Addendum to HCUP Statistical Brief #306: Overview of Outcomes for Inpatient Stays Involving Sepsis, 2016–2021, Addition of 2022 Data

HCUP Statistical Brief #306 Addendum to Include 2022 Data | June 2025

Pamela L. Owens, Ph.D., Melissa A. Miller, M.D., M.S., Marguerite L. Barrett, M.S., Molly Hensche, M.S.

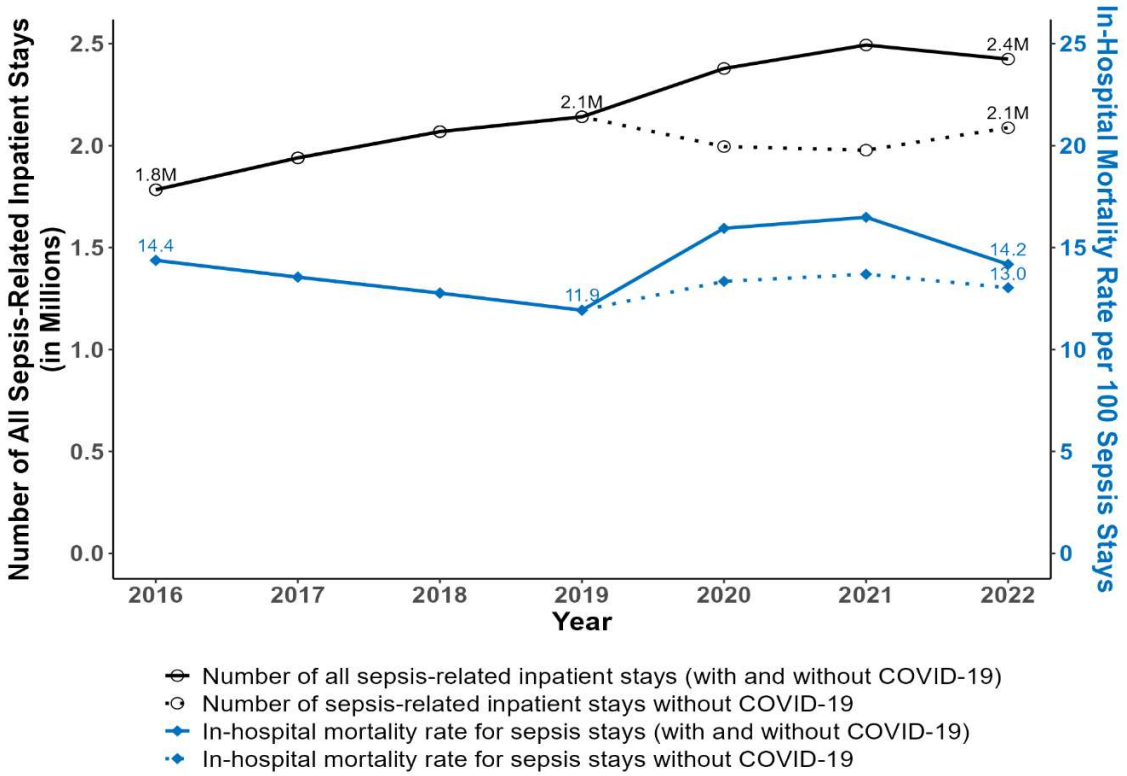
This is an addendum to HCUP Statistical Brief #306, Overview of Outcomes for Inpatient Stays Involving Sepsis, 2016–2021. This addendum updates exhibits to include 2022 data. For trend figures, 2022 data are an additional data point. For all other figures and/or tables, 2022 data replace 2021 data. Please refer to Statistical Brief #306 for information related to methodology (i.e., definitions and calculations), suggested citation, and contact information.

