



# Examining Differences in Rural and Urban Medicare FFS Beneficiaries' Emergency Department Use Before and During COVID-19

Alana Knudson, PhD, Craig D. Holden, PhD, MPH, Marilyn Klug, PhD, Tricia Stauffer, MPH, Shena Popat, MHA

Emergency departments (EDs) play an important role in providing acute care and serving as safety nets in rural communities. The COVID-19 pandemic presented unprecedented challenges that considerably affected patient behavior and health care use. As health care providers and policymakers aim to optimize resource allocation to improve patient outcomes, understanding the shifts in ED use is crucial. This study examined changes in ED use from 2018 to 2022, focusing on how patterns of care shifted from before to during the COVID-19 pandemic in rural and urban settings.

The study examined factors such as patient demographics, primary diagnoses, and admission sources to understand the impact of COVID-19 on ED use. Study findings may also inform health policy and resource allocation to support rural health care providers' preparedness planning efforts to improve their readiness to respond and recover from the next public health emergency or disaster that affects rural communities.

## Background

Emergency departments treat patients with urgent and acute conditions or severe injuries. However, EDs also fill the role of safety net providers for many patients.<sup>1,2</sup> Complicating the role EDs play in urgent and acute care, more than one third of all visits to EDs are non-urgent and could be treated in other care settings.<sup>3</sup> There are a multitude of reasons that EDs are used for non-urgent medical issues, including convenience and accessibility, lack of available alternatives such as urgent care centers, no usual source of primary care among patients or difficulty getting appointments with primary care providers, and other reasons including the legal requirement that EDs treat all patients without regard to ability to pay.<sup>4,5</sup> An analysis of the National Hospital Ambulatory Medical Care Survey Data found that rural ED visits increased by more than 50 percent from 2005 to 2016, far outpacing the 6 percent increase of urban ED visits, reflecting the safety net role of EDs in rural

## Key Takeaways

- During the COVID-19 pandemic, there was an 8% increase in ED use among rural Medicare Fee-for-Service (FSS) beneficiaries and an 8.5% increase among their urban counterparts.
- Emergency Department use among dual eligibles (Medicare and Medicaid coverage) declined among rural (-6.3%) and urban (-3.3%) beneficiaries.
- ED visits resulting in hospital admissions and deaths significantly increased during COVID-19. Specifically, rural EDs experienced a nearly 30 percent increase in patient deaths and a 17.2% increase in patients admitted for inpatient hospital care following an ED visit.

communities.<sup>6</sup> This safety net role is particularly crucial in rural areas due to primary care provider shortages and disproportionately poor health outcomes.<sup>7</sup>

The spread of SARS-CoV-2 caused by the novel coronavirus disease in 2020 (COVID-19) led to a surge in patients with acute respiratory symptoms seen in hospitals across the United States. As a result, state officials across the country issued stay at home orders and restricted elective medical and surgical procedures to redirect constrained hospital resources to COVID-19 patients and mitigate the spread of the virus. As a result, outpatient visits and ED visits declined nationwide from March to April 2020. There was almost a 60 percent decrease in health care services used by June 2020 with EDs experiencing some of the greatest declines in utilization.<sup>8,9</sup> Indecision and uncertainty around evolving recommendations throughout the early period of COVID-19 resulted in people with medical emergencies avoiding EDs and delaying necessary health care.<sup>10,11</sup>

This study examines how rural and urban ED use transitioned and adjusted from before to during the COVID-19 pandemic (2018 – 2022). The study describes the demographic, eligibility status, and health service characteristics associated with ED service use changes and their relationship to communities experiencing disruptive changes.

## Methods

### *Data Sources and Variables*

This study was designed as a cross-sectional comparative analysis to identify shifts in ED utilization patterns before and during the COVID-19 pandemic. Medicare Fee-for-Service (FFS) inpatient and outpatient claims from January 2018 to December 2022 were used in the analyses. The pre-COVID period was defined as January 2018 to February 2020, while the during-COVID period was from March 2020 to December 2022. Demographic data come from the Medicare Master Beneficiary Summary File, including age, sex, and dual status (Medicare-Medicaid) during the study period. Rural or urban status was categorized using the Federal Office of Rural Health Policy ZIP code list as of April 2023.

