Addendum to HCUP Statistical Brief #308: Rural and Urban Hospital Differences in Inpatient Stays Involving Sepsis, 2019 and 2021, Addition of 2022 Data

HCUP Statistical Brief #308 Addendum to Include 2022 Data | June 2025

Joanna Jiang, Ph.D., Lan Liang, Ph.D., Meghana Chandra, M.P.P, and Sai Loganathan, Ph.D.

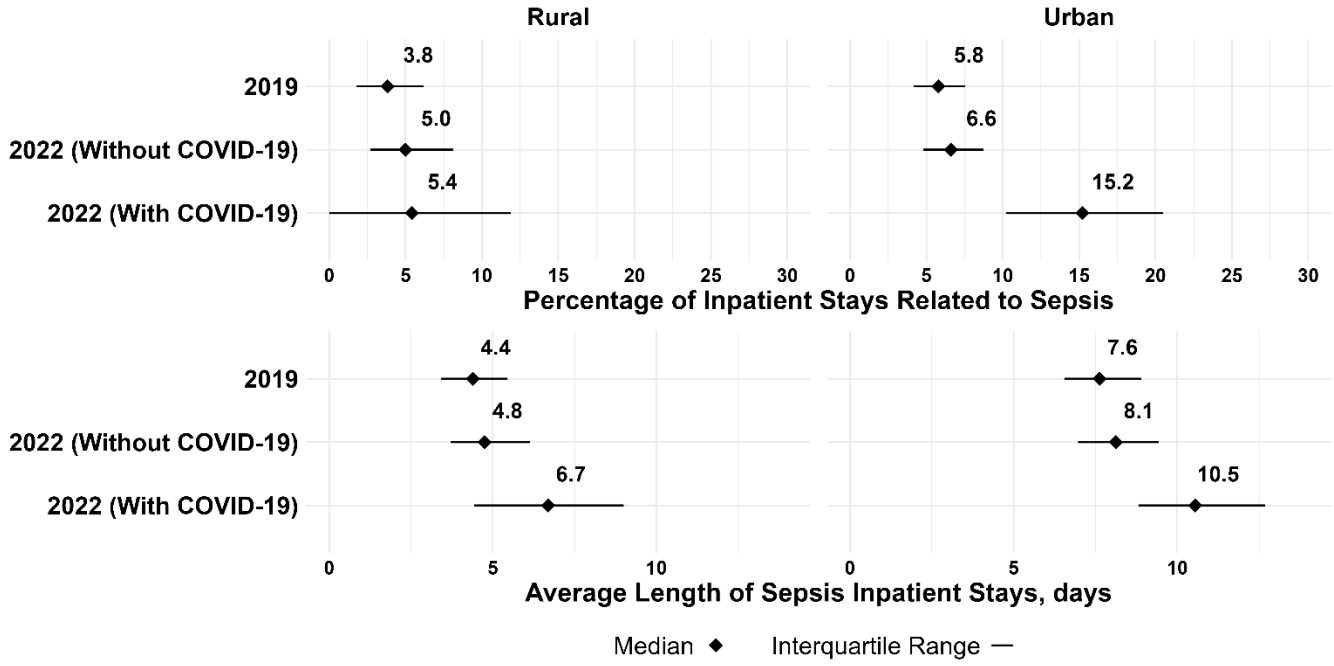
This is an addendum to HCUP Statistical Brief #308, Rural and Urban Hospital Differences in Inpatient Stays Involving Sepsis, 2019 and 2021. For all figures and/or tables, this addendum replaces 2021 data with 2022 data. Please refer to the main Statistical Brief for information related to methodology (i.e., definitions and calculations), suggested citation, and contact information.