Findings

Annual Trends in the Number of Inpatient Stays and In-hospital Mortality Rate for Stays Involving Sepsis

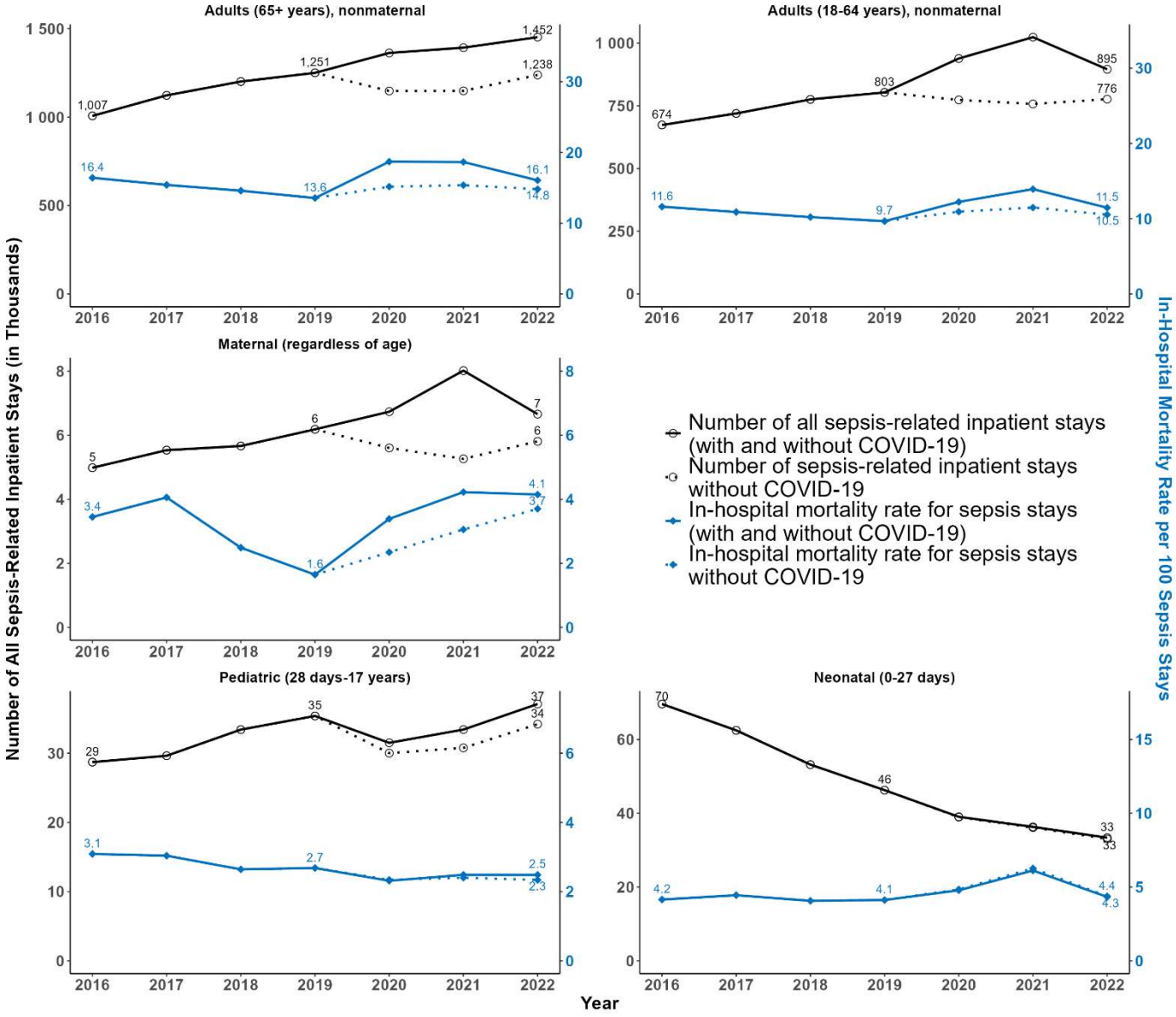
Figures 1 and 2 present national trends from 2016 to 2022 in the number of inpatient stays with any diagnosis of sepsis and the in-hospital mortality rate for stays with a principal diagnosis of sepsis. Trends are presented separately for each patient population. When examining annual trends in inpatient stays involving sepsis, it is important to also understand the impact of COVID-19 beginning in 2020. For this reason, the trends include information on all inpatient stays involving sepsis and those without COVID-19 for 2020–2022.