The main outcome of interest was the frequency and characteristics of ED visits. We used revenue center codes to identify emergency department (ED) visits, which included care provided at various facilities, including prospective payment system (PPS) hospitals, critical access hospitals (CAHs), community health clinics, and federally qualified health centers. Our analysis included emergency care from facilities beyond PPS hospitals and CAHs to comprehensively assess rural emergency care. This inclusion aimed to evaluate if the care in these additional settings differed significantly from that in traditional settings. Although these visits represented a minor portion of the total claims (less than 0.5 percent), their inclusion provided a complete assessment of rural emergency care. Additional variables included the length of ED stays, source of admission, and patient demographics. The study included Medicare FFS beneficiaries aged 65 and older who were covered by Medicare FFS for the entire research period and who visited the ED during that time. Medicare beneficiaries with even one month of Part C (Medicare Advantage) coverage and those who had no ED visits during the study period were excluded. Provider-level characteristics, such as rural or urban ZIP code designation and type of hospital, were included in the analysis.

### **Data Aggregation**

Data were aggregated at both the beneficiary and provider levels. Counts of ED visits during the pre-COVID and during-COVID periods were calculated for each beneficiary. Rural or urban status, as well as age, was determined based on the last ED visit in each respective period.

### **Statistical Analysis**

To answer the research questions, we employed a series of statistical analyses. Descriptive statistics were used to outline basic trends in the data. Chi-square tests were conducted to compare categorical variables such as rural and urban, ED use, and mortality rates. Continuous variables, such as length of stay, were compared using t-tests. By combining these methods, we aimed to provide a comprehensive view ED use patterns from pre-COVID to during the COVID-19 pandemic.

## **Findings**

### **Characteristics of Medicare FFS Beneficiaries**

We studied 3,936,629 rural and 10,205,050 urban Medicare FFS beneficiaries in the pre-COVID period, and 4,312,534 rural and 11,299,833 urban Medicare FFS beneficiaries in the during-COVID period. **Table A1** (Appendix) shows the prevalence of rural and urban beneficiaries in both periods by demographic and health care use characteristics.

The average age for rural beneficiaries was 73.2 years with a standard deviation (SD) of 12.7 in the pre-COVID period, and 73.4 years with a standard deviation of 12.2 during COVID. For urban beneficiaries, the corresponding ages were 73.9 years (SD 12.9) pre-COVID and 74.1 years (SD 12.3) during COVID. Over a quarter of the beneficiaries in both categories were 81 years or older.

There were slightly more females in both the rural/urban and time frame categories. Specifically, females made up 54.0 percent of rural and 55.9 percent of urban beneficiaries pre-COVID, and 53.7 percent rural and 55.2 percent urban beneficiaries in the during-COVID period. About one in four beneficiaries were classified as having Medicare-Medicaid dual status, and we observed a slight decrease in the during-COVID period – from 27.1 percent to 23.5 percent in rural areas and from 24.6 percent to 21.8 percent in urban areas.

In terms of ED visits, fewer than half of beneficiaries had only one visit in both time frames. There was a slight increase in the number of beneficiaries with four or more visits in the during-COVID period, rising slightly from 23.6 percent to 24 percent in rural areas and from 22 percent to 22.1 percent in urban areas.

### **Patterns of ED Use by Beneficiary**

We examined the patterns of ED use among rural and urban Medicare FFS beneficiaries both pre-COVID and in the during-COVID period (shown in **Table A2** in the appendix). Overall, there was an 8.0 percent increase in ED utilization for rural beneficiaries and an 8.5 percent increase for their urban counterparts.

Males exhibited a higher rate of increase in ED use as compared to females. Specifically, rural male beneficiaries' ED use increased by 8.5 percent and their urban counterparts had a 10.0 percent increase,

compared to a 7.6 percent and 7.3 percent increase among rural and urban female beneficiaries, respectively.

The age group that showed the largest increase in ED utilization was those between 71 and 80 years. Among rural beneficiaries, those aged 71-75 showed the highest increase in ED use (16.5 percent), followed by those aged 76-80 at 12.4 percent. For urban beneficiaries, those in the 71-75 age range again had the highest increase at 18.3 percent, followed by the 76-80 age group at 15.6 percent.

The patterns in ED use differed markedly when examined through various beneficiary, facility, and visit attributes. **Table 1** shows changes and differences in ED use between pre- and during-COVID time periods and rural and urban beneficiaries, with changes greater than 25% denoted in gray. Specifically, dual-status beneficiaries (those eligible for both Medicare and Medicaid) exhibited a decline in ED use from the pre-COVID to the during-COVID period. This decrease was more pronounced among rural beneficiaries (6.3 percent) as compared to the decrease among their urban counterparts (3.3 percent).

