Ground Ambulance Industry Trends, 2017–2022

Analysis of Medicare Fee-for-Service Claims

April 2024

Research Report

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Analysis of Medicare Fee-for-Service Claims

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Executive Summary

Section 50203(b) of the Bipartisan Budget Act of 2018 amended section 1834(1)(17)(A) of the Social Security Act to require the Centers for Medicare & Medicaid Services (CMS) to collect cost, revenue, utilization, and other information from representative samples of ground ambulance organizations. To meet this requirement, CMS developed the Medicare Ground Ambulance Data Collection System (GADCS) and used a stratified sampling approach to select four representative cohorts of organizations covering nearly all of the over 10,000 organizations that bill Medicare annually. CMS' sampling approach aimed to ensure that the selected organizations were representative across four key organizational characteristics: (1) enrollment as a Medicare provider versus supplier, (2) ownership category, (3) service area population density, and (4) volume of Medicare ground ambulance transports.[1]

CMS selected the first two annual GADCS cohorts using Medicare fee-for-service claims and enrollment data from 2017 and 2018, respectively, and the third and fourth annual cohorts using data from 2020. As a result of the coronavirus disease 2019 (COVID-19) public health emergency, CMS delayed some GADCS selection, data collection, and reporting timelines to allow ground ambulance organizations to focus on their operations and patient care. The later GADCS data collection and reporting timelines raise important questions regarding the extent to which GADCS cohorts, which were selected using historical data, generalize to more recent cohorts of organizations.

To explore whether ground ambulance organizations have changed over time, including through the COVID-19 pandemic, we examined trends in transport volume (i.e., the number of ground ambulance transports paid for by Traditional [fee-for-service] Medicare) and the characteristics of organizations billing Medicare for ground ambulance services from 2017 through 2022. These analyses of changes in ground ambulance organizations over time focused on the four characteristics included in CMS' sampling approach. Of these four organizational characteristics, transport volume may be the most likely to change over time. A prior analysis of Medicare fee-for-service claims found a gradual reduction in transport volume between 2017 and 2019 and a substantial decline from late 2019 through 2020, coinciding with the onset of the

[1] We use the term *Medicare ground ambulance transports* to refer to separately billed Medicare ground ambulance services, excluding the ground ambulance mileage Healthcare Common Procedure Coding System (HCPCS) code A0425. In some cases, HCPCS codes listed on the Ambulance Fee Schedule do not explicitly involve a patient transport, for example, in the case of paramedic intercept services.

COVID-19 pandemic.[2] Utilization of health care services generally declined across most service categories, including emergency department visits, inpatient stays, and ambulatory care, over the same early-pandemic period.[3] (Although other studies show utilization has returned to near-prepandemic levels for many categories of health care services, little is known about the postpandemic recovery for Medicare ground ambulance services.)

For this analysis, we combined Medicare fee-for-service claims data; CMS' Medicare Provider Enrollment, Chain, and Ownership System data; and Medicare enrollment data. The analysis presented here focuses on 2017 through 2022. Our analytic approach also explored how Medicare Advantage (MA) enrollment growth over time could affect the volume of Traditional Medicare ground ambulance transports. Furthermore, we assessed which International Classification of Diseases, Tenth Revision, Clinical Modification diagnosis codes were most frequently reported with Medicare fee-for-service claims for ground ambulance transports and explored how these lists of diagnosis codes changed between 2017 and 2022. Finally, we examined the share of transports that were to or from an end-stage renal disease (ESRD) facility for each year.

We found that the volume of Traditional Medicare transports declined considerably over time, from more than 14.6 million transports in 2017 to fewer than 10.8 million in 2022. Although the largest portion of the decrease in overall transport volume occurred during the start of the COVID-19 pandemic in 2020, this trend continued in 2021 and 2022, even as health care use in other sectors returned to nearly prepandemic levels.[4] The other organizational characteristics remained fairly consistent over time, although there were slight changes in the distribution of ground ambulance organizations across ownership type categories, with decreasing proportions of non-profit and increasing proportions of government organizations.