Figure 1. Trends in the number of inpatient stays and in-hospital mortality rate for stays involving sepsis, 2016–2022



Notes: The number of inpatient stays was based on any-listed diagnosis of sepsis. In-hospital mortality rates were based on stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the number of stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2022

Figure 2. Trends in the number of inpatient stays and in-hospital mortality rate for stays involving sepsis by patient population, 2016–2022



Note: The number inpatient stays was based on any-listed diagnosis of sepsis. In-hospital mortality rates were based on stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the number of stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2022

Average Length of Stay and Hospital Costs for Inpatient Stays for Sepsis

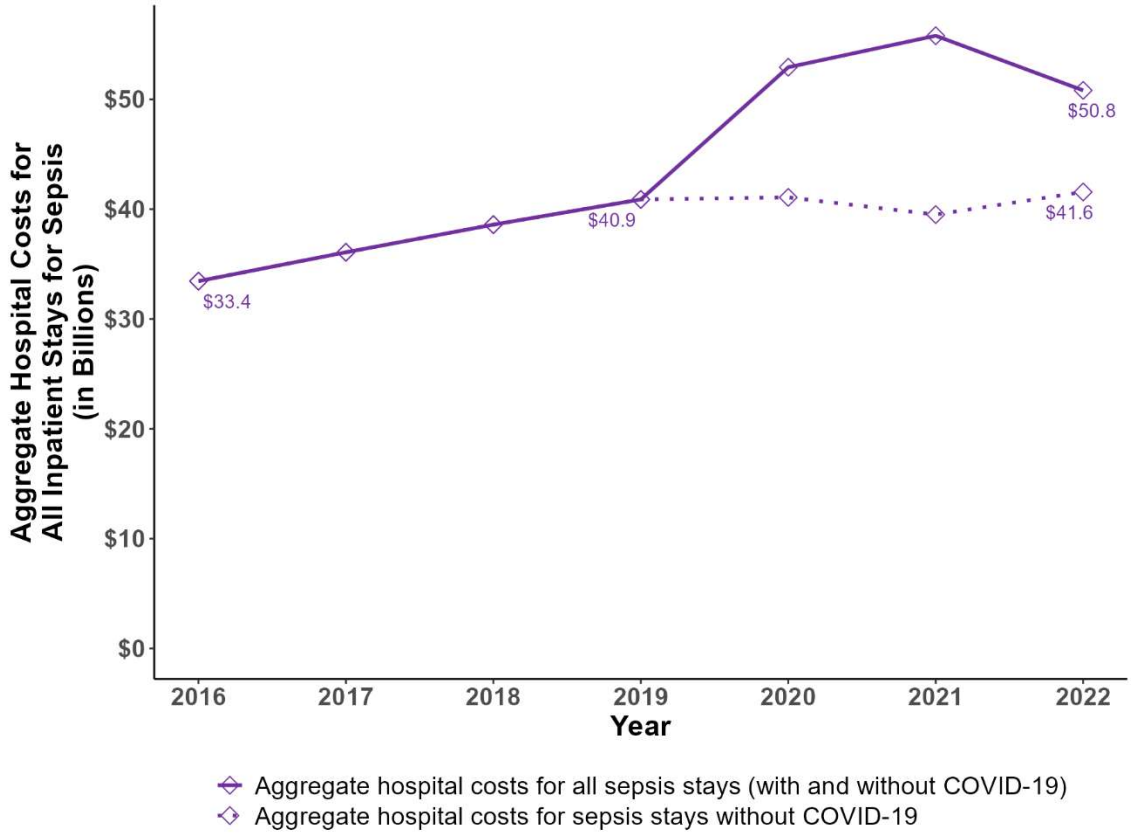
Table 1 presents the average length of stay and average total hospital costs for inpatient stays for sepsis (i.e., sepsis is the principal diagnosis). Information is presented as an average across years for 2016–2019 and with and without COVID-19 for 2020 and 2022. Figures 3 and 4 present annual trends in aggregate hospital costs for sepsis stays from 2016 to 2022. Figure 5 presents the distribution of aggregate hospital costs of inpatient stays for sepsis by the expected primary payer for 2020 and 2022 with and without COVID-19. Figure 5 also presents information for 2016–2019 as an average for all sepsis stays and all inpatient stays for comparison.