**Table 1: Utilization of ED Pre- and During-Covid by Rural and Urban Medicare FFS Beneficiaries**

		Rural		Urban		Pre to During Change (%)		Difference in Rural and Urban Percentages (%)
		Visits Pre	Visits During	Visits Pre	Visits During			
		N	N	N	N	Rural	Urban	
<b>Total</b>		11,364,349	12,277,961	28,425,422	30,846,917	8.0	8.5	-0.5
<b>Dual Status</b>	Yes	4,161,736	3,897,753	9,687,066	9,371,902	-6.3	-3.3	-3.1
	No	7,202,613	8,380,208	18,738,356	21,475,015	<b>16.3</b>	<b>14.6</b>	1.7
<b>Number of ED Visits per beneficiary</b>	1	1,663,978	1,788,239	4,528,584	4,998,599	7.5	10.4	-2.9
	2	858,248	946,199	1,207,150	2,455,473	10.2	<b>11.3</b>	-1.0
	3	485,869	540,978	1,223,322	1,358,183	<b>11.3</b>	<b>11.0</b>	0.3
	4+	928,534	1,037,118	2,245,994	2,487,578	<b>11.7</b>	<b>10.8</b>	0.9
<b>CAH ED Visits</b>	No	8,721,549	9,194,317	28,072,144	30,423,697	5.4	8.4	-3.0
	Yes	2,642,800	3,083,644	353,278	423,220	<b>16.7</b>	<b>19.8</b>	-3.1
<b>PPS ED Visits</b>	No	2,686,073	3,124,799	521,019	587,844	<b>16.3</b>	<b>12.8</b>	3.5
	Yes	8,678,276	9,153,162	27,904,403	30,259,073	5.5	8.4	-3.0
<b>Admission Source for ED Visit</b>	Amb only	3,183,153	3,453,315	8,286,377	9,104,707	8.5	9.9	-1.4
	SNF only	176,148	196,062	375,672	524,944	<b>11.3</b>	<b>39.7</b>	<b>-28.4</b>
	SNF & Amb	479,912	559,851	992,197	1,277,990	<b>16.7</b>	<b>28.8</b>	<b>-12.1</b>
	SNF	656,060	755,913	1,367,869	1,802,934	<b>15.2</b>	<b>31.8</b>	<b>-16.6</b>
	Other	7,525,136	8,068,733	18,771,176	19,939,276	7.2	6.2	1.0
<b>ED Visit (LOS) &gt; 1 Day</b>	Yes	331,659	375,439	849,308	896,275	<b>13.2</b>	5.5	7.7
	No	11,032,690	11,902,522	27,576,114	29,950,642	7.9	8.6	-0.7
<b>ED Visit Discharge Type</b>	Death	213,450	276,961	630,208	838,933	<b>29.8</b>	<b>33.1</b>	-3.4
	Inpatient	165,025	193,360	364,580	449,196	<b>17.2</b>	<b>23.2</b>	-6.0
	SNF	3,527,618	3,812,185	10,334,773	11,357,622	8.1	9.9	-1.8
	Other	7,458,256	7,995,455	17,095,861	18,201,166	7.2	6.5	0.7

Notes: Change in pre- to during-COVID ED use greater than 10% bolded; changes greater than 25% further emphasized by denoting cells in gray. Ambulance (Amb); critical access hospital (CAH); emergency department (ED); prospective payment system hospital (PPS); skilled nursing facility (SNF).

In contrast, Medicare FFS beneficiaries who were not dual eligibles (those with Medicare and Medicaid coverage) experienced a significant increase in ED use – rural Medicare FFS beneficiaries had an increase of 16.3 percent, while their urban counterparts had a 14.6 percent increase. CAH ED use surged for both rural and urban Medicare FFS beneficiaries, with rural beneficiaries using CAH EDs experiencing an increase of 16.7 percent compared to 19.8 percent in urban beneficiaries using CAH EDs. However, PPS ED use was notably different, and the increase was considerably less – 5.5 percent in rural Medicare FFS beneficiaries using PPS EDs and 8.4 percent in urban beneficiaries using PPS EDs.

The source of admission accounted for a significant portion of the difference observed in ED use. The most significant change was noted among patients admitted from Skilled Nursing Facilities (SNF). For rural EDs, the increase was 15.2 percent, but in urban EDs the increase was 31.8 percent – an absolute

difference of 16.6 percent. Patients with both ambulance and SNF sources of admission to the ED also showed large changes in utilization (16.7 percent in rural and 28.8 percent in urban EDs).