We found that adjusting for county-level changes in the percentage of Medicare beneficiaries enrolled in Traditional Medicare (as opposed to MA plans) from 2017 to 2022 explained roughly two-thirds of observed declines in Traditional Medicare ground ambulance transports over the same period. We also found a sharp decline in the share of Traditional Medicare ground ambulance transports to or from ESRD facilities over time. This share remained fairly steady (around 16 percent) from 2017 through 2021. However, we found a sharp decrease in 2022, with only 9.5 percent of all transports being to or from an ESRD facility. The recent expansion of MA

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[2] Andrew W. Mulcahy, Christine Buttorff, Jonathan Cantor, J. Scott Ashwood, Sara E. Heins, and Jennifer Gildner, *Ground Ambulance Industry Trends, 2017–2020: Analysis of Medicare Fee-for-Service Claims*, Task Order No. HHSM-500-T0052, November 2022.

[3] Matt McGough, Krutika Amin, and Cynthia Cox, "How Has Health Care Utilization Changed Since the Pandemic?" Kaiser Family Foundation, January 24, 2023.

[4] Changes in the distribution of ground ambulance organizations across Medicare ground ambulance transport volume categories also reflect a gradual decline in transport volume. We found that the share of organizations in the low and medium volume categories increased over time. McGough, Amin, and Cox, 2023.

eligibility to include newly enrolling beneficiaries with ESRD (as part of the 21st Century Cures Act) may have contributed to this decrease in 2022.

In sum, this analysis found only slight changes in ground ambulance organizational characteristics from 2017 to 2022, with the exception of a long-term, gradual decline in Traditional Medicare transport volume. Analyses using GADCS data could consider implementing such methodological approaches as weighting to account for this trend when describing results in terms that are most relevant to the current population of Medicare ground ambulance organizations.

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Introduction

The Centers for Medicare & Medicaid Services (CMS) developed the Medicare Ground Ambulance Data Collection System (GADCS) in response to a new data collection requirement introduced by the Bipartisan Budget Act of 2018, which amended the Social Security Act ("the Act").[5] Section 1834(l)(17) of the Act required the Secretary of the U.S. Department of Health and Human Services (HHS) to develop a new system to collect cost, revenue, utilization, and other information from representative samples of ground ambulance organizations over four years. CMS finalized a sampling approach and a survey-based data collection instrument to collect the necessary information in the calendar year (CY) 2020 Physician Fee Schedule (PFS) final rule (84 FR 62864 through 62897).[6] CMS refers to the instrument and a web-based portal for reporting data collectively as the *GADCS*. Ultimately, the Medicare Payment Advisory Commission (MedPAC) will use the data to assess the adequacy of Medicare's payments for ground ambulance services and geographic variations in the cost of furnishing such services.

Section 1834(l)(17)(B)(ii) of the Act requires that the GADCS data be collected from "representative sample(s)" of ground ambulance organizations that are "representative of the different types of providers and suppliers of ground ambulance services . . . and the geographic locations in which ground ambulance services are furnished."[7] CMS developed a stratified sampling approach based on historical Medicare fee-for-service claims data and enrollment data to ensure coverage across four key organizational characteristics: (1) enrollment as a Medicare provider versus supplier, (2) ownership category, (3) service area population density, and (4) volume of Medicare ground ambulance transports.[8] These historical data were from years 2017 and 2018, prior to the coronavirus disease 2019 (COVID-19) pandemic and public health emergency (PHE) for the first two GADCS cohorts and from 2020 for the latter two GADCS cohorts. CMS modified the timing of data collection periods and data reporting periods for the GADCS to increase flexibility for ground ambulance organizations that would otherwise have

[5] Section 50203(b) of Public Law 115-123, Bipartisan Budget Act of 2018, February 9, 2018, added paragraph (17) to section 1834 (l) of the Social Security Act (Public Law 74-271, The Social Security Act of 1935, August 14, 1935).

[6] CMS proposed and finalized clarifying language in some instrument questions in the CY 2022 PFS final rule (86 FR 65306-65317), proposed and finalized further clarifications and changes in the CY 2023 PFS final rule (87 FR 70014), and most recently proposed and finalized changes and clarifications to the GADCS instrument in the CY 2024 PFS final rule (CMS-1784-F).

[7] Pub. L. 115-123, 2018, sections 50203[a], 1834[l][12] and [13].