Table 1. Average length of stay and average total hospital costs for inpatient stays for sepsis by patient population, 2016–2019, 2020, and 2022

Outcome and patient population	2016-2019 Average	2020 Overall (with and without COVID-19)	2020 with COVID-19	2020 without COVID-19	2022 Overall (with and without COVID-19)	2022 with COVID-19	2022 without COVID-19
Average length of sepsis stays, days							
All sepsis stays	8.2	8.8	11.4	8.3	9.0	11.2	8.6
Adult (65+ years), nonmaternal	7.6	8.2	10.9	7.6	8.4	10.2	8.0
Adult (18–64 years), nonmaternal	9.1	9.7	12.1	9.1	10.0	13.1	9.5
Maternal	7.9	7.3	11.7	6.8	8.0	19.6	6.6
Pediatric (28 days–17 years)	9.0	9.3	8.1	9.3	8.6	10.0	8.5
Neonatal (0–27 days)	13.3	15.7	7.0	15.8	16.8	13.0	16.9
Average total hospital costs for sepsis stays, $							
All sepsis stays	26,300	30,300	39,600	28,400	28,600	35,500	27,400
Adult (65+ years), nonmaternal	23,200	26,800	35,400	25,200	25,300	30,300	24,400
Adult (18–64 years), nonmaternal	30,700	35,000	44,800	32,600	33,600	45,100	31,700
Maternal	33,200	33,100	78,900	28,200	36,100	123,200	26,000
Pediatric (28 days–17 years)	40,900	48,000	45,700	48,100	41,100	50,900	40,300
Neonatal (0–27 days)	46,500	65,400	11,000	66,100	68,200	58,900	68,600

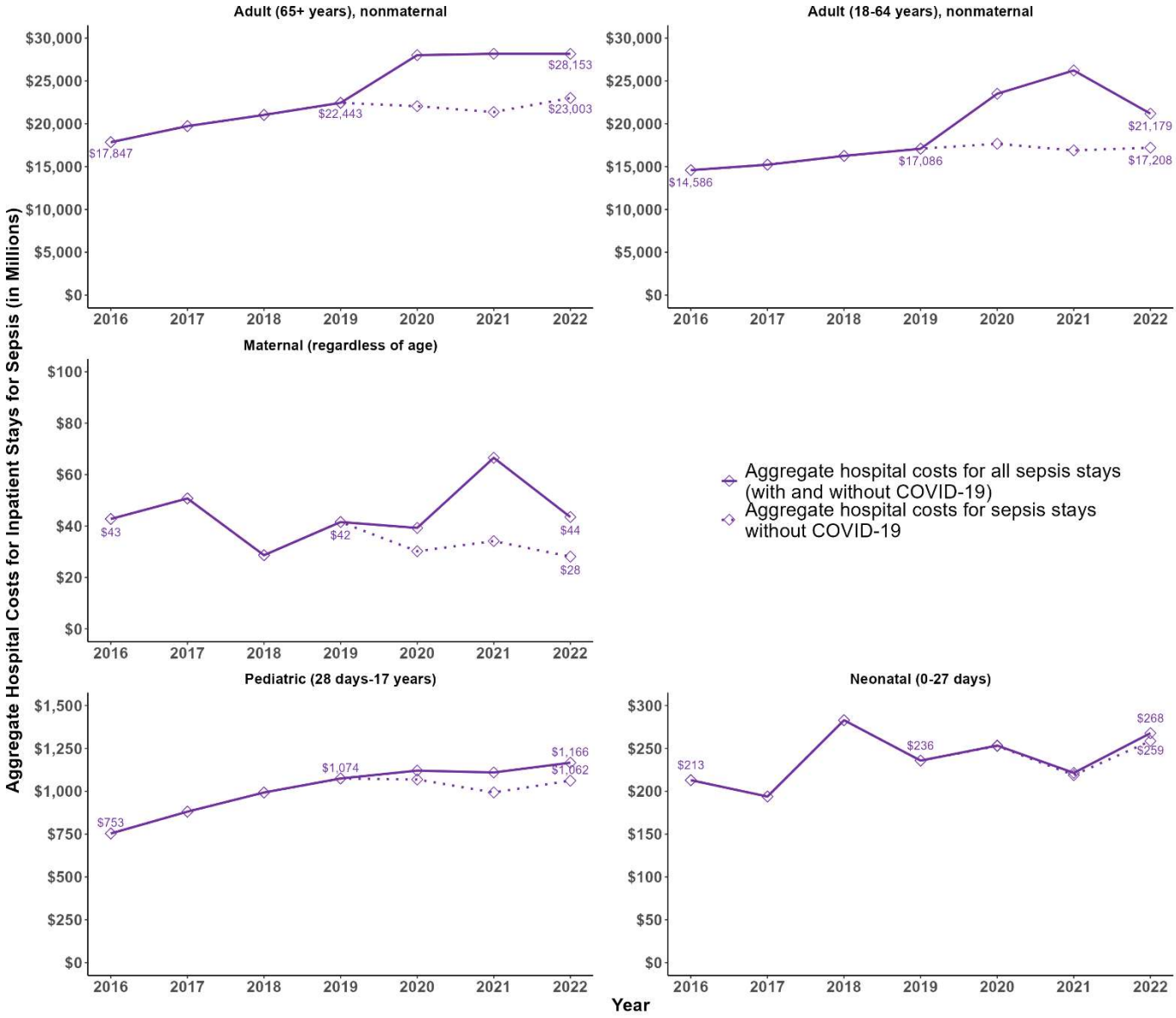
Note: Outcomes (average length of sepsis stay and average total hospital costs) were based on stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the number of stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay. 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 hospital costs were rounded to the nearest hundreds.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2020 and 2022

