



Rate of COVID-19-Related Inpatient Stays Per 100,000 Population  
by Patient's State of Residence, April–December 2020

December 13, 2022

Recommended citation: Rate of COVID-19-Related Inpatient Stays Per 100,000 Population by State of Patient's Residence, April–December 2020. Healthcare Cost and Utilization Project. ONLINE. December 13, 2022. Agency for Healthcare Research and Quality.

Available: [www.hcup-us.ahrq.gov/reports/ataglance/findingsataglance.jsp](http://www.hcup-us.ahrq.gov/reports/ataglance/findingsataglance.jsp)

## Table of Contents

Overview .....	1
Methods.....	1
Results.....	2
Rates of Regional and National COVID-19-Related Inpatient Stays per 100,000 Population from April to December 2020 .....	2
Rate of COVID-19-Related Inpatient Stays per 100,000 Population by Patient’s State of Residence and Discharge Month, April to December 2020 .....	3
Monthly Variation in the Rate of Inpatient Stays per 100,000 Population by presence of COVID-19 Diagnosis and Patient’s State of Residence, April-December 2020 .....	8
References.....	13
Appendix A. HCUP Partner Organizations.....	14
Appendix B. Healthcare Cost and Utilization Project (HCUP) Databases.....	15

## OVERVIEW

In March 2020, the World Health Organization declared COVID-19 a pandemic and States in the U.S. began to implement procedures to slow the spread of the virus.<sup>1</sup> Most States reported COVID-19 cases by mid-April 2020; however, the number of hospitalizations related to COVID-19 varied by State and across months through the remainder of the year.<sup>2</sup>

Until recently, the study of COVID-19 hospitalization has been largely based on the state in which the hospital was located, and not the state in which the patient resided. Understanding where and at what rate COVID-19 spread across the United States population can support future policy and public health planning efforts. Using data from the Healthcare Cost and Utilization Project, this report examines monthly State-level population rates of COVID-19 hospitalizations as well as quarterly regional and national population rates of COVID-19 hospitalizations from April to December 2020.

## METHODS

State-specific rates of inpatient stays were derived from the Healthcare Cost and Utilization Project (HCUP) 2020 State Inpatient Databases (SID) for 48 States and the District of Columbia. The SID capture information on all types of inpatient stays, including those admitted through the emergency department (ED) of the hospital, direct admissions, and transfers from acute care hospitals and other types of health facilities. National and regional estimates of rates of inpatient stays were derived from the 2020 HCUP National Inpatient Sample (NIS). The NIS is a 20-percent stratified sample of inpatient stays drawn from the SID, weighted to produce national and regional estimates.

The analysis was limited to inpatient stays at community hospitals, excluding rehabilitation and long-term acute care facilities. Counts of State-level inpatient stays are summarized by the State of the *patient's* residence (not the hospital location). Because each SID is specific to discharges from hospitals in a State, inpatient stays were combined across SID and then reallocated by the State of the patient's residence. Counts of regional inpatient stays from the NIS were summarized by the region for the *hospital* (information on the region of the patient's residence is not available in the NIS). Population rates of inpatient stays were calculated using the HCUP data as the numerator and estimates of the 2020 resident population as the denominator. Resident population data were obtained from Claritas, a vendor that produces population estimates and projections based on data from the U.S. Census Bureau.<sup>3</sup> State-specific population rates are presented for each discharge month from April to December 2020 whereas national and regional population rates are presented for each discharge quarter for this same time period (information on discharge month is not available in the NIS).

COVID-19-related inpatient stays were identified by a principal or secondary diagnosis of *U07.1 Coronavirus disease-2019* or *J12.82 Pneumonia due to coronavirus disease 2019*. It should be noted that the *U07.1 Coronavirus disease-2019* diagnosis code was not introduced until April 1, 2020 (the beginning of the time period shown in this data brief).<sup>4</sup>

The Partner organizations that provide data to HCUP are listed in Appendix A. Background on the SID and NIS can be found in Appendix B. Additional State-specific information on COVID-19-related inpatient stays and ED visits, including the underlying data for the figures in this report, is available on the HCUP User Support website in the [HCUP Summary Trend Tables](#) and [HCUP Visualization of Inpatient Trends COVID-19 and Other Conditions](#).