[8] We use the term *Medicare ground ambulance transports* to refer to separately billed Medicare ground ambulance services, excluding the ground ambulance mileage Healthcare Common Procedure Coding System (HCPCS) code A0425. In some cases, HCPCS codes listed on the Ambulance Fee Schedule do not explicitly involve a patient transport, for example, in the case of paramedic intercept services.

been required to collect data in 2020–2021 so that they could focus on their operations and patient care during the COVID-19 PHE.

Selected organizations required to report to the GADCS must first collect information specified in Section 1834(l)(17)(A) of the Act over a continuous 12-month data collection period and then report this information to CMS within five months after their data collection period ends. The first two GADCS cohorts (Year 1 and Year 2) began collecting data in 2022. CMS opened the GADCS portal for the Year 1 and Year 2 ground ambulance organizations on January 1, 2023, and as of October 2023, most of the Year 1 and Year 2 ground ambulance organizations had already reported data to CMS. Other selected ground ambulance organizations (including some in Year 1 and Year 2 cohorts with data collection start dates later in 2022 and all in the third and fourth cohorts [Year 3 and Year 4]) have not yet reached their data reporting deadlines.

We explore whether ground ambulance organizations have changed over time, including through the COVID-19 pandemic, and update earlier analyses examining how the trends in transport volume (i.e., the number of ground ambulance transports paid for by Traditional [fee-for-service] Medicare) and the characteristics of organizations billing Medicare for ground ambulance services have changed over time.[9] In our prior work, we found only slight changes in ownership categories, provider versus supplier composition, and service area population density from 2015 to 2020. However, we found a gradual reduction in transport volume between 2017 and 2019 and a substantial decline from late 2019 through 2020, coinciding with the onset of the COVID-19 pandemic and the resulting PHE that the Secretary of HHS declared under section 319 of the Public Service Act and was in effect from January 31, 2020, to May 11, 2023.[10] Health care utilization decreased across most service types and categories during the early months of the pandemic. However, utilization has generally returned to pre-pandemic levels in most health care sectors.

In this report, we describe recent trends in transport volume and in the characteristics of organizations billing Medicare for ground ambulance services. The analyses extend the work of the prior report to cover the onset and later stages of the COVID-19 pandemic and PHE and may be helpful in understanding whether ground ambulance organizations selected for the GADCS based on historical data prior to the pandemic and PHE are representative of more recent cohorts of ground ambulance organizations.

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[9] Andrew Mulcahy, Kristen Becker, Jonathan Cantor, Scott Ashwood, Jeanne Ringel, Lisa Sontag-Padilla, Christine Buttorff, Michael Robbins, Susan Lovejoy, Thomas Goughnour, Sara Heins, Beverly Weidmer, Monique Martineau, Mike Oelrich, Jennifer Gildner, Gina Karimi, and Thomas Goode, *Medicare's Ground Ambulance Data Collection System: Sampling and Instrument Considerations and Recommendations*, Task Order No. HHSM-500-T0052, MITRE Corporation, July 30, 2019; Mulcahy, et al., 2022.

[10] U.S. Code, Title 42, The Public Health and Welfare, Chapter 6A, Public Health Service, Subchapter II, General Powers and Duties, Part B, Federal-State Cooperation, Section 247d, Public Health Emergencies; Executive Office of the President, "Declaring a National Emergency Concerning the Novel Coronavirus Disease (COVID-19) Outbreak," Proclamation 9994, March 13, 2020.

Data and Methods

We used two main sources of Medicare data for our analyses: Medicare fee-for-service claims accessed via CMS' Integrated Data Repository (IDR) and CMS' Medicare Provider Enrollment, Chain, and Ownership System (PECOS) data. Our study population includes all provider and supplier National Provider Identifiers (NPIs) with paid Medicare ground ambulance transports from 2017 through 2022, using ground ambulance HCPCS codes to identify these NPIs.[11]