Findings

Variation in the Percentage of Inpatient Stays and Outcomes Related to Sepsis Among Rural and Urban Hospitals, 2019 and 2022

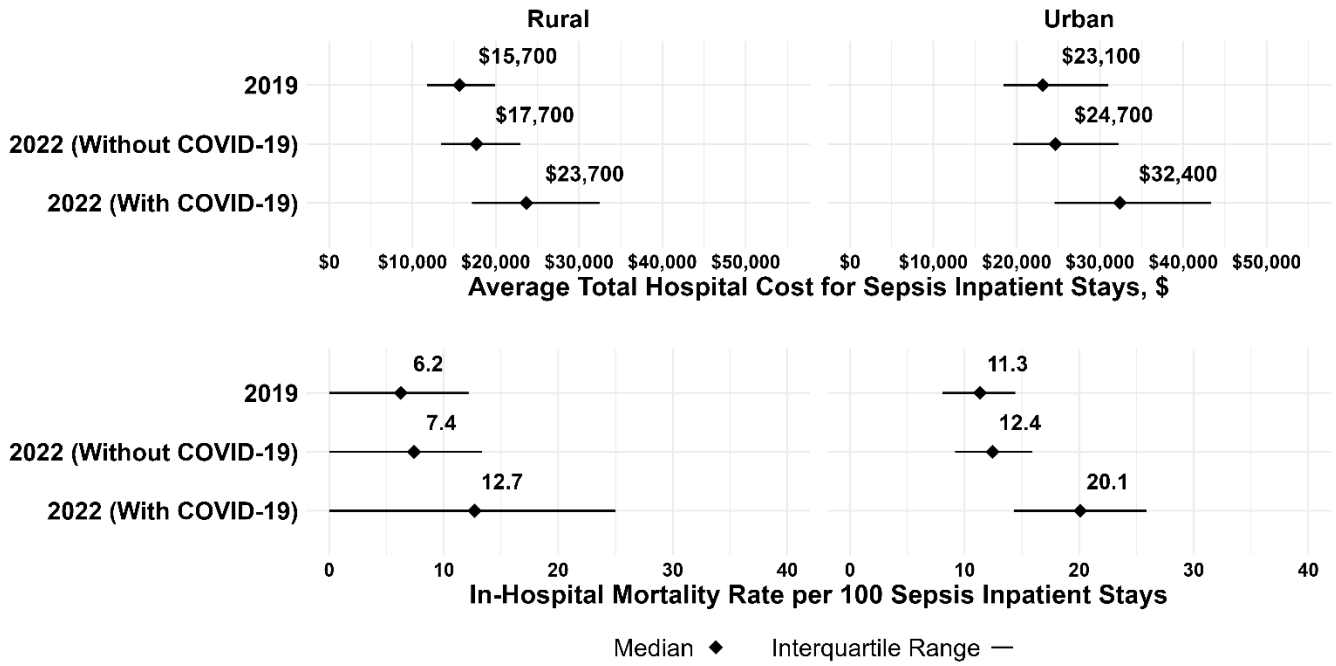
Figures 1a and 1b present the percentage of inpatient stays related to sepsis by hospital urban-rural location and outcomes related to average length of stay, average total hospital cost, and in-hospital mortality rate for sepsis inpatient stays. The data are presented as a distribution. The median is denoted by a diamond. The interquartile range, which represents the 25th and 75th percentiles, is indicated by lines. For 2022, information is presented for sepsis inpatient stays involving and not involving COVID-19. About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19.

Figure 1a. Rural and urban hospital variation in outcomes related to sepsis, 2019 and 2022



Notes: The percentage of inpatient stays related to sepsis was based on stays with any diagnosis of sepsis. The average length of stay was based only on hospitalizations in which the reason for the stay (as indicated by the principal/first-listed diagnosis) was sepsis. About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Figure 1b. Rural and urban hospital variation in outcomes related to sepsis, 2019 and 2022