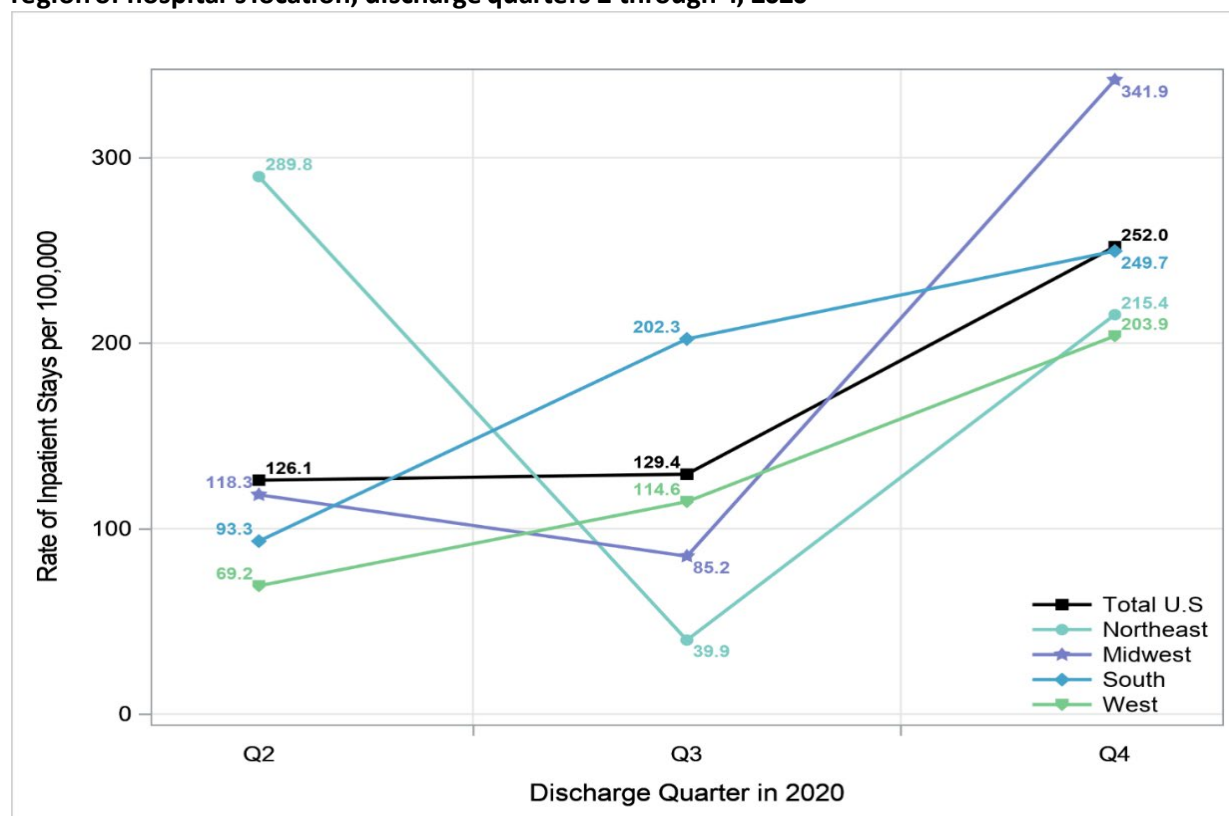
## RESULTS

Figure 1 presents national and regional rates of COVID-19-related inpatient stays per 100,00 population by discharge quarter from April to December 2020. Figures 2 through 10 present a series of maps displaying the rate of COVID-19-related inpatient stays per 100,000 population by the patient's State of residence for each discharge month from April to December 2020. The rates on the maps are categorized into quintiles based on the distribution of all State-specific monthly rates from April to December 2020 ( $\leq 15$ ,  $16 < 30$ ,  $30 < 45$ ,  $45 < 90$ , and  $90-295$  per 100,000 population). Figures 11 through 14 present the monthly variation (minimum, median, and maximum values) in the rate of inpatient stays related to COVID-19 and not related to COVID-19 between the discharge months of April and December 2020 by the State of patient's residence. States are grouped into the figures based on the U.S. Census region.

### Rates of Regional and National COVID-19-Related Inpatient Stays per 100,000 Population from April to December 2020

Figure 1 shows the regional and national rates of COVID-19-related inpatient stays per 100,000 population for each discharge quarter from April to December 2020.

**Figure 1. National and regional rates of COVID-19-related inpatient stays per 100,000 population, by region of hospital's location, discharge quarters 2 through 4, 2020**

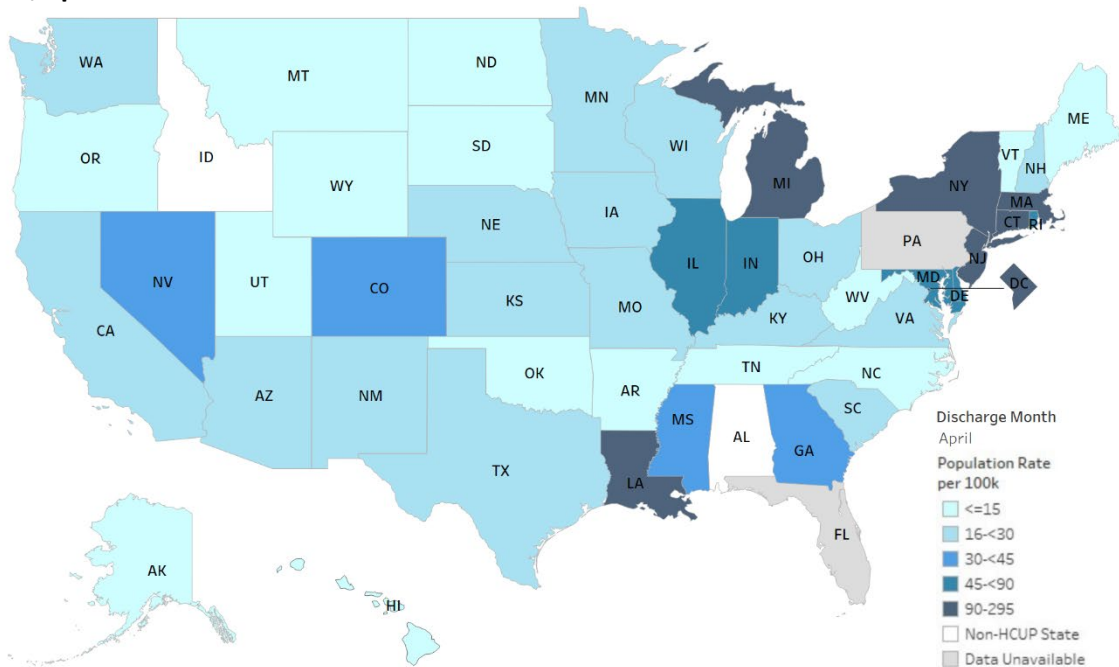


Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2020

## Rate of COVID-19-Related Inpatient Stays per 100,000 Population by Patient's State of Residence and Discharge Month, April to December 2020

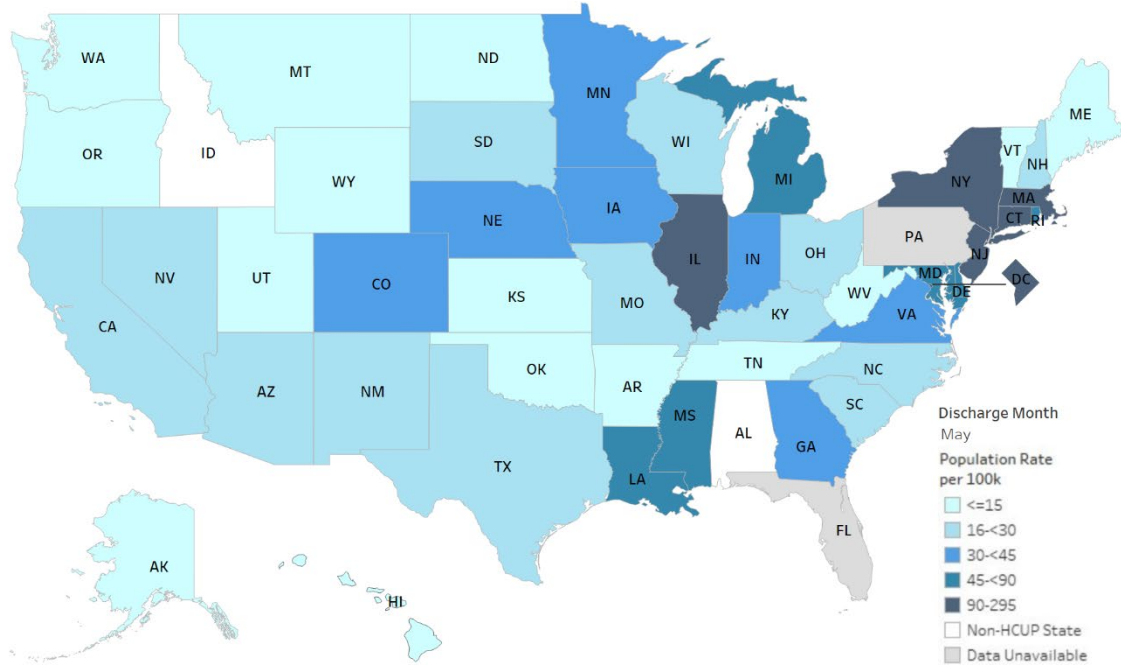
Figures 2–10 show the rate of COVID-19-related inpatient stays per 100,000 population for each discharge month from April to December 2020 by the State of the patient's residence. Note that for some HCUP Partner organizations, monthly information is unavailable because of data suppression (i.e., the number of inpatient stays is less than or equal to 10) or because monthly information is not reportable.