Claims Data

The Medicare fee-for-service claims contain information on ground ambulance transports billed and paid by Medicare that includes the level of service transport, the mileage from the patient's point of ambulance pickup to the nearest appropriate facility that can treat the patient's condition, the diagnosis code reported with the transport, and the origin and destination codes for the ground ambulance transport. We acquired line-level Medicare fee-for-service professional and facility claims through CMS' IDR for all NPIs that billed ground ambulance services with service dates from 2017 to 2022.[12] We identified ground ambulance services using HCPCS codes, which are a collection of standardized codes that represent medical procedures, supplies, products, and services.[13] We used HCPCS codes A0425, A0426, A0427, A0428, A0429, A0432, A0433, A0434, and A0999 to identify professional Medicare service claims and revenue center codes 540–549 for Part B institutional claims to identify ground ambulance services.[14] The Medicare fee-for-service claims data include NPI, service date, paid amount, HCPCS code, and origin and destination modifier codes.[15] Professional claims include the ZIP Code for the point of the ambulance pickup and the allowed amount for the claim line. Facility claims include a

[11] Suppliers are those whose specialty is ambulance service supplier. Providers include hospitals, critical access hospitals, rural emergency hospitals, skilled nursing facilities, and renal dialysis facilities. See methodological details in Mulcahy et al., 2022.

[12] Claims submitted by providers to Medicare and other health care payers generally include one *line* for each discrete service, and the entire claim can include multiple lines.

[13] CMS, "Healthcare Common Procedure Coding System (HCPCS) Level II Coding Procedures," Department of Health and Human Services, December 2022.

[14] HCPCS code A0426 is used to report advanced life support (ALS), non-emergency transports, level 1, and A0428 is used for basic life support (BLS), non-emergency transports. HCPCS codes A0427, A0429, A0432, A0433, and A0434 are the HCPCS codes used to report ALS-1 emergency, BLS emergency, paramedic ALS intercept, ALS2, and specialty care transport, respectively. We also included HCPCS code A0999, which is used for unlisted ambulance services, in our analysis.

[15] These modifier codes indicate the broad category of pickup and destination location (hospital, home, end-stage renal disease [ESRD] facility, etc.).

provider ID that we linked to a primary practice location ZIP Code. We did not extract professional claim lines with a payment of zero dollars or institutional claims that were billed under Part A.

The resulting claims extract included lines from 12,181 unique NPIs with claim lines for ground ambulance services at any point from 2017 through 2022. We assigned transport services to CYs based on service date to determine whether each NPI was active in each year from 2017 to 2022. However, we did not require continuous participation in Medicare or billing over time to create a stable panel of NPIs. As a result, NPIs could contribute between one and six years of claims data. There are usually two line-level records for each transport—one with the HCPCS code identifying the level of service and one with the HCPCS code that corresponds to mileage. We excluded a small number of ground ambulance organizations each year (fewer than ten annually) with a claim for ground ambulance mileage (A0425) but without an HCPCS level of service transport code in the same year. In our analyses, to avoid double-counting transports, we examined only the line-level records with the HCPCS code identifying the level of service in order. We retrieved the claims data from CMS' IDR between March 2022 and August 2023.[16]

Medicare Enrollment Data

We used publicly available data on Traditional Medicare enrollment and Medicare Advantage (MA) penetration rates in some of the described analyses below to capture enrollment trends and adjust for changes in the size of the Traditional Medicare population. The Traditional Medicare enrollment data, available on CMS' website, provide annual estimates of the number of Traditional Medicare enrollees in each county across U.S. states and territories.[17] We linked these to county-level MA penetration rates, also available online from CMS.[18] MA penetration rates, calculated monthly, represent the percentage of individuals in a county that are eligible to enroll in MA plans and who elect to do so. For our analyses, we used the average penetration rates and enrollment numbers for each year (2017–2022).

PECOS Enrollment Data

As in our prior analyses, we used PECOS enrollment information to classify ground ambulance organizations as either Medicare providers or suppliers and to identify ground

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[16] We retrieved the national-level claims data from CMS' IDR on the following dates: April 26, 2023, for 2017 data; April 27, 2023, for 2018 and 2019 data; March 21, 2022, for 2020 data; July 19, 2022, for 2021 data; and June 7, 2023, for 2022 data. We retrieved the county-level data on August 8, 2023. We retrieved the data for the renal dialysis analyses on August 23, 2023, and the data for the diagnosis analyses on August 24, 2023.

[17] CMS, "Medicare Monthly Enrollment," webpage, undated-b.