Figure 3. Trends in aggregate hospital costs for all inpatient stays for sepsis, 2016–2022



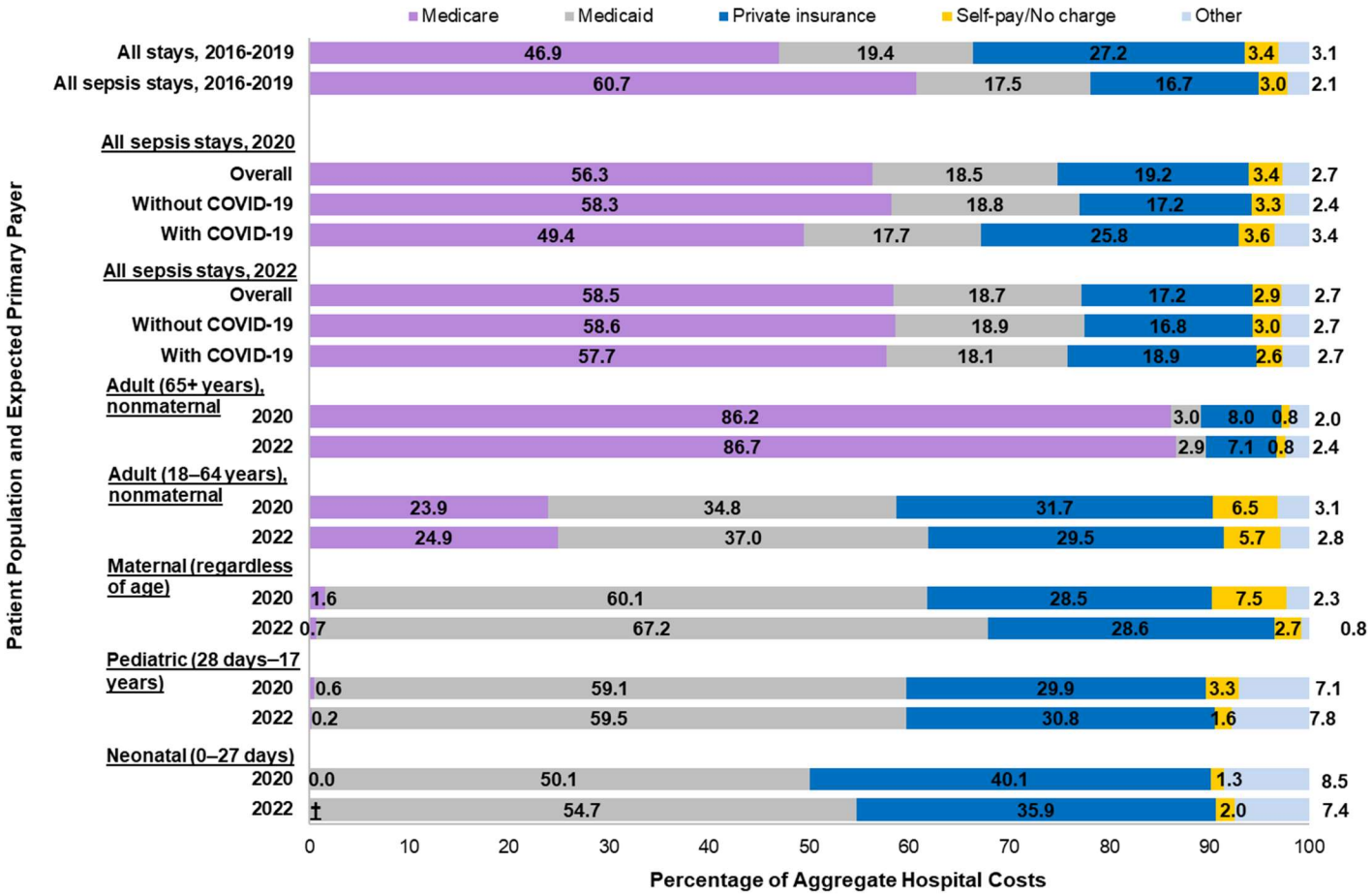
Note: Aggregate total hospital costs were based on stays in which sepsis was the reason for the stay. Table 3 of the Methods section includes information on the distribution of the aggregate total hospital costs for stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay. Charges were imputed to account for missing information prior to conversion to hospital costs. Hospital costs were adjusted to the base year of 2022. Aggregate hospital costs were rounded to the nearest millions.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2022