**Figure 2. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, April 2020**



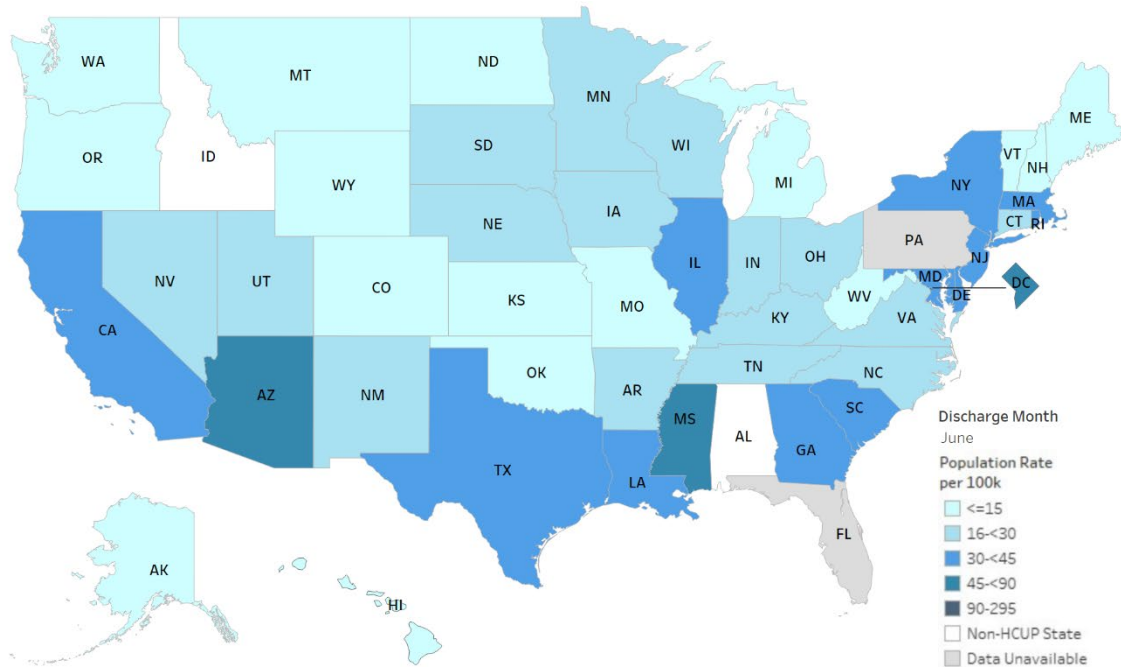
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 3. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, May 2020**



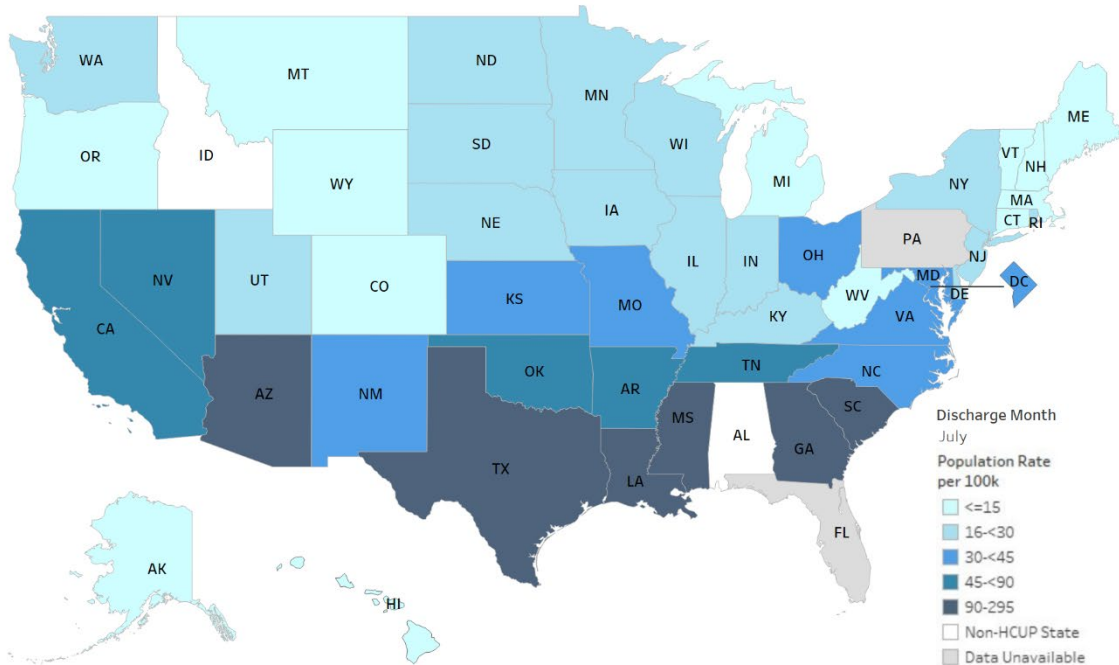
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 4. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, June 2020**



