac dysrhythmias (CIR017)	328	255	–73	2,949	2,625	–324
Skin and subcutaneous tissue infections (SKN001)	266	194	–72	868	731	–137
Urinary tract infections (GEN004)	273	210	–63	1,730	1,577	–153
Acute myocardial infarction (CIR009)	358	297	–61	655	656	2
Conditions with the greatest percentage decrease based on the principal diagnosis						
Condition (CCSR category)	**Apr–Dec 2019**	**Apr–Dec 2020**	**Percent change**	**Apr–Dec 2019**	**Apr–Dec 2020**	**Percent change**
Influenza (RSP003)	26	2	–91.8	67	13	–81.3
Acute bronchitis (RSP005)	69	11	–83.9	283	90	–68.1
Other specified upper respiratory infections (RSP006)	24	8	–65.1	169	76	–54.8
Asthma (RSP009)	83	34	–58.8	1,189	1,035	–12.9
Osteoarthritis (MUS006)*	552	261	–52.6	1,770	1,265	–28.5
Meningitis (NVS001)	14	7	–49.6	31	21	–32.8
COPD (RSP008)*	257	133	–48.3	2,576	2,092	–18.8
Aseptic necrosis and osteonecrosis (MUS030)	11	6	–44.8	57	44	–22.3
Viral infection (INF008)	23	13	–43.4	810	1,422	75.5
Acute and chronic tonsillitis (RSP004)	11	7	–39.8	23	15	–34.5

Abbreviations: CCSR, Clinical Classifications Software Refined; COPD, chronic obstructive pulmonary disease; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

Notes: Diagnoses are grouped using the CCSR for ICD-10-CM Diagnoses (www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp). Principal diagnosis is assigned to a single default CCSR category (see Definitions below). CCSR categories with fewer than 10,000 hospitalizations in 2019 are excluded. The number of hospitalizations is rounded to the nearest thousand. The difference and percent change are calculated from unrounded values.

* The osteoarthritis and COPD conditions (MUS006 and RSP008) appear in both the top conditions with the greatest decrease in number of hospitalizations and the top conditions with the greatest percentage decrease.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2019 and 2020, 38 States plus DC

- **Three out of the top six principal diagnoses with the greatest decrease in number of hospitalizations in April–December 2020 compared with the same months in 2019 were for respiratory conditions.**

  The number of hospitalizations principally for pneumonia, COPD, and respiratory failure decreased by 133,000, 124,000, and 96,000 respectively in 2020 compared to 2019.

- **Diagnoses of pneumonia and respiratory failure shifted from the principal diagnosis to the secondary diagnosis in April–December 2020 compared with the same months in 2019.**

  The number of hospitalizations principally for pneumonia decreased by 133,000 from 363,000 in 2019 to 230,000 in 2020. However, the number of hospitalizations with any diagnosis of pneumonia increased by 555,000 from 1.3 million to 1.9 million.

  The number of hospitalizations principally for respiratory failure decreased by 96,000 from 278,000 to 182,000. However, the number of hospitalizations with any diagnosis of respiratory failure increased by 325,000 from 2.2 million to 2.5 million.

- **Six respiratory conditions were among the top 10 principal diagnoses with the greatest percentage decrease in hospitalizations.**

  Influenza (91.8 percent decrease), acute bronchitis (83.9 percent decrease), other specified upper respiratory infections (65.1 percent decrease), asthma (58.8 percent decrease), COPD (48.3 percent decrease), and acute and chronic tonsillitis (39.8 percent decrease) were among the top 10 conditions with the greatest percentage decrease in the number of hospitalizations during April–December 2020 compared with the same months in 2019. The number of hospitalizations involving these conditions as all-listed diagnoses decreased as well.

In-hospital deaths by principal diagnosis in April–December 2019 and 2020
Table 3 presents the top 10 principal diagnoses among COVID-19-related hospitalizations for which the patient died in the hospital during April–December 2020.

Table 3. Top 10 principal diagnoses among COVID-19-related in-hospital deaths, 38 States plus DC, April–December 2020

Condition (CCSR category)	Number of COVID-19-related in-hospital deaths	Percent of COVID-19-related in-hospital deaths
Total COVID-19-related deaths (all-listed)	153,866	100.0
COVID-19 (INF012)	80,122	52.1
Septicemia (INF002)	60,050	39.0
Other aftercare encounter (FAC010)	5,067	3.3
Acute myocardial infarction (CIR009)	599	0.4
Cerebral infarction (CIR020)	535	0.3
Respiratory failure; insufficiency; arrest (RSP012)	459	0.3
Traumatic brain injury (TBI); concussion, initial encounter (INJ008)	383	0.2
Heart failure (CIR019)	353	0.2
Acute hemorrhagic cerebrovascular disease (CIR021)	334	0.2
Acute and unspecified renal failure (GEN002)	307	0.2