The length of stays (LOS) in EDs also varied. ED visits that extended beyond a day (24 hours) increased by 13.2 percent in rural EDs, whereas urban EDs LOS increased by 5.5 percent.

Two ED patient discharge types – patients who died in the ED and patients who were admitted for inpatient hospital care following an ED visit increased between 33.1 and 17.2 percent, respectively. Rural EDs experienced a nearly 30 percent increase in patient deaths and a 17.2 percent increase in patients admitted to inpatient care following an ED visit. In comparison, urban EDs saw higher increases in both metrics, with a 33.1 percent increase in patient deaths and a 23.2 percent increase in admissions to inpatient care. The absolute difference in increases of deaths in the ED was 3.4 percent higher for rural EDs than for urban EDs. Likewise, rural EDs had a 6.0 percent higher increase in admitting patients to inpatient hospital care following an ED visit than urban EDs.

### ***ED Use of Common Diagnoses among Rural and Urban Medicare FFS Beneficiaries***

The analysis of ED utilization by primary diagnoses offers additional insight into how health needs shifted during the COVID-19 pandemic for both rural and urban Medicare FFS beneficiaries. **Table 2** shows changes in use across six common diagnoses. The diagnoses included in our analyses varied considerably from pre-COVID to during COVID. Among these diagnoses, sepsis differed the greatest between rural and urban EDs. Rural hospitals had a 10.0 percent increase in ED visits for sepsis, while urban hospitals experienced an increase of 17.7 percent.

**Table 2: Use of ED Pre- and During-COVID by Rural and Urban Medicare FFS Beneficiaries by Common Diagnoses**

	Rural		Urban		Pre to During Change (%)		Rural to Urban Change Diff. (%)*
	Pre	During	Pre	During			
	N	N	N	N	Rural	Urban	
<b>Total</b>	11,364,349	12,277,961	28,425,422	30,846,917	8.0	8.5	-0.5
<b>Sepsis</b>	380,166	418,358	1,236,777	1,455,271	10.0	<b>17.7</b>	-7.6
<b>COPD</b>	292,991	195,278	495,379	315,658	<b>-33.4</b>	<b>-36.3</b>	2.9
<b>Back Pain</b>	228,035	233,411	542,848	535,613	2.4	-1.3	3.7
<b>Urinary</b>	306,962	312,881	684,944	656,544	1.9	-4.1	6.1
<b>Pain in throat and chest</b>	482,671	481,010	1,132,638	1,136,162	-0.3	0.3	-0.7
<b>Abdominal or pelvic pain</b>	255,827	274,913	647,228	679,152	7.5	4.9	2.5

\*A negative percentage indicates that rural EDs had a smaller change than urban EDs between pre-COVID and during-COVID time periods.

Notes: Change in pre- to during-COVID ED use greater than 10% bolded; changes greater than 25% further emphasized by denoting cells in grey.

Conversely, COPD diagnoses had a sharp decrease in both rural and urban EDs, falling by 33.4 percent and 36.3 percent respectively. The absolute difference between rural and urban EDs was a modest 2.9 percent, indicating similar trends in both rural and urban communities. Back pain diagnoses showed a

slight increase of 2.4 percent in rural EDs and a small decrease of 1.3 percent in urban EDs, resulting in an absolute difference of 3.7 percent.

Another diagnosis, urinary issues, presented a distinct pattern. Rural EDs had a slight uptick of 1.9 percent, while urban EDs had a decrease of 4.1 percent. This was an absolute difference of 6.1 percent, suggesting that rural EDs experienced an increase in these types of diagnoses compared to a decrease in urban EDs. For pain in the throat and chest diagnoses, ED visits remained relatively stable. There was a slight decrease of 0.3 percent in rural EDs and a minor increase of 0.3 percent in urban EDs, making for an absolute difference of -0.7 percent.

Lastly, abdominal and pelvic pain diagnoses increased in both rural and urban EDs. Rural EDs experienced a 7.5 percent rise, while urban EDs had a 4.9 percent increase.

Overall, the analysis revealed differences in health care utilization patterns between rural and urban Medicare FFS beneficiaries before and during the pandemic. Diagnoses related to sepsis and COPD showed notable changes, while other types of diagnoses remained relatively stable or even decreased. Importantly, these trends demonstrate how the impact of the pandemic on ED utilization was not uniform and varied substantially depending on the specific diagnosis and geographical location.