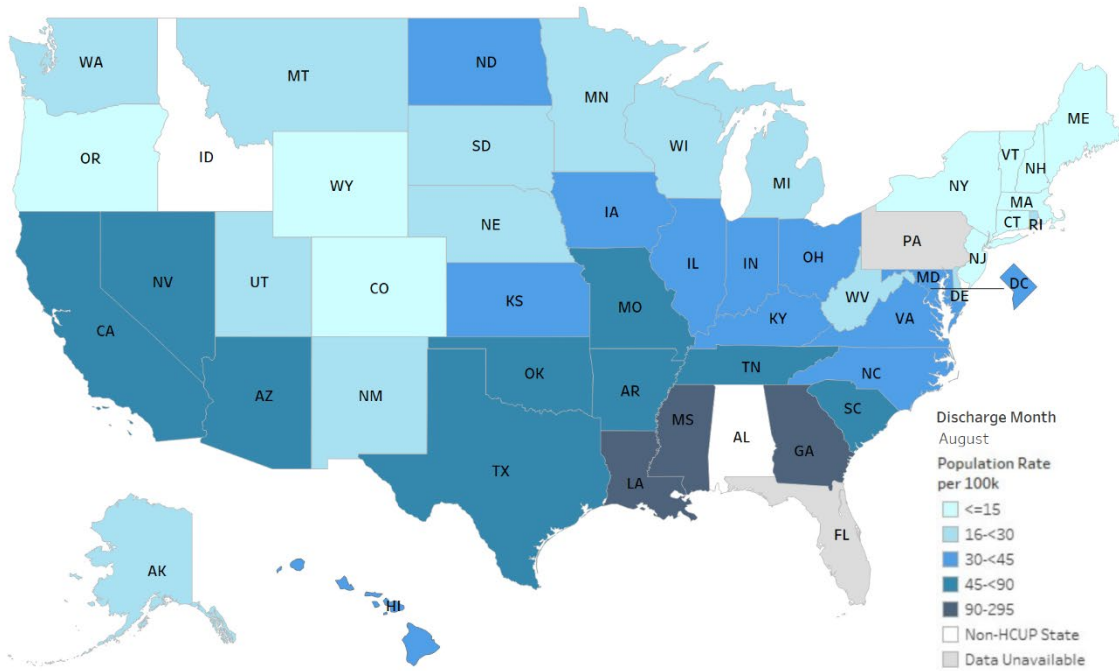
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 5. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, July 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

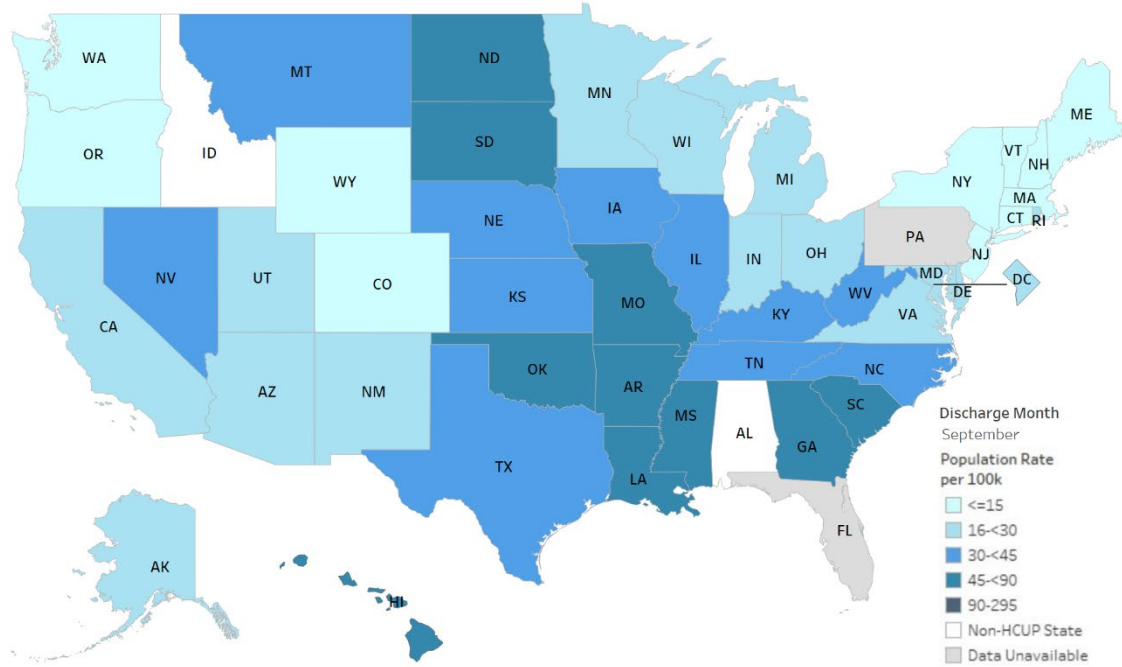
**Figure 6. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, August 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

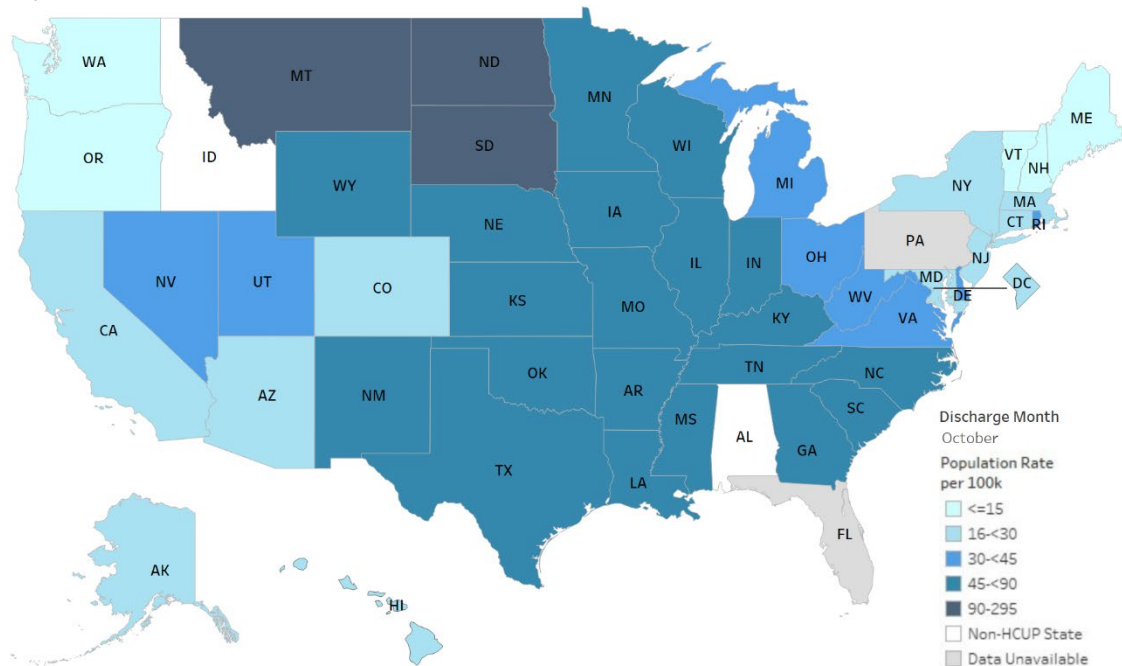


**Figure 7. Rate of COVID-19-related inpatient stays per 100,000 population by patient’s State of residence, September 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