Figure 4. Trends in aggregate hospital costs for inpatient stays for sepsis, by patient population, 2016–2022



Note: Aggregate total hospital costs were based on stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the aggregate total hospital costs for stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay. Charges were imputed to account for missing information prior to conversion to hospital costs. Hospital costs were adjusted to the base year of 2022. Aggregate hospital costs were rounded to the nearest millions.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2022

Figure 5. Distribution of aggregate hospital costs of inpatient stays for sepsis, by patient population and expected primary payer, 2016–2019, 2020, and 2022

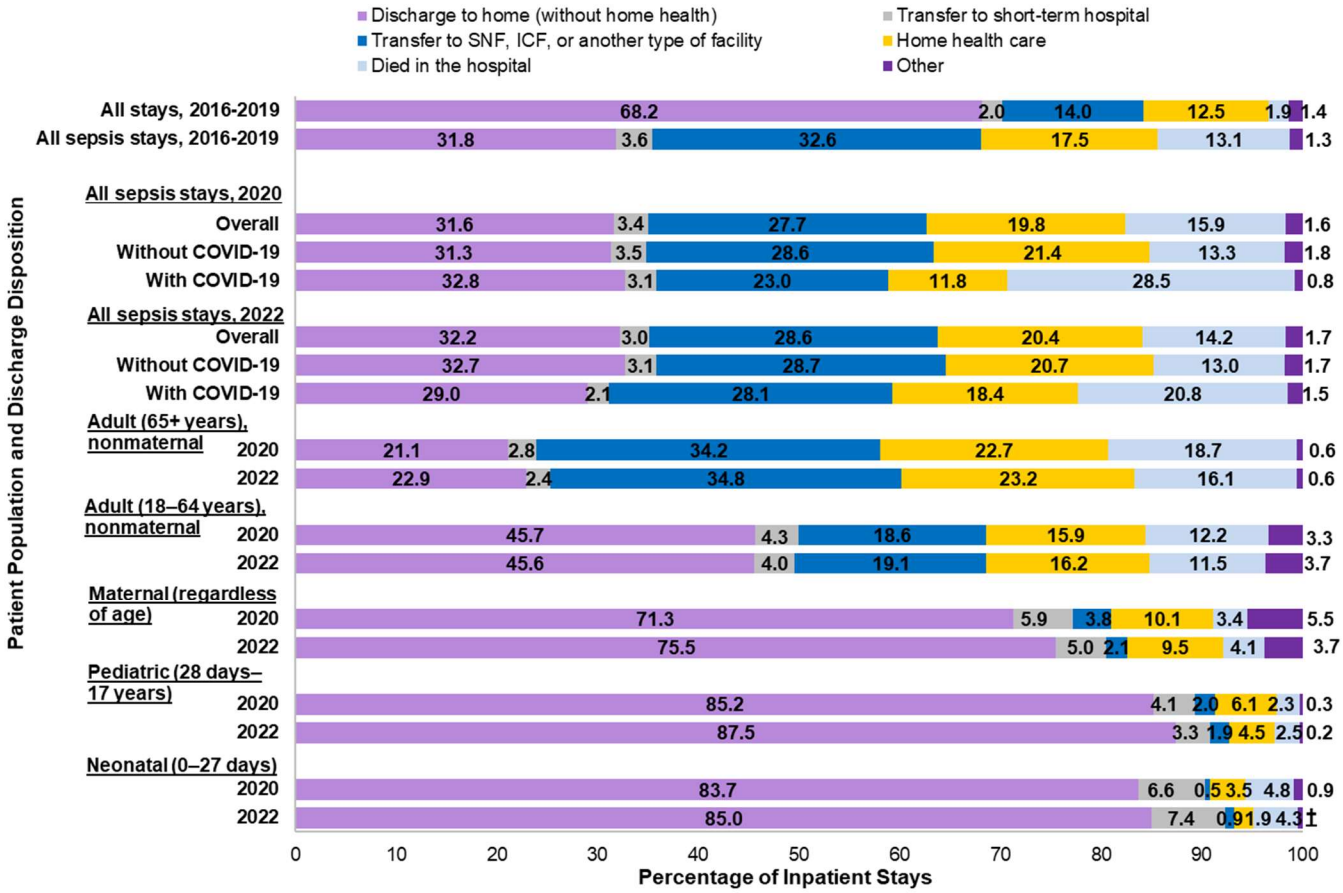


Notes: Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment. Aggregate total hospital costs were based on inpatient stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the aggregate total hospital costs for stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay. Charges were imputed to account for missing information prior to conversion to hospital costs. Hospital costs were adjusted to the base year of 2022. No distinction was made by COVID-19 in 2022 for the patient populations.
‡Statistics based on a cell size less than or equal to 10 are suppressed.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2020 and 2022

Discharge Disposition for Inpatient Stays for Sepsis

Figure 6 presents the distribution of the number of inpatient stays for sepsis by the discharge disposition for 2020 and 2022 with and without COVID-19. Figure 6 also presents information for 2016–2019 as an average for all inpatient stays and all sepsis stays for comparison.