### ***Changes in ED Use***

Heat maps offer a nuanced way of summarizing and showing how ED use varied by primary diagnosis and visit attributes, visually displaying distinct patterns for rural and urban patients. Overall, patients with dual (Medicare and Medicaid) coverage experienced less than a 10 percent change in ED use, while those with Medicare FFS coverage had a more substantial increase, exceeding 20 percent. Regarding the number of visits, patients who visited the ED four or more times during the pre-COVID period showed minimal change in utilization patterns, whereas those with fewer ED visits during pre-COVID experienced a 25 percent to 50 percent increase in use in the during-COVID period. ED use remained largely stable between CAHs and PPS hospitals, with about a 10 percent change. In terms of how Medicare FFS beneficiaries arrived at the ED (i.e., arrival source is a claim variable), those patients arriving by ambulance or other means showed less than a 10 percent change, while patients arriving from SNFs increased by more than 30 percent. Duration of ED visits also varied, with stays up to a day in length changing minimally, whereas stays longer than a day rose substantially—75 percent for rural patients and 50 percent for their urban counterparts.

**Figure 1** summarizes diagnosis-specific trends. COPD patients experienced a decline in ED utilization by at least 20 percent, as indicated by the darker blue in both the rural and urban columns of the heat map, with a large 38 percent decrease for rural patients arriving from SNFs compared to a 25 percent decrease for urban patients. In contrast, back pain patients showed less than 10 percent change across analyzed variables. However, rural ED patients experienced a slight increase in being subsequently admitted for inpatient care, while urban ED patients saw a 25 percent increase in SNF admissions. For patients with urinary diagnoses, ED utilization across most analyzed variables remained stable. However, only rural patients showed an increase (14.7 percent) in the proportion of patients with a urinary diagnosis who died in the ED. Patients with throat or abdominal pain experienced minimal changes across most attributes, but ED patients who were admitted to inpatient hospital care or discharged to SNFs decreased

by over 10 percent. Lastly, for abdominal or pelvic pain, while most variables were stable, urban patients had an increase of over 10 percent in SNF admissions following an ED visit.

**Figure 1: ED Use for Rural and Urban Beneficiaries**

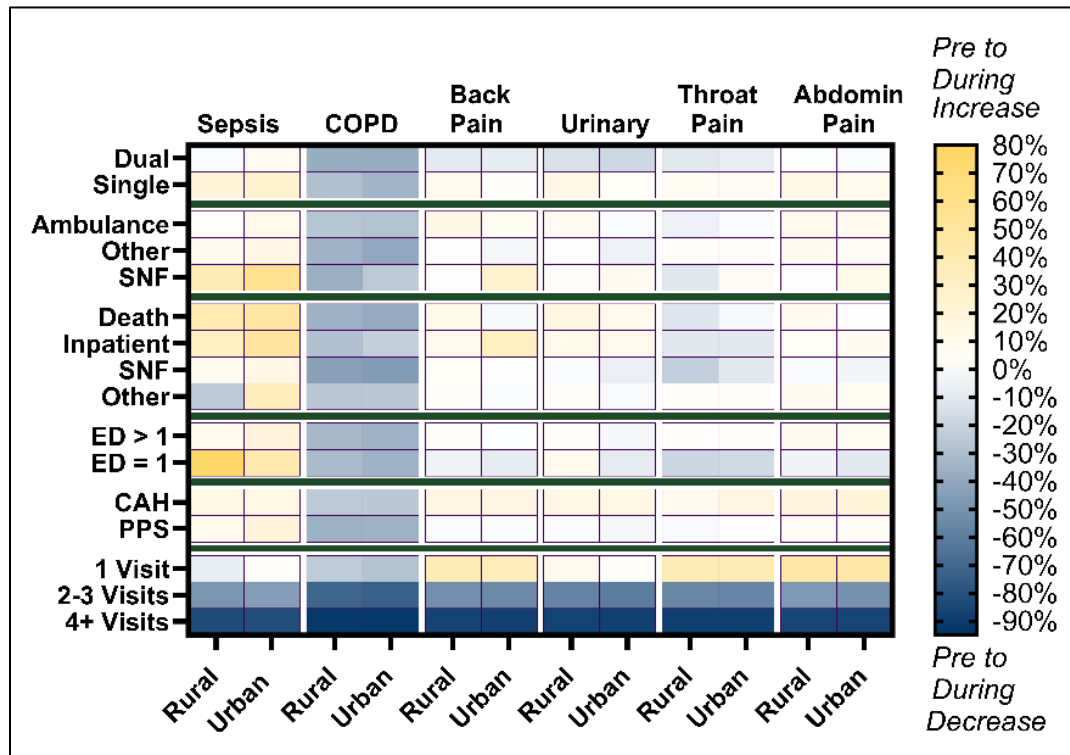
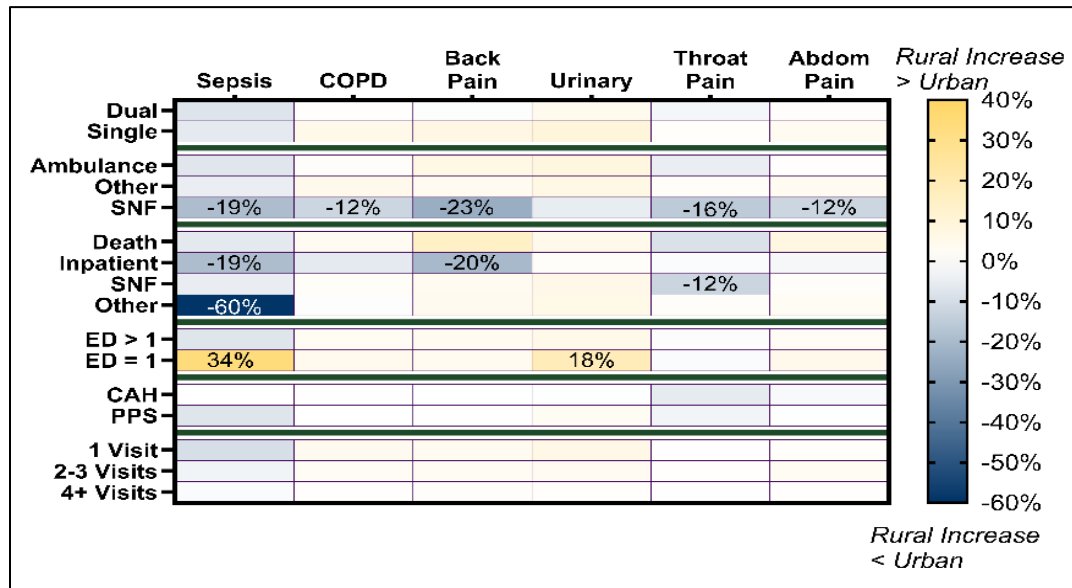