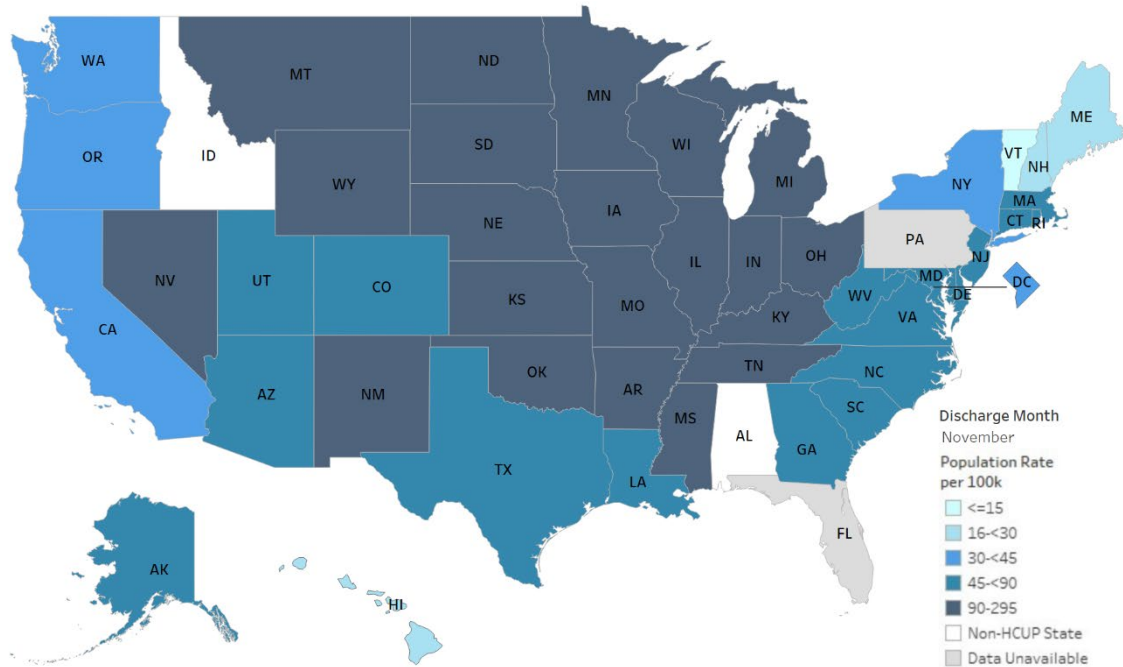
**Figure 8. Rate of COVID-19-related inpatient stays per 100,000 population by patient’s State of residence, October 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

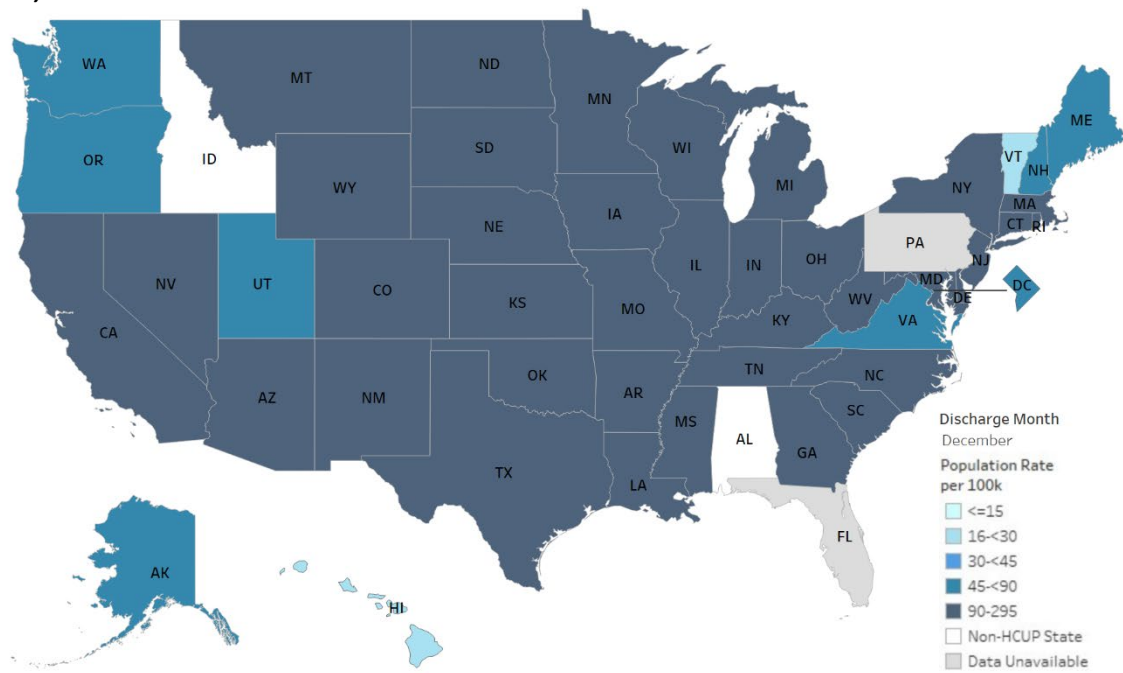


**Figure 9. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, November 2020**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 10. Rate of COVID-19-related inpatient stays per 100,000 population by patient's State of residence, December 2020**