Abbreviation: CCSR, Clinical Classifications Software Refined; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

Notes: Diagnoses are grouped using the CCSR for ICD-10-CM Diagnoses (www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp). Principal diagnosis is assigned to a single default CCSR category. Not all conditions are listed; the remaining 4% of COVID-19-related in-hospital deaths comprised roughly 50 CCSR categories, each with fewer than 300 hospitalizations. Other aftercare encounters include attention or aftercare following major surgery, such as tracheostomy, gastrostomy, kidney transplant, and liver transplant.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2020, 38 States plus DC

- **Among the 153,866 patients who died in the hospital with any COVID-19 diagnosis, more than 90 percent had been hospitalized principally for COVID-19 or septicemia.**

  The two most common principal diagnoses, COVID-19 and septicemia, accounted for 91.1 percent of COVID-19-related hospitalizations where the patient died in the hospital (52.1 and 39.0 percent, respectively).

Table 4 presents the top 10 principal diagnoses among non-COVID-19-related hospitalizations for which the patient died in the hospital during April–December 2019 and 2020. The table also provides the percentage change in the number of in-hospital deaths among hospitalizations not related to COVID-19 during April–December 2020 compared with the same months in 2019.

Table 4. Top 10 principal diagnoses among non-COVID-19-related in-hospital deaths, 38 States plus DC, April–December 2019 and 2020

Condition (CCSR category)	Number of in-hospital deaths		Percent change
	Apr–Dec 2019	Apr–Dec 2020	
Total non-COVID-19-related deaths	363,700	343,800	–5.5
Septicemia (INF002)	99,100	101,000	1.9
Other aftercare encounter (FAC010)	20,300	24,100	18.9
Respiratory failure; insufficiency; arrest (RSP012)	22,000	18,500	–15.9
Acute myocardial infarction (CIR009)	15,800	13,800	–12.6
Heart failure (CIR019)	14,500	13,000	–10.6
Acute hemorrhagic cerebrovascular disease (CIR021)	12,800	11,700	–8.7
Cerebral infarction (CIR020)	10,900	9,900	–9.1
Traumatic brain injury (TBI); concussion, initial encounter (INJ008)	9,500	9,400	–1.0
Pneumonia (RSP002)	7,500	7,300	–3.1
Cardiac arrest and ventricular fibrillation (CIR018)	7,300	6,600	–9.8

Abbreviation: CCSR, Clinical Classifications Software Refined; ICD-10-CM, International Classification of Diseases, Tenth Revision, Clinical Modification

Notes: Diagnoses are grouped using the CCSR for ICD-10-CM Diagnoses (www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp). Principal diagnosis is assigned to a single default CCSR category. The table contains the top 10 diagnoses ranked by number of deaths in 2019; the ranking is the same in 2020. Other aftercare encounters include attention or aftercare following major surgery, such as tracheostomy, gastrostomy, kidney transplant, and liver transplant. Percent change is calculated from unrounded values.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), April–December 2019 and 2020, 38 States plus DC

- **Among hospitalizations without a COVID-19 diagnosis, the number of in-hospital deaths decreased during April–December 2020 compared with the same months in 2019.**

  There were 363,700 in-hospital deaths during April–December 2019 and 343,800 during April–December 2020, a 5.5 percent decrease, among hospitalizations without COVID-19 as a principal or secondary diagnosis.

- **Among hospitalizations without a COVID-19 diagnosis, only 1 of the top 10 principal diagnoses (other aftercare encounter) increased substantially in the number of in-hospital deaths during April–December 2020 compared with the same months in 2019.**

  Other aftercare encounter (including attention or aftercare following major surgery such as tracheostomy, gastrostomy, kidney transplant or liver transplant) was the only condition in the top 10 among non-COVID-19-related hospitalizations to increase substantially (18.9 percent increase) in the number of in-hospital deaths during April–December 2020 compared with 2019.

  Three conditions in the top 10 decreased substantially in the number of in-hospital deaths. Respiratory failure decreased by 15.9 percent, acute myocardial infarction decreased by 12.6 percent, and heart failure decreased by 10.6 percent during April–December 2020 compared with the same months in 2019.

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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 2019–2020 State Inpatient Databases (SID) for 38 States and the District of Columbia for which there were monthly data available through December 2020 in the HCUP Summary Trend Tables. The States included in this Statistical Brief were Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Montana, Nevada, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin, as well as the District of Columbia.