[18] CMS, "MA State/County Penetration," webpage, undated-a.

ambulance ownership type.[19] The PECOS data contain information that providers and suppliers submitted via their Medicare enrollment process via CMS-855A (provider) and CMS-855B (supplier) enrollment forms. The data include detailed information on the type of ground ambulance organization, their service area, linkages between enrollment records and NPIs, and points of contact.

We acquired enrollment records for ambulance organizations that billed Medicare for ground ambulance transports between 2017 and 2022. Each individual PECOS data file includes all enrollment records for an NPI up to the present, which allowed us to create year-specific measures for the organization. For ground ambulance suppliers, we used data from the most recent enrollment record where the specialty was listed as "ambulance service supplier." For ambulance providers, many of which have concurrent enrollment records of various types (e.g., hospital, critical access hospital, rural emergency hospital, skilled nursing facility, and renal dialysis facility), we created a sequential classification process with priority given to critical access hospitals, then hospitals. We assigned all other providers to the "other" category. This methodology follows that used in our prior report.[20] We also used the PECOS data to identify ground ambulance ownership type, as discussed below.

Analytic Approach

In this section of the report, we describe our analytic approach, following the same order as the presentation of our results.

Medicare Ground Ambulance Characteristics and Volume of Transports

We used a combination of Medicare claims and PECOS enrollment data from 2017 through 2022 to categorize each NPI along four dimensions: volume, service area population density, provider versus supplier designation, and ownership category. We categorized NPIs along these dimensions in each year where the NPI had paid Medicare ground ambulance transport claims. We selected these dimensions of ground ambulance organizations because prior research suggests that ground ambulance costs and revenue may vary across these organizational characteristics.[21] We did not have enrollment records for 22 NPIs and were unable to determine their designation status. We excluded these NPIs from our analyses. Below, we detail how we categorized NPIs on each of the dimensions in each applicable year.

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[19] Mulcahy et al., 2022.

[20] Mulcahy et al., 2022.

[21] Mulcahy et al., 2019.

Medicare Ground Ambulance Transport Volume

We calculated Traditional Medicare ground ambulance transport volume overall and per NPI by counting line-level Medicare fee-for-service transport claim lines within a year. We categorized NPI-level annual volume into one of four volume categories (see Table 1).

Table 1. Categories of Traditional Medicare Ground Ambulance Transport Volume

Volume Category	Number of Annual Medicare Ground Ambulance Transports
Low volume	200 or fewer
Medium volume	201 to 800
High volume	801 to 2,499
Very high volume	2,500 or more

The previous report on industry trends contains more detailed information as to why we used these specific cut points.[22]

Service Area Population Density

We based the service area population density of ambulance service suppliers on their point of ambulance pickup location information in the professional claims data. We used point of ambulance pickup location information because it provides direct information about where their services are rendered. We classified all point of ambulance pickup ZIP Codes as either urban, rural, or super rural using a crosswalk maintained by the U.S. Census Bureau.[23] Using the distribution of ambulance pickups for the three service area categories (urban, rural, or super rural), we assigned one service area population density category to the organization. In contrast, for ambulance providers, we used the business location ZIP Code contained in their institutional claims. We chose this location because the point of ambulance pickup location is not available for these claims.

[22] For a full description of the methodology, please see Mulcahy et al., 2019.

[23] This classification is used to calculate add-on payments for urban, rural, and super-rural services. For more information on the classification, please see Michael Ratcliffe, Charlynn Burd, Kelly Holder, and Alison Fields, *Defining Rural at the U.S. Census Bureau: American Community Survey and Geography Brief*, U.S. Census Bureau, December 2016. The list of CMS ZIP Codes and their designations can be found in the ZIP Code to Carrier Locality file located at CMS, "Ambulance Fee Schedule & ZIP Code Files," webpage, last accessed August 16, 2023.

Provider Versus Supplier Designation

As previously described, PECOS enrollment information is used to classify each NPI as either a provider or a supplier. Suppliers are those whose specialty is "ambulance service supplier." Providers include critical access hospitals, hospitals, rural emergency hospitals, skilled nursing facilities, and renal dialysis facilities.