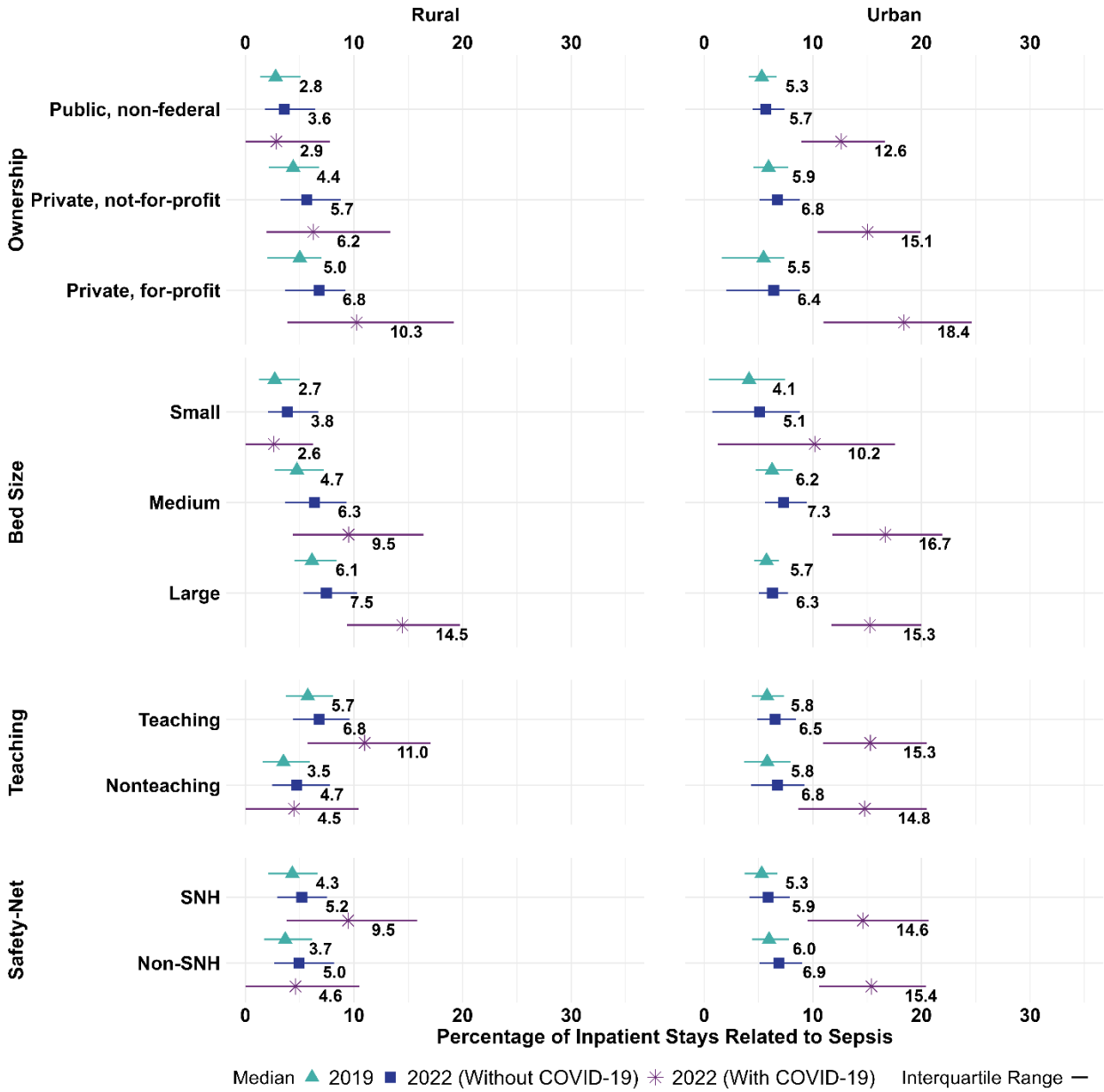


Notes: The average total hospital cost and in-hospital mortality rate were based only on hospitalizations in which the reason for the stay (as indicated by the principal/first-listed diagnosis) was sepsis. Hospital costs were adjusted to the base year of 2022. Average total hospital cost was rounded to the nearest hundreds. About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Variation Among Rural and Urban Hospitals in the Percentage of Inpatient Stays Related to Sepsis, 2019 and 2022

Figure 2 presents the percentage of inpatient stays related to sepsis by select hospital characteristics and hospital urban-rural location. The data are presented as a distribution. The median is denoted by a shape, with the value displayed. The interquartile range, which represents the 25th and 75th percentiles, is indicated by lines. For 2022, information is presented for inpatient stays involving and not involving COVID-19.