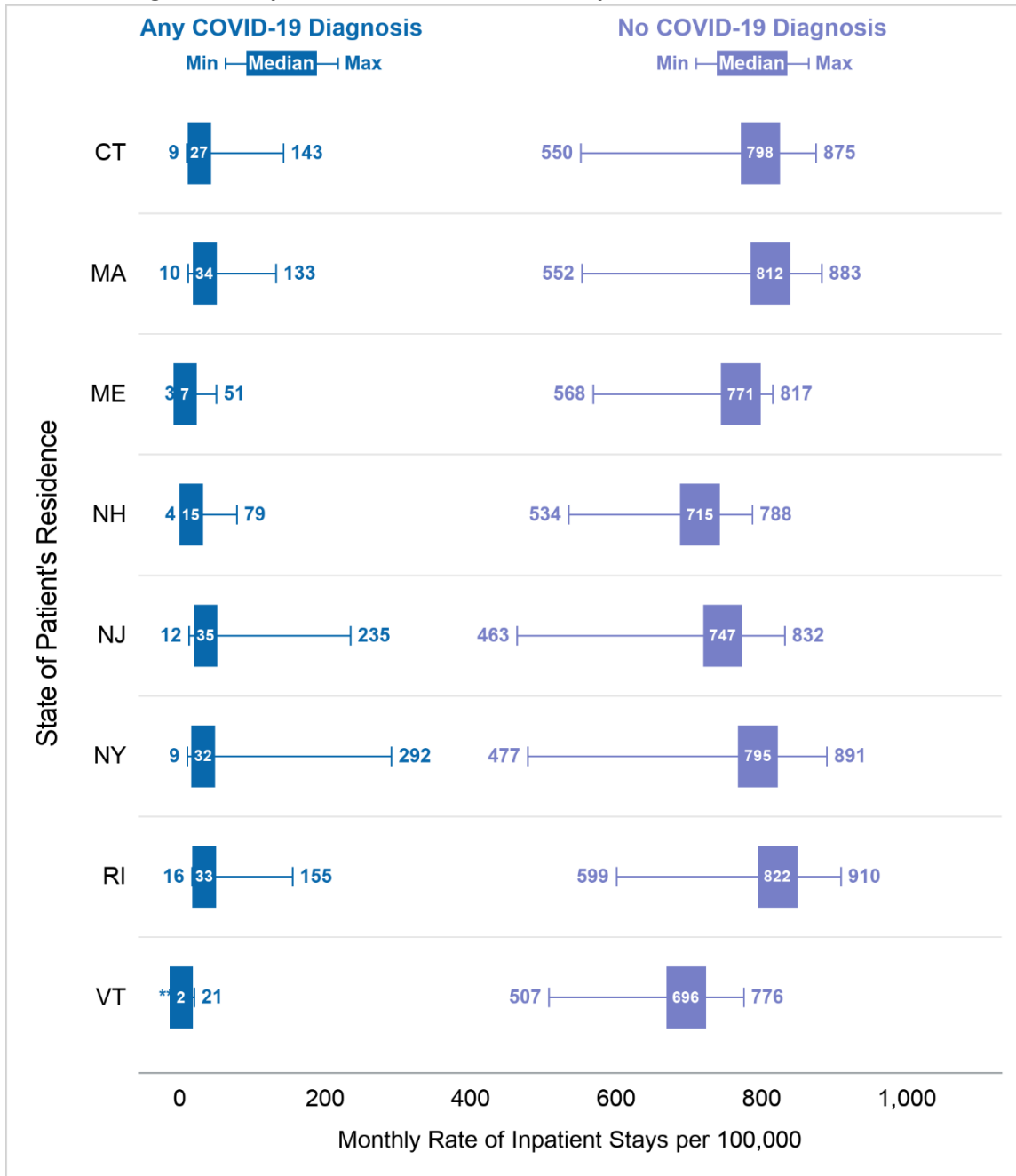


Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Monthly Variation in the Rate of Inpatient Stays per 100,000 Population by presence of COVID-19 Diagnosis and Patient’s State of Residence, April-December 2020**

Figures 11–14 display the monthly variation (minimum, median, and maximum) in the rate per 100,000 population of inpatient stays related to COVID-19 and not related to COVID-19 between the discharge months of April and December 2020 by the State of the patient’s residence. States are grouped into the figures based on the U.S. Census region. For some HCUP Partner organizations, monthly information is unavailable because of data suppression or because monthly information is not reportable.

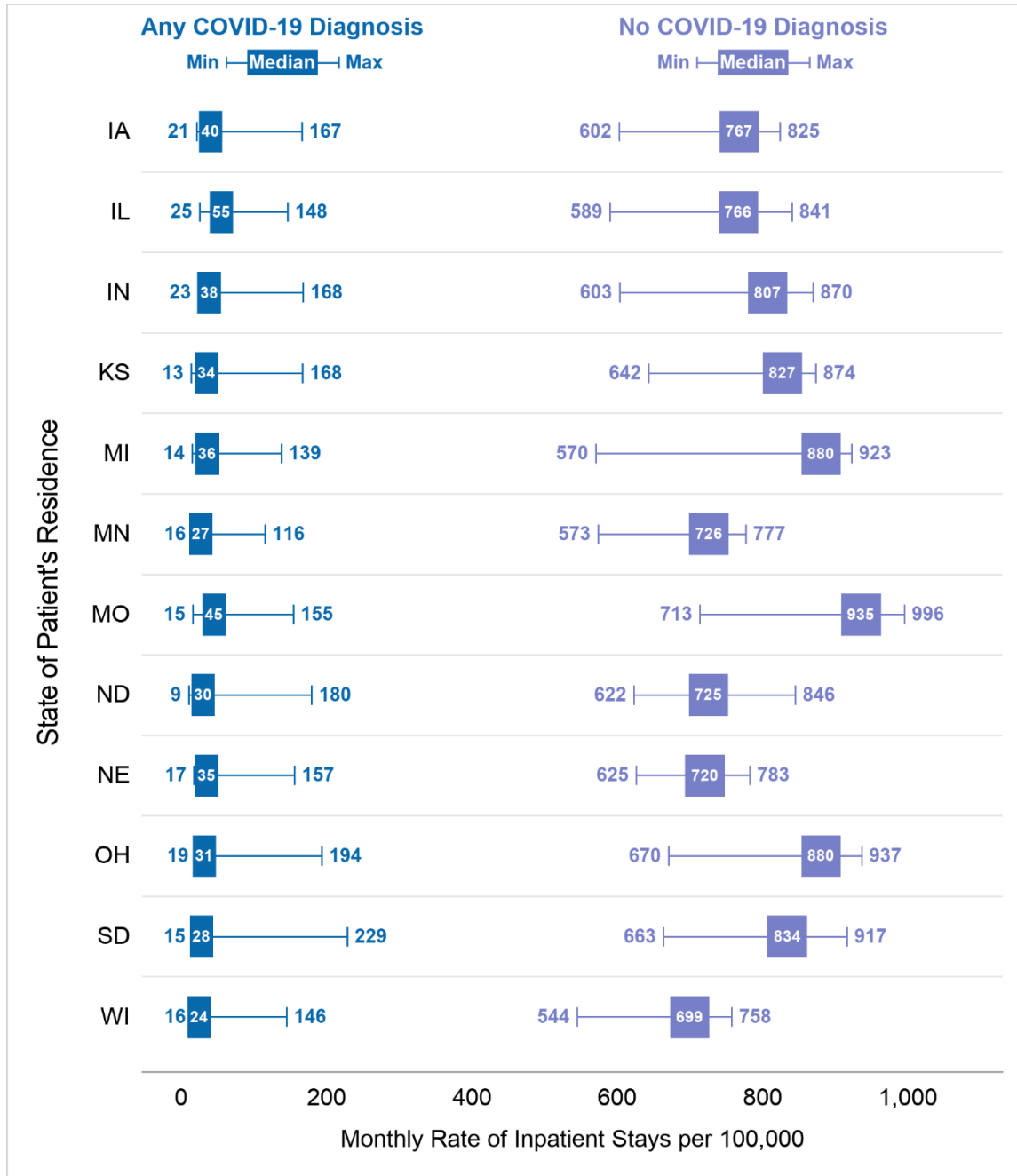
**Figure 11. Monthly variation in the rate of inpatient stays per 100,000 population by presence of COVID-19 diagnosis and patient’s State of residence, April–December 2020, States in the Northeast**