Figure 2 provides a summary of the differences in rural and urban ED use shown in Figure 1. While overall differences were minor, a difference was observed in individuals who commonly used EDs pre-COVID. These individuals notably reduced their ED visits during the pandemic in both rural and urban areas. In terms of sepsis cases, urban EDs saw a greater increase compared to rural EDs. Moreover, rural patients with sepsis typically had a single ED visit, as indicated by the darker orange in rural columns of the heat map. The heat maps offer valuable insights for health care providers and policymakers, illuminating both broad and specific shifts in health care needs, such as the decline in ED visits among beneficiaries with a COPD diagnosis. Both rural and urban EDs saw higher rates of patient deaths and admissions to inpatient hospital care, with urban EDs experiencing these increases more markedly.



Figure 2: Rural-Urban Differences in ED Use



## Conclusion

This study's findings provide a comprehensive analysis of ED utilization among rural and urban Medicare FFS beneficiaries before and during the COVID-19 pandemic. By exploring variations in ED use based on beneficiary characteristics, facility types, visit attributes, and primary diagnoses, the research findings show changes in health care behavior that have implications for health policy, preparedness planning, and resource allocation.

A key finding was the disproportionate impact of the pandemic on rural and urban beneficiaries. For instance, ED visits for some diagnoses, such as sepsis, significantly increased among urban beneficiaries as compared to rural beneficiaries. Conversely, rural and urban beneficiaries with COPD were less likely to seek ED care, indicating that federal guidance to limit ED visits issued during the pandemic may have affected COPD care seeking behavior. Likewise, rural and urban dual eligibles also experienced a decrease in ED visits during COVID-19. These findings provide valuable insights for policymakers, and public health and health care practitioners who provide guidance on accessing health care services during public health emergencies and other disasters.

Another important observation was the increase in SNF patients seeking care in the ED for diagnoses such as sepsis and back pain, particularly among urban SNF patients. These diagnoses may indicate quality of care issues, such as inadequate staffing available to care for the needs of SNF patients.