Figure 2. Rural and urban hospital variation in the percentage of inpatient stays related to sepsis, by select hospital characteristics, 2019 and 2022

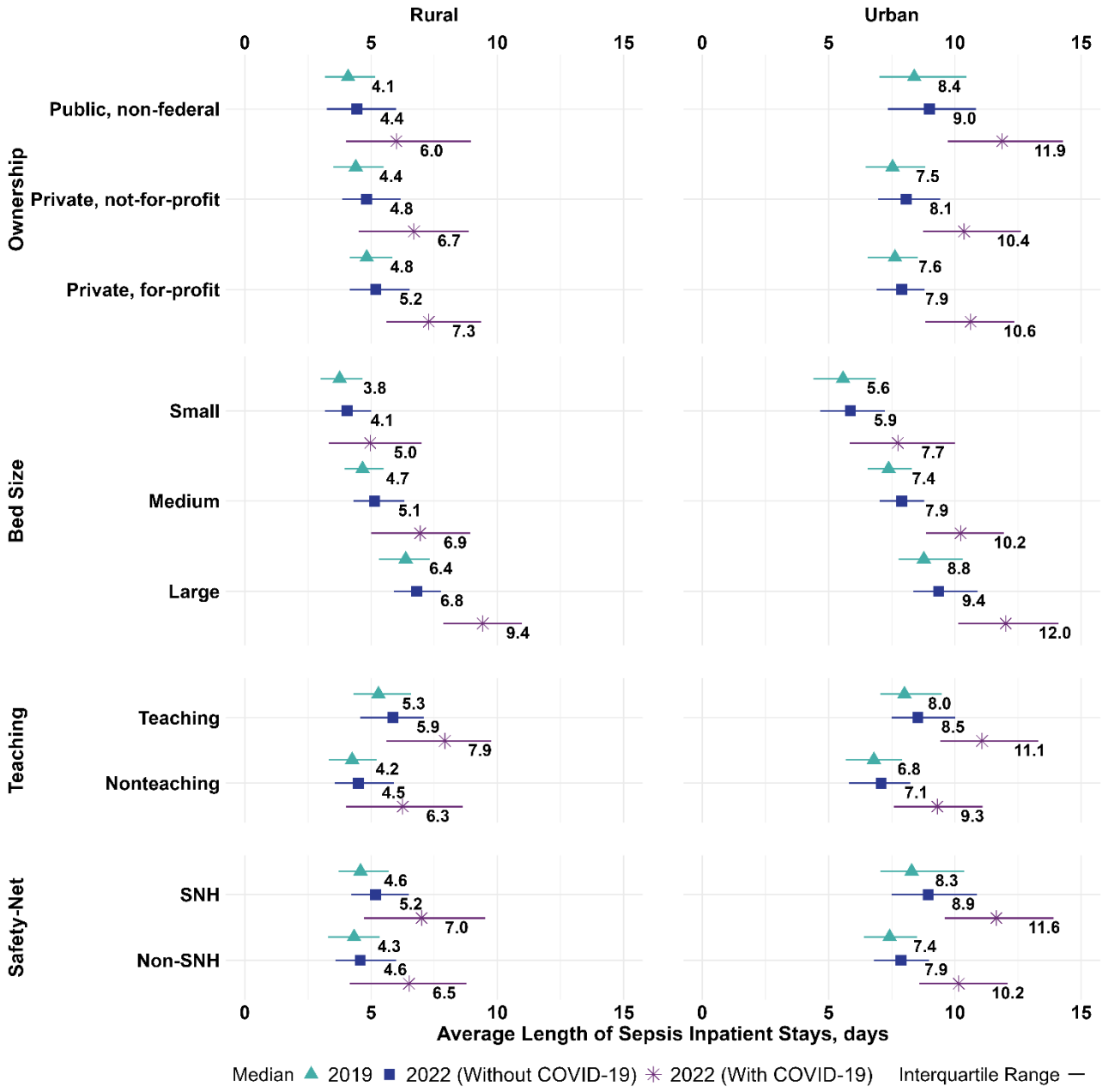


Abbreviation: SNH, safety-net hospital
Note: Sepsis-related inpatient stays were identified by any diagnosis of sepsis. About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. Less than one percent of records for rural hospitals were missing safety-net status. Bed size definitions vary for rural and urban hospitals. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Variation Across Rural and Urban Hospitals in the Average Length of Stay, Average Total Hospital Cost, and In-Hospital Mortality Rate for Sepsis Stays, 2019 and 2022