Note: Rates with a numerator less than or equal to 10 are masked with an asterisk (\*).

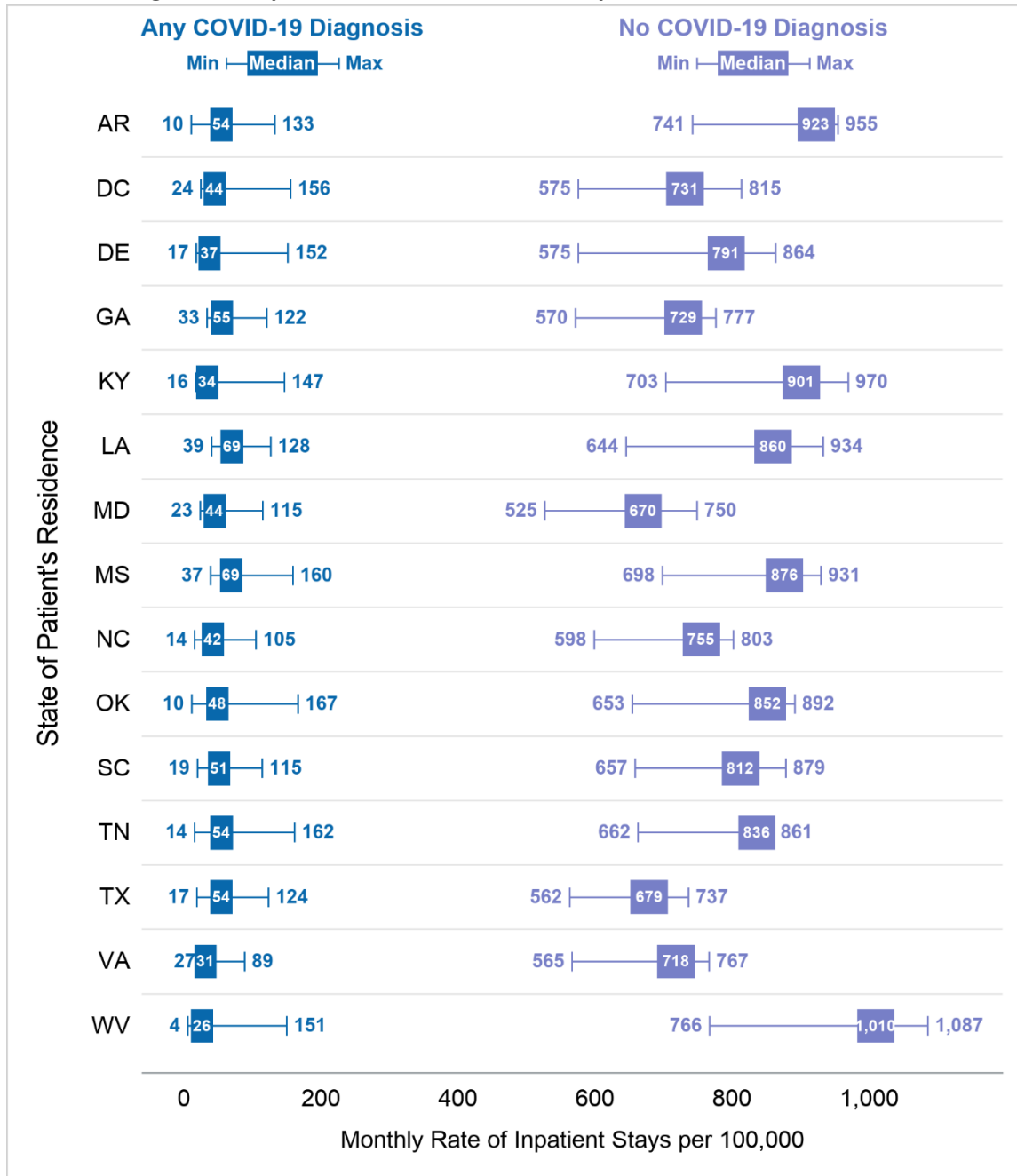
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 12. Monthly variation in the rate of inpatient stays per 100,000 population by presence of COVID-19 diagnosis and patient’s State of residence, April–December 2020, States in the Midwest**