Further, our analyses revealed a shift in the nature and outcomes of ED visits, including increased rates of discharges to inpatient hospital care and death. These trends underscore the heightened severity of conditions that led individuals to seek emergency care during the pandemic. Given these increases, there is an urgent need for improving risk communication regarding accessing health care in a timely manner. Similar to other studies, we found that some patients delayed seeking care to the point of requiring hospitalization or even death. It is important to explore ways to enhance the effectiveness of our public health and health care messages during crises, ensuring that people receive timely care to prevent the

worsening of health conditions and reduce the risk of premature death. Lastly, the variations in ED use by the number of visits, duration of stay, and discharge types indicate that resource allocation strategies must be dynamic and adaptable to changing health care landscapes. For example, the significant increase in longer ED stays among rural patients suggests these facilities may require additional resources to support surge capacity to care for complex cases effectively, such as intensive care resources (e.g., equipment and staff).

The COVID-19 pandemic exerted significant pressure on EDs, evidenced by overcrowding, provider shortages, and the EDs often being the only accessible health care option for COVID-19 patients. These challenges likely contributed to the observed increases in length of stay and deaths. Additionally, the rapid progression of illness in SNF residents during the pandemic may have led to a surge in ED visits from these facilities, further straining the emergency care system.

Policymakers at the local, state, and national levels can leverage this study's findings from the COVID-19 response to inform preparedness planning activities including policies, resource allocation (e.g., access to negative pressure rooms, ventilators, and personal protective equipment), and training (e.g., risk communication and preparedness exercises to test health care response capacity). In addition, as public health and health care systems move forward with preparedness planning and response efforts, it is essential to ensure the needs of those who are at highest risk, such as SNF residents, are thoughtfully addressed in a timely manner.

## Limitations

While our study provides important insights into health care use across rural and urban settings, several limitations of CMS Administrative Data must be considered. First, the data only captures diagnosed conditions, which means under-diagnosed conditions may not be fully represented. Second, the data may not always provide a comprehensive view of a patient's needs or the full scope of care received. For example, services that providers expect to be denied for payment may not be consistently billed or recorded.

The data also lacks clinical measurements like blood pressure and results of common diagnostic tests, rendering it difficult to gauge the severity or timing of medical events. Procedure coding varies by care setting, introducing inconsistencies in how procedures are recorded. The quality of recorded data can also vary, particularly when the data impacts payment; therefore, variables such as comorbidity and severity of illness may be inconsistently recorded.

This project was supported by the Health Resources and Services Administration (HRSA), U.S. Department of Health and Human Services (HHS) under the grant number U1CRH39978 Rural Health Research Grant Cooperative Agreement. The information or content and conclusions are those of the authors and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the U.S. Government.



ETSU/NORC RURAL HEALTH  
RESEARCH CENTER

## References

1. Uscher-Pines L, Pines J, Kellermann A, Gillen E, Mehrotra A. Emergency department visits for nonurgent conditions: systematic literature review. *Am J Manag Care*. 2013;19(1):47-59.
2. Durand AC, Gentile S, Devictor B, et al. ED patients: how nonurgent are they? Systematic review of the emergency medicine literature. *Am J Emerg Med*. 2011;29(3):333-345. doi:10.1016/j.ajem.2010.01.003
3. Giannouchos TV, Washburn DJ, Kum HC, Sage WM, Ohsfeldt RL. Predictors of Multiple Emergency Department Utilization Among Frequent Emergency Department Users in 3 States. *Med Care*. 2020;58(2):137-145. doi:10.1097/MLR.0000000000001228
4. Brousseau D, Nimmer M, Yunk N, Nattinger A, Greer A. Nonurgent Emergency-Department Care: Analysis of Parent and Primary Physician Perspectives. Published February 2011. Accessed July 14, 2023. <https://publications.aap.org/pediatrics/article-abstract/127/2/e375/65222/Nonurgent-Emergency-Department-Care-Analysis-of?redirectedFrom=fulltext?autologincheck=redirected>
5. Vogel JA, Rising KL, Jones J, Bowden ML, Ginde AA, Havranek EP. Reasons Patients Choose the Emergency Department over Primary Care: a Qualitative Metasynthesis. *J Gen Intern Med*. 2019;34(11):2610-2619. doi:10.1007/s11606-019-05128-x
6. Greenwood-Ericksen MB, Kocher K. Trends in Emergency Department Use by Rural and Urban Populations in the United States. *JAMA Netw Open*. 2019;2(4):e191919. doi:10.1001/jamanetworkopen.2019.1919
7. Eighteenth Annual Report to the Secretary of the U.S. Department of Health and Human Services and the U.S. Congress.
8. Mehrotra A, Chernew ME, Linetsky D, Hatch H, Cutler DM, Schneider EC. The Impact of COVID-19 on Outpatient Visits in 2020: Visits Remained Stable, Despite a Late Surge in Cases. doi:10.26099/bvvhf-e411
9. Hartnett KP. Impact of the COVID-19 Pandemic on Emergency Department Visits — United States, January 1, 2019–May 30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69. doi:10.15585/mmwr.mm6923e1
10. Jeffery MM, D'Onofrio G, Paek H, et al. Trends in Emergency Department Visits and Hospital Admissions in Health Care Systems in 5 States in the First Months of the COVID-19 Pandemic in the US. *JAMA Intern Med*. 2020;180(10):1328-1333. doi:10.1001/jamainternmed.2020.3288
11. Wong L, Hawkins J, Langness S, Murrell K, Iris P, Sammann A. Where Are All the Patients? Addressing Covid-19 Fear to Encourage Sick Patients to Seek Emergency Care. *NEJM Catal Innov Care Deliv*. Published online May 14, 2020. doi:10.1056/CAT.20.0193