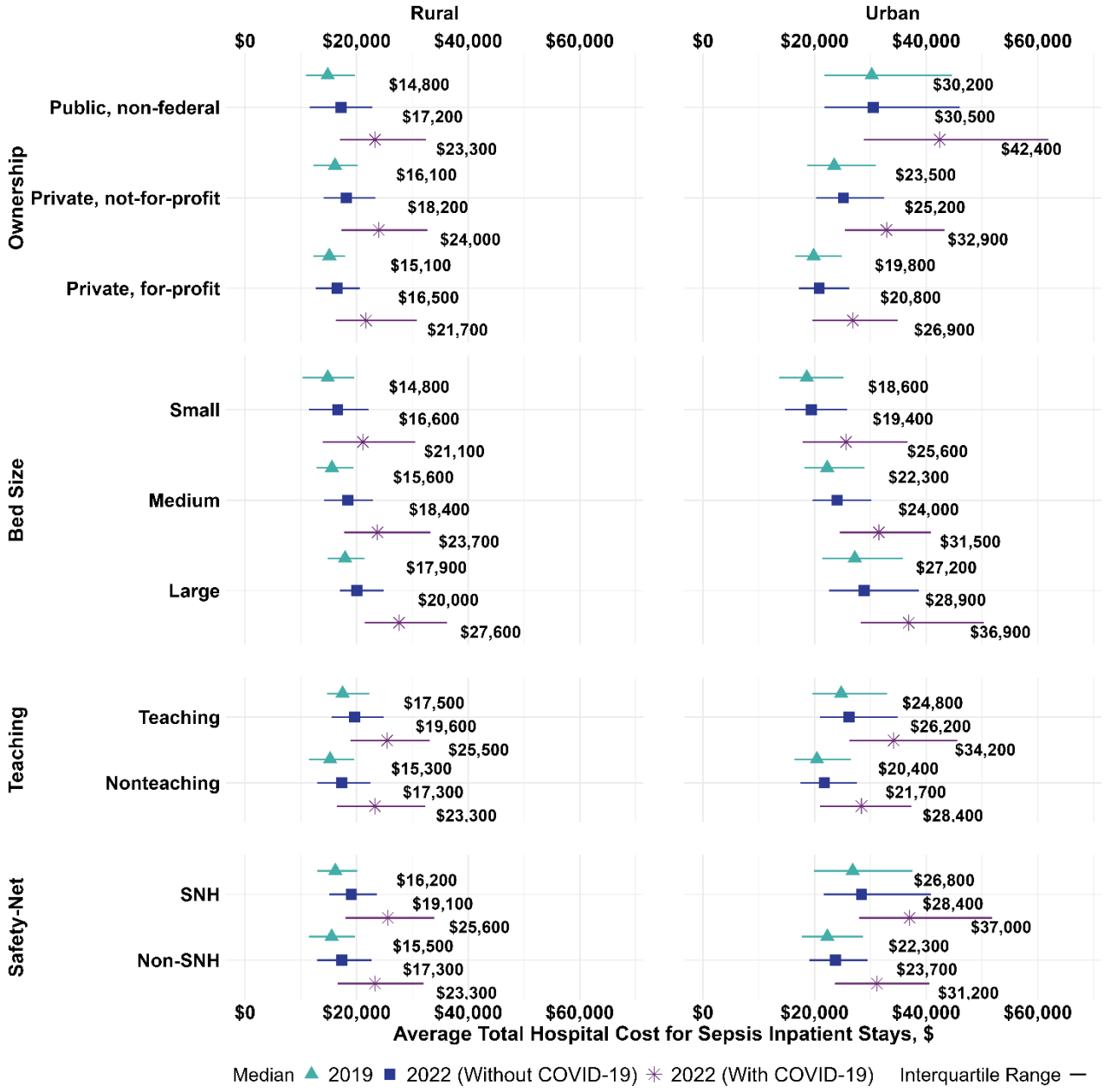
Figures 3, 4, and 5 present the average length of stay, average total hospital cost, and in-hospital mortality rate of inpatient stays for sepsis (i.e., sepsis is the principal diagnosis) among urban and rural hospitals by select hospital characteristics. The data are presented as a distribution. The median is denoted by a shape, with the value displayed. The interquartile range, which represents the 25th and 75th percentiles, is indicated by lines. For 2022, information is presented for inpatient stays involving and not involving COVID-19.