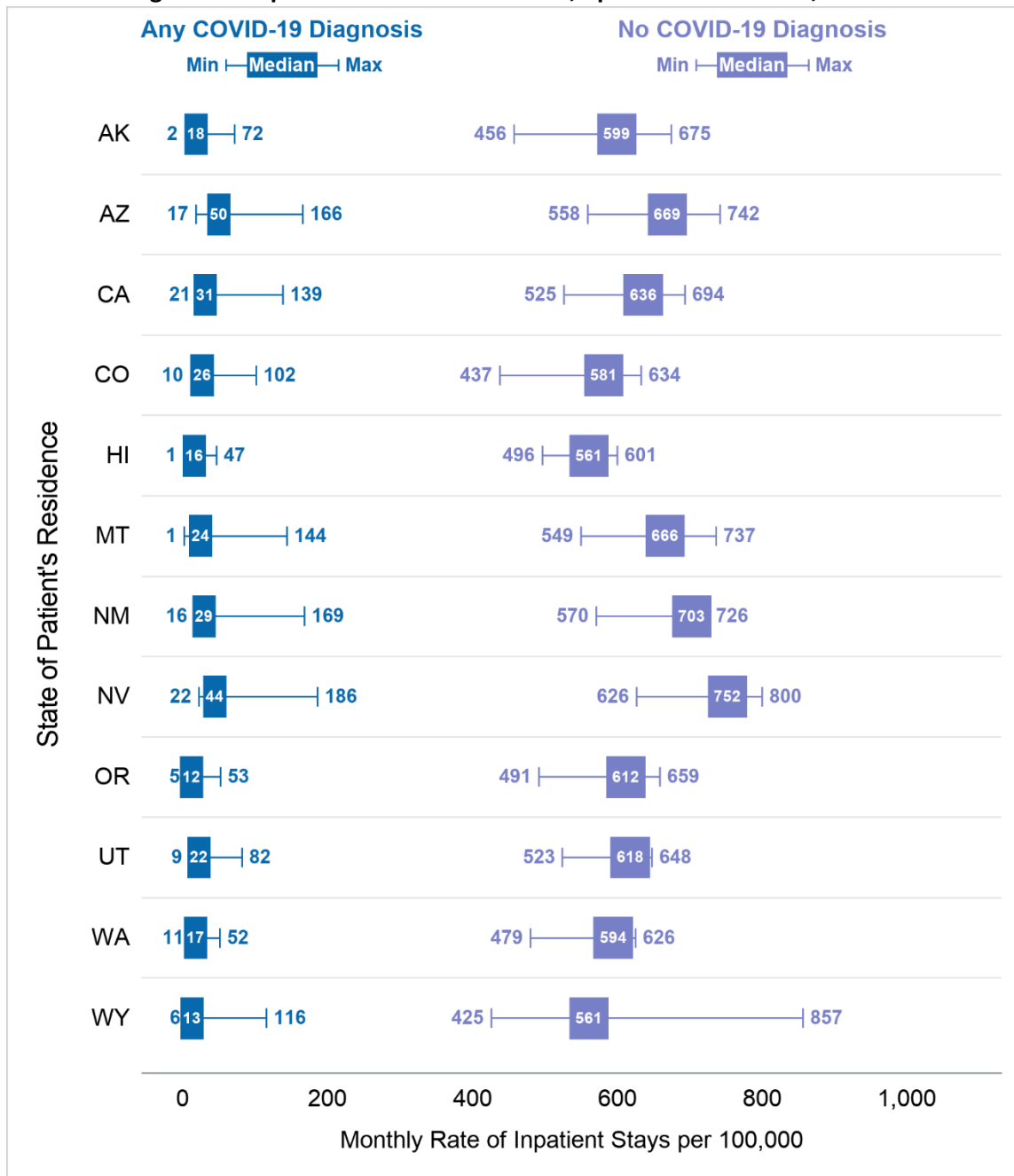
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 13. Monthly variation in the rate of inpatient stays per 100,000 population by presence of COVID-19 diagnosis and patient’s State of residence, April–December 2020, States in the South**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

**Figure 14. Monthly variation in the rate of inpatient stays per 100,000 population by presence of COVID-19 diagnosis and patient’s State of residence, April–December 2020, States in the West**



Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 48 States and the District of Columbia, 2020

## REFERENCES

---

<sup>1</sup> Centers for Disease Control and Prevention (CDC). CDC Museum COVID-19 Timeline.

<https://www.cdc.gov/museum/timeline/covid19.html#Early-2020>. Accessed October 4, 2022.

<sup>2</sup> Healthcare Cost and Utilization Project (HCUP) Statistical Briefs Series on COVID-19-Related Hospitalizations in 13 States (HCUP Statistical Briefs #273–276). June 2021. Agency for Healthcare Research and Quality, Rockville, MD.

[www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp](http://www.hcup-us.ahrq.gov/reports/statbriefs/statbriefs.jsp).

<sup>3</sup> Claritas. Claritas Demographic Profile by ZIP Code. [www.claritas360.claritas.com/mybestsegments/](http://www.claritas360.claritas.com/mybestsegments/).

<sup>4</sup> New ICD-10-CM code for the 2019 Novel Coronavirus (COVID-19), April 1, 2020. Centers for Disease Control and Prevention. <https://www.cdc.gov/nchs/data/icd/Announcement-New-ICD-code-for-coronavirus-3-18-2020.pdf>



## APPENDIX A. HCUP PARTNER ORGANIZATIONS

**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** Lauima Data Alliance  
**Hawaii** University of Hawaii 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

## APPENDIX B. HEALTHCARE COST AND UTILIZATION PROJECT (HCUP) DATABASES

The Healthcare Cost and Utilization Project (HCUP) 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.

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 capture information on all types of inpatient discharges, including those admitted through the ED of the hospital, direct admissions, and transfers from acute care hospitals and other types of health facilities. Researchers and policymakers use the SID to investigate questions related to inpatient care unique to one or more States, to conduct market area research or small variation analyses, and to identify State-specific trends.

Sampled from the SID, the **National Inpatient Sample (NIS)** is designed to produce national and regional estimates of inpatient utilization, access, cost, quality, and outcomes. The NIS is a 20-percent stratified sample of discharges from U.S. community hospitals, excluding rehabilitation and long-term acute care hospitals. The number of States participating in the NIS has grown from 8 in the first year (1988) to 48, plus the District of Columbia, in 2020.

The HCUP databases contain more than 100 clinical and nonclinical data elements included hospital discharge abstract, such as the following:

- Principal and secondary diagnoses and procedures
- Admission type and discharge status
- Patient demographic characteristics (e.g., sex, age, and, for some States, race and ethnicity)
- Expected payment source
- Total charges
- Length of stay

More information is available on the HCUP User Support website ([www.hcup-us.ahrq.gov](http://www.hcup-us.ahrq.gov)). Additional State-specific information on COVID-19-related inpatient stays and ED visits, including the underlying data for the figures in this report, is available on the HCUP User Support website in the [HCUP Summary Trend Tables](#) and [HCUP Visualization of Inpatient Trends COVID-19 and Other Conditions](#).