12. Medicare and Medicaid Programs: Minimum Staffing Standards for Long-Term Care Facilities and Medicaid Institutional Payment Transparency Reporting (CMS 3442-P) | CMS. (n.d.). Retrieved October 12, 2023, from <https://www.cms.gov/newsroom/fact-sheets/medicare-and-medicaid-programs-minimum-staffing-standards-long-term-care-facilities-and-medicaid?tcs-token=3a36881f45261b1343335f85aef9e93df5cb5e16dceb3cc29b85254a015b77e2>

## Appendix

**Table A1: Descriptives of Beneficiaries using ED pre- or during-COVID**

		Pre COVID				During COVID			
		Rural N = 3,936,629		Urban N = 10,205,050		Rural N = 4,312,534		Urban N = 11,299,833	
		N	%	N	%	N	%	N	%
Age	<65	736,277	18.7%	1,759,067	17.2%	741,819	17.2%	1,789,751	15.8%
	65-70	753,612	19.1%	1,892,899	18.5%	853,031	19.8%	2,145,321	19.0%
	71-75	716,909	18.2%	1,837,353	18.0%	848,037	19.7%	2,203,877	19.5%
	76-80	616,948	15.7%	1,567,369	15.4%	691,005	16.0%	1,814,258	16.1%
	81+	1,112,883	28.3%	3,148,362	30.9%	1,178,642	27.3%	3,346,626	29.6%
Sex	Male	1,810,151	46.0%	4,500,007	44.1%	1,997,827	46.3%	5,062,870	44.8%
	Female	2,126,478	54.0%	5,705,043	55.9%	2,314,707	53.7%	6,236,963	55.2%
Dual Status	Yes	1,065,940	27.1%	2,506,163	24.6%	1,011,978	23.5%	2,467,854	21.8%
	No	2,870,689	72.9%	7,698,887	75.4%	3,300,556	76.5%	8,831,979	78.2%
Number of Visits to ED	1	1,663,978	42.3%	4,528,584	44.4%	1,788,239	41.5%	4,998,599	44.2%
	2	858,248	21.8%	1,207,150	21.6%	946,199	21.9%	2,455,473	21.7%
	3	485,869	12.3%	1,223,322	12.0%	540,978	12.5%	1,358,183	12.0%
	4+	928,534	23.6%	2,245,994	22.0%	1,037,118	24.0%	2,487,578	22.0%

Note: Emergency department (ED).

**Table A2: Utilization of ED pre- and during-COVID by Rural and Urban Patients by Demographics**

		Rural		Urban		% Change in Pre to During		Abs. Diff.
		Pre	During	Pre	During			
		N	N	N	N	Rural	Urban	
Total		11,364,349	12,277,961	28,425,422	30,846,917	8.0%	8.5%	-0.5%
Sex	Male	5,151,572	5,590,787	12,547,616	13,804,564	8.5%	10.0%	-1.5%
	Female	6,212,777	6,687,174	15,877,806	17,042,353	7.6%	7.3%	0.3%
Age	<=65	2,685,708	2,681,157	6,651,195	6,685,583	-0.2%	0.5%	-0.7%
	66-70	1,848,707	2,070,678	4,465,650	5,012,065	12.0%	12.2%	-0.2%
	71-75	1,854,703	2,160,573	4,462,816	5,281,238	16.5%	18.3%	-1.8%
	76-80	1,714,122	1,925,892	4,072,806	4,706,741	12.4%	15.6%	-3.2%
	81+	3,261,109	3,439,661	8,772,955	9,161,290	5.5%	4.4%	1.0%

Notes: Emergency department (ED). All observed differences were statistically significant to the  $p < 0.001$  level.