Figure 3. Rural and urban hospital variation in the average length of sepsis stays, by select hospital characteristics, 2019 and 2022



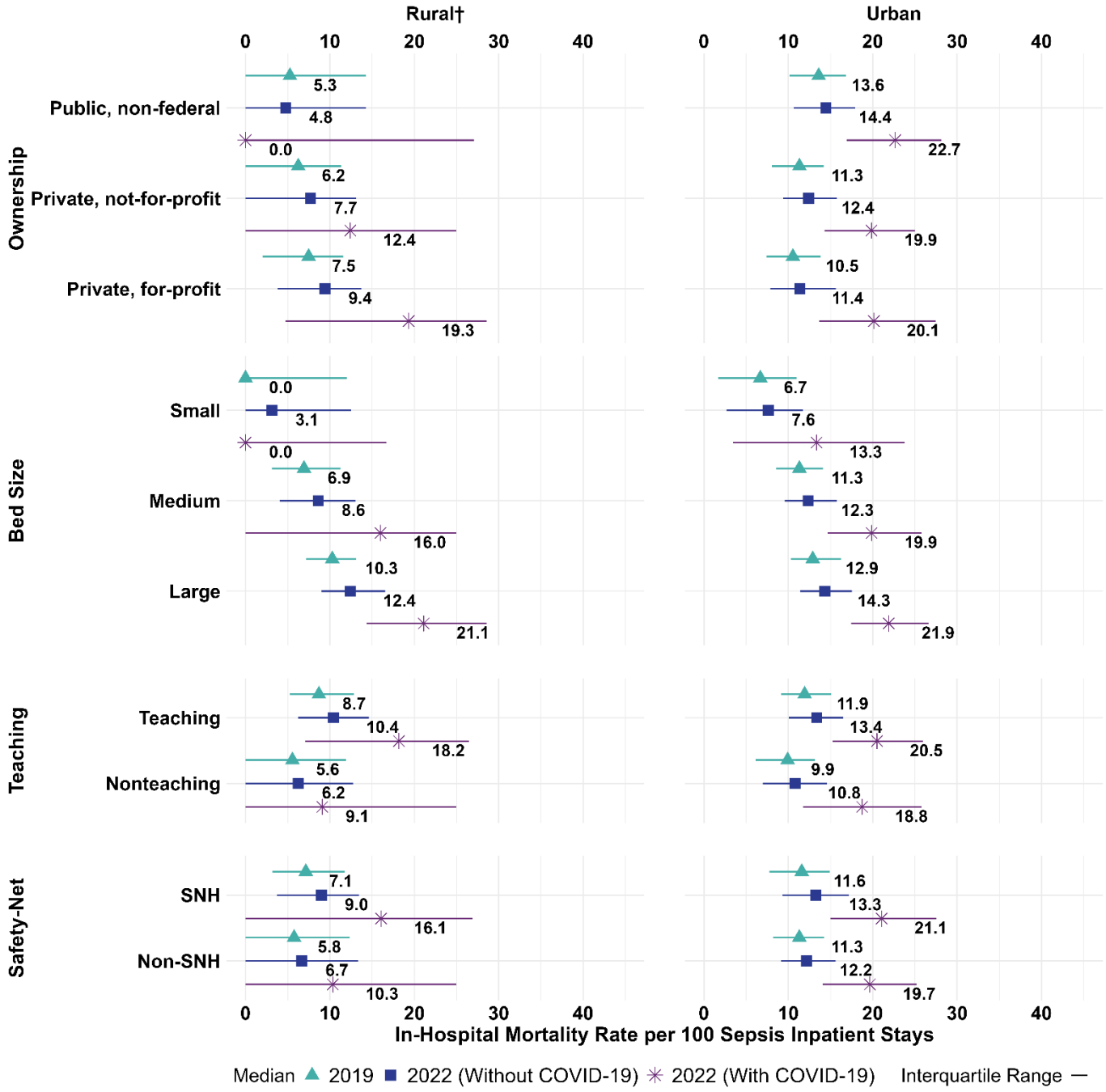
Abbreviation: SNH, safety-net hospital
Note: Average length of sepsis stay was calculated for inpatient stays where sepsis was the reason for the stay (i.e., principal diagnosis). About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. Less than one percent of records for rural hospitals were missing safety-net status. Bed size definitions vary for rural and urban hospitals. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Figure 4. Rural and urban hospital variation in average total hospital cost for sepsis inpatient stays, by select hospital characteristics, 2019 and 2022