Figure 6. Distribution of the number of inpatient stays for sepsis, by patient population and discharge disposition, 2016–2019, 2020, and 2022



Abbreviations: ICF, intermediate care facility; SNF, skilled nursing facility
Notes: Other includes dispositions of against medical advice, discharged alive, missing, and invalid. The distribution of the number of inpatient stays for sepsis by discharge disposition was based on stays in which sepsis was the reason for the stay (i.e., principal diagnosis). Table 3 of the Methods section includes information on the distribution of the number of stays in which sepsis was the reason for the stay versus was a co-occurring condition or complication of the stay. No distinction was made by COVID-19 in 2022 for the patient populations.
‡Statistics based on a cell size less than or equal to 10 are suppressed.
Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2020 and 2022

Data Source

This Statistical Brief uses data from the HCUP 2016–2022 National Inpatient Sample (NIS). For additional information about the HCUP NIS, see: https://hcup-us.ahrq.gov/db/nation/nis/nisdbdocumentation.jsp.

Population Studied

This analysis focused on inpatient stays with any-listed ICD-10-CM diagnosis of sepsis. Although the maximum number of diagnoses varies in the 2016–2022 NIS (30 diagnoses in the 2016 NIS and 40 diagnoses in 2017–2022), this analysis used all available diagnoses in the data year. Within each year, the number of diagnoses in the individual State Inpatient Databases (SID) used to create the NIS vary and may be different than the maximum retained in the NIS. No more than one percent of records have diagnoses excluded from the NIS in any given year.

The unit of analysis is the hospital discharge (i.e., the inpatient stay), not a person or patient. 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.