Definitions

Diagnoses, ICD-10-CM, and Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses
The *principal diagnosis* is that condition established after study to be chiefly responsible for the patient's admission to the hospital. *Secondary diagnoses* are 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.

The CCSR aggregates ICD-10-CM diagnosis codes into a manageable number of clinically meaningful categories.[a] The CCSR is intended to be used analytically to examine patterns of healthcare in terms of cost, utilization, and outcomes; rank utilization by diagnoses; and risk-adjust by clinical condition. The CCSR capitalizes on the specificity of the ICD-10-CM coding scheme and allows ICD-10-CM codes to be classified in more than one category. Approximately 10 percent of diagnosis codes are associated with more than one CCSR category because the diagnosis code documents either multiple conditions or a condition along with a common symptom or manifestation. For this Statistical Brief, the principal diagnosis code is assigned to a single default CCSR based on clinical coding guidelines, etiology and pathology of diseases, and standards set by other Federal agencies. The assignment of the default CCSR for the principal diagnosis is available starting with version v2020.2 of the software tool. ICD-10-CM coding definitions for each CCSR category presented in this Statistical Brief can be found in the *CCSR reference file*, available at www.hcup-us.ahrq.gov/toolsssoftware/ccsr/ccs_refined.jsp#download. For this Statistical Brief, v2021.2 of the CCSR was used for 2019 data and v2022.1 was used for 2020 data.

Case definition
COVID-19-related hospitalizations and in-hospital deaths are identified by any-listed ICD-10-CM code of U07.1 (2019 novel coronavirus disease) on the discharge record. Per coding guidelines,[b] the use of U07.1 is based on documentation by the provider or documentation of a positive COVID-19 test result. The ICD-10-CM code for COVID-19 was implemented beginning April 1, 2020. As such, there may be some measurement error in the identification of cases.

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

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.

Percentage change
Percentage change between groups was calculated using the following formula:

$$\text{Percentage change} = \left(\frac{\text{2020 value} - \text{2019 value}}{\text{2019 value}}\right) \times 100$$

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

[a] Agency for Healthcare Research and Quality. Clinical Classifications Software Refined (CCSR) for ICD-10-CM Diagnoses. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality. Updated February 2022. www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp. Accessed October 23, 2022.

[b] Centers for Disease Control and Prevention, National Center for Health Statistics. ICD-10-CM Official Guidelines for Coding and Reporting FY 2021 (October 1, 2020 - September 30, 2021). www.cdc.gov/nchs/data/icd/10cmguidelines-FY2021.pdf. Accessed October 23, 2022.

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: Hispanic, non-Hispanic Black, non-Hispanic White, and other non-Hispanic races and ethnicities (including Asian/Pacific Islander, American Indian/Alaska Native, and Other).

Location of patients' residence
Place of residence is based on the urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS) and based on the Office of Management and Budget (OMB) definition of a metropolitan service area as including a city and a population of at least 50,000 residents. For this Statistical Brief, we collapsed the NCHS codes into the following three categories:

Large metropolitan (metro) area:

- Large Central Metropolitan: Counties in a metropolitan area with 1 million or more residents that satisfy at least one of the following criteria: (1) containing the entire population of the largest principal city of the metropolitan statistical area (MSA), (2) having their entire population contained within the largest principal city of the MSA, or (3) containing at least 250,000 residents of any principal city in the MSA
- Large Fringe Metropolitan: Counties in a metropolitan area with 1 million or more residents that do not qualify as large central metropolitan counties

Medium/small metro area:

- Medium Metropolitan: Counties in a metropolitan area of 250,000–999,999 residents
- Small Metropolitan: Counties in a metropolitan area of 50,000–249,999 residents

Rural area:

- Micropolitan: Counties in a nonmetropolitan area of 10,000–49,999 residents
- Noncore: Counties in a nonmetropolitan and nonmicropolitan 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.[c] The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign or have a missing or invalid ZIP Code reported on the record.

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.

[c] Claritas. Claritas Demographic Profile by ZIP Code. https://claritas360.claritas.com/mybestsegments/. Accessed October 23, 2022.

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
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 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 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 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 COVID-19, refer to the COVID-19 HCUP Statistical Briefs topic area located at 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
- HCUP Visualization of Inpatient Trends in COVID-19 and Other Conditions at www.hcup-us.ahrq.gov/datavisualizations/covid-19-inpatient-trends.jsp

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 State Inpatient Databases (SID), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated September 2021. www.hcup-us.ahrq.gov/sidoverview.jsp. Accessed March 9, 2022.

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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:

Joel W. Cohen, Ph.D., Director
Center for Financing, Access and Cost Trends
Agency for Healthcare Research and Quality
5600 Fishers Lane
Rockville, MD 20857

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