Abbreviation: SNH, safety-net hospital
Note: Average total hospital cost for sepsis inpatient stays was calculated for stays where sepsis was the reason for the stay (i.e., principal diagnosis). Charges were imputed to account for missing information prior to conversion to hospital costs. Hospital costs were adjusted to the base year of 2022. Average total hospital cost was rounded to the nearest hundreds. About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. Less than one percent of records for rural hospitals were missing safety-net status. Bed size definitions vary for rural and urban hospitals. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Figure 5. Rural and urban hospital variation in in-hospital mortality rate for sepsis inpatient stays, by select hospital characteristics, 2019 and 2022



Abbreviation: SNH, safety-net hospital
Note: In-hospital mortality rate for sepsis inpatient stays was calculated for stays where sepsis was the reason for the stay (i.e., principal diagnosis). About 6.2 percent of the 32.9 million inpatient stays in 2022 involved a diagnosis of COVID-19. Less than one percent of records for rural hospitals were missing safety-net status. Bed size definitions vary for rural hospitals and urban hospitals. For more information, please see the Definitions section in Statistical Brief #308.
† The median in-hospital mortality rate for certain types of rural hospitals was very low, with only a few hospitals reporting any deaths. This is likely due to the low number of sepsis inpatient admissions at these facilities.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Data Source

This Statistical Brief uses data from the HCUP 2019 and 2022 State Inpatient Databases (SID) for 47 States and the District of Columbia. States include Alaska, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.

Population Studied

This analysis focused on inpatient stays with any-listed ICD-10-CM diagnosis of sepsis. Although this analysis focused on all inpatient stays related to sepsis, the clinical criteria for defining sepsis varied across patient populations. The ICD-10-CM diagnoses codes used to identify a sepsis infection are included in Appendix A, Table A.1. The ICD-10-CM diagnoses codes used to identify organ dysfunction are included in Appendix A, Table A.2. The ICD-10-CM/PCS codes used to identify a maternal case are included in Appendix A, Table A.3. Table 1 provides the clinical criteria used to define mutually exclusive patient populations for sepsis-related inpatient stays. Table 2 provides statistics on the number of rural and urban hospitals by hospital characteristic in 2019 and 2022.