Case definition of sepsis by patient populations

Consistent with the Third International Consensus Definitions Task Force definition of Sepsis-3, the identification of inpatient stays related to sepsis was based on ICD-10-CM diagnoses indicating the presence of sepsis and organ dysfunction[a] Patients were divided into five mutually exclusive categories for the identification of inpatient stays related to sepsis with varying age and sepsis criteria: 1) maternal regardless of age, 2) adults 65 years and older, 3) adults 18–64 years, 4) pediatrics aged 28 days–17 years, and 5) neonates aged 0–27 days (Table 2).

The ICD-10-CM diagnoses codes used to identify sepsis 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.

[a] Singer M, Deutschman CS, Seymour CW, et al. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). *Jama.* 2016;315(8):801-810

Table 2. 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	65 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
Adult	No	18-64 years	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 65 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.

Sepsis as the reason for the inpatient stay

For this Statistical Brief, outcomes (mortality rates, hospital costs, length of stay, and discharge disposition) 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. Table 3 presents the number and percentage of inpatient stays involving sepsis. Information is presented for 2016–2019 as an average across years and with and without COVID-19

for 2020 and 2022. Additionally, information is presented separately for sepsis as the reason for the stay versus a co-occurring condition or complication of the stay.

Table 3. Number and Percentage of Inpatient Stays Involving Sepsis by Patient Population, 2016–2019, 2020, and 2022

Outcome and patient population	2016-2019 (Average)	2020 Overall (with and without COVID-19)	2020 with COVID-19	2020 without COVID-19	2022 Overall (with and without COVID-19)	2022 with COVID-19	2022 without COVID-19
Sepsis was the reason for the inpatient stay (principal diagnosis of sepsis)							
Number of sepsis stays							
All sepsis stays	1,415,885	1,743,905	299,505	1,444,400	1,775,605	260,685	1,514,920
Adult (65+ years), nonmaternal	872,371	1,043,445	168,015	875,430	1,111,920	170,215	941,705
Adult (18–64 years), nonmaternal	514,671	672,055	130,190	541,865	630,185	88,135	542,050
Maternal	1,234	1,185	115	1,070	1,205	125	1,080
Pediatric (28 days–17 years)	22,635	23,345	1,135	22,210	28,370	2,055	26,315
Neonatal (0–27 days)	4,974	3,875	50	3,825	3,925	155	3,770
Percent of all sepsis stays, %							
All sepsis stays	71.4	73.3	78.2	72.4	73.2	77.4	72.6
Adult (65+ years), nonmaternal	76.2	76.6	78.1	76.3	76.6	79.7	76.0
Adult (18–64 years), nonmaternal	69.3	71.6	78.9	70.1	70.4	74.0	69.8
Maternal	22.1	17.6	10.2	19.1	18.1	14.7	18.6
Pediatric (28 days–17 years)	71.2	74.1	76.4	74.0	76.4	70.6	76.9
Neonatal (0–27 days)	8.6	9.9	55.6	9.8	11.7	46.3	11.4
Sepsis as a co-occurring condition or complication of the stay (secondary diagnosis of sepsis)							
Number of sepsis-related inpatient stays							
All sepsis-related stays	567,834	634,830	83,360	551,470	649,125	76,140	572,985
Adult (65+ years), nonmaternal	273,081	319,400	47,035	272,365	340,185	43,395	296,790
Adult (18–64 years), nonmaternal	228,305	266,550	34,920	231,630	265,265	30,985	234,280
Maternal	4,359	5,550	1,015	4,535	5,455	725	4,730
Pediatric (28 days–17 years)	9,150	8,155	350	7,805	8,740	855	7,885
Neonatal (0–27 days)	52,939	35,175	40	35,135	29,480	180	29,300
Percent of all sepsis-related inpatient stays, %							
All sepsis-related stays	28.6	26.7	21.8	27.6	26.8	22.6	27.4
Adult (65+ years), nonmaternal	23.8	23.4	21.9	23.7	23.4	20.3	24.0
Adult (18–64 years), nonmaternal	30.7	28.4	21.1	29.9	29.6	26.0	30.2
Maternal	77.9	82.4	89.8	80.9	81.9	85.3	81.4
Pediatric (28 days–17 years)	28.8	25.9	23.6	26.0	23.6	29.4	23.1
Neonatal (0–27 days)	91.4	90.1	44.4	90.2	88.3	53.7	88.6

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), National Inpatient Sample (NIS), 2016–2020 and 2022

Please refer to Statistical Brief #306 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.