Table 1. Clinical Coding Criteria for Identifying Sepsis-Related Inpatient Stays for Mutually Exclusive Patient Populations

Population	Maternal	Age Criteria	Sepsis Criteria
Maternal	Yes – Any DX indicating a maternal condition as identified by QI setname MDC14PRINDX*	Any age	Any ICD-10-CM diagnosis of the following: • Septic shock** • Severe sepsis*** • Any other diagnosis indicating sepsis with at least one diagnosis indicating organ dysfunction (including maternal “O” organ dysfunction codes)
Adult	No	Age 18 years and older****	Any ICD-10-CM diagnosis of the following: • Septic shock** • Severe sepsis*** • Any other diagnosis indicating sepsis with at least one diagnosis indicating organ dysfunction
Pediatric	No	Age 0 with age in days > 27 days or age 1–17 years	Any ICD-10-CM diagnosis of the following: • Septic shock** • Severe sepsis*** • Any other diagnosis indicating sepsis (no requirement to have indication of organ dysfunction)
Neonatal	No	Age in days of 0–27	Any ICD-10-CM diagnosis of the following: • Septic shock** • Severe sepsis*** • Any other diagnosis indicating sepsis (no requirement to have indication of organ dysfunction)

*AHRQ Prevention Quality Indictor (PQI), Appendix F: MDC 14 and MDC 15 Principal Diagnosis Codes, v2023 (https://qualityindicators.ahrq.gov/Downloads/Modules/PQI/V2023/TechSpecs/PQI_Appendix_F.pdf). Accessed November 10, 2023.
** Septic shock identified by ICD-10-CM diagnoses R6521 and T8112XA.
*** Severe sepsis identified by ICD-10-CM diagnosis R6520.
**** The adults aged 18 years and older group included a small percentage of records (less than 0.02 percent) of sepsis-related inpatient stays missing patient age information. Records missing patient age information were included in this group because it was the largest of the patient populations.

Table 2. Number of rural and urban hospitals by hospital characteristic, 2019 and 2022

Hospital Characteristic	Rural Hospitals		Urban Hospitals	
	2019	2022	2019	2022
All	2,009	1,992	2,235	2,223
Ownership				
Public, non-federal	668	636	194	189
Private, not-for-profit	1,153	1,178	1,565	1,580
Private, for-profit	188	178	476	454
Bed Size				
Small	1,095	1,103	498	518
Medium	665	649	1,020	981
Large	249	240	717	724
Teaching Status				
Teaching	246	318	1,416	1,468
Nonteaching	1,763	1,674	819	755
Safety-Net Designation				
Safety-net	441	438	595	633
Non-safety-net	1,567	1,553	1,640	1,590

Note: Less than one percent of records for rural hospitals were missing safety-net status. Bed size definitions vary for rural and urban hospitals. For more information, please see the Definitions section in Statistical Brief #308.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID), 47 States and the District of Columbia, 2019 and 2022.

Sepsis as the reason for the inpatient stay

For this Statistical Brief, outcomes (in-hospital mortality rate, average total hospital cost, and average length of stay) are reported only when sepsis was the reason for the inpatient stay (i.e., principal diagnosis). Outcomes for stays when sepsis was a co-occurring condition or complication of the stay (i.e., only reported as a secondary diagnosis) are not examined in this Statistical Brief. For stays in which sepsis was a co-occurring condition or complication of the stay, other conditions such as cancer, pneumonia, or heart failure may be the reason for the inpatient stay and contribute to increased length of stay or hospital costs. Thus, outcomes for these inpatient stays cannot be attributed solely to sepsis.

The proportion of inpatient stays in which sepsis was the reason for the inpatient stay varies by patient population partially because of ICD-10-CM clinical coding guidelines. As such, these guidelines are important to consider in the development of the case definition for sepsis.

The unit of analysis is a hospital with summary statistics calculated on the hospital discharges (i.e., the hospital stay), not individual persons or patients. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate discharge from the hospital.

Please refer to Statistical Brief #308 for information related to methodology (i.e., definitions and calculations), suggested citation, and contact information.

This Statistical Brief addendum was posted online on June 11, 2025.