Ownership Category

Assigning each NPI an ownership type required combining several sources of information in four steps. First, we used the PECOS enrollment data to identify ground ambulance organizations as either non-profit or proprietor organizations. Second, we used the PECOS data variable indicating organizational structure. In the PECOS data, organizations select one of the following categories: corporation, individual, LLC, not selected, partnership, sole owner, sole proprietor, or other. Within the other category, there are multiple unique (i.e., write-in) responses. Using the information in the data, we classified organizations into one of three categories—non-profit, government, or for-profit or unclassifiable—to the extent categorization was feasible using the text provided by the organization. Third, for organizations without an assigned organization structure, we used targeted internet searches to classify the organization into one of the three categories. Finally, we assigned all non-profit organizations without a government organizational structure to a non-profit category, all organizations with a government organizational structure to a government category, and all remaining organizations to a for-profit or unclassifiable category.

Volume per Traditional Medicare Beneficiary

We conducted an analysis on volume per Traditional Medicare beneficiary by estimating the volume of ground ambulance transports per Traditional Medicare enrollee in each year. We calculated the volume of ground ambulance transports as described above and derived the denominator (number of Traditional Medicare enrollees in each year) using Medicare enrollment data.

Adjusting for Changes in MA Enrollment

As more Medicare beneficiaries have chosen to enroll in MA plans (rather than Traditional Medicare) over the years, the representativeness of the Medicare fee-for-service claims data might have shifted, and overall Traditional Medicare ground ambulance transport volume may have declined. In this analysis, we sought to understand the potential role that MA enrollment changes have had over time on ground ambulance transport utilization within the Traditional Medicare data by controlling for time-varying Traditional Medicare versus MA enrollment at the county level. We hypothesized that controlling for changing enrollment trends would mitigate the decline in Traditional Medicare ground ambulance transport volume found in our prior analysis.

First, we examined county MA penetration rates. To do this, we used Medicare enrollment data to group counties each year into one of six categories of MA penetration rates: very low (less than 10 percent), low (10–19 percent), medium-low (20–29 percent), medium-high (30–39 percent), high (40–49 percent), or very high (50 percent or higher).[24] We then calculated the percentage of all counties in each of these categories in each year.

To adjust Traditional Medicare ground ambulance volume for changes in enrollment trends, we created an adjustment factor that we applied to the annual Traditional Medicare ground ambulance transport volume for each county. We created the adjustment factor using a two-step process. In the first step, we calculated the ratio of Traditional Medicare enrollment to total Medicare enrollment in each county in each year (see Equation 1). We used annual average enrollment numbers across all months in the year in our calculation of this ratio. The ratio for 2017 became the baseline ratio for each county.

$$\text{Traditional Medicare enrollment ratio} = \frac{\text{Average Traditional Medicare enrollment}_{tc}}{\text{Average Total Medicare enrollment}_{tc}} \quad (1)$$

where t = year and c = county.

Next, for each year in each county, we divided the baseline ratio by that year's ratio to create annual county-level adjustment factors (see Equation 2).

$$\text{Adjustment factor} = \frac{\text{Traditional Medicare enrollment ratio}_{2017c}}{\text{Traditional Medicare enrollment ratio}_{tc}} \quad (2)$$

We then multiplied the annual county-level Traditional Medicare ground ambulance transport volumes by the adjustment factors to estimate adjusted county-level transport volumes. In our results, we report the average annual unadjusted and adjusted county-level transport volume, controlling for changes since 2017 in the percentage of Medicare beneficiaries enrolled in Traditional Medicare.

Frequent Diagnosis Codes Associated with Ground Ambulance Transports

For our next analyses, we examined whether International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) diagnosis codes reported for ground ambulance transports are consistent across years. To do so, we identified the top 20 ICD-10-CM diagnosis codes reported with ground ambulance transport claims for each year, examining non-emergency and emergency transports separately, and explored how these lists of diagnosis codes changed over time. We also calculated the percentage of transports (including total transports, emergency transports, and non-emergency transports) that each of these diagnosis codes represent. Non-

[24] We selected these categories for MA penetration rates to reflect work that has been done by others in the area, such as in Nancy Ochieng, Jeannie Fuglesten Biniek, Meredith Freed, Anthony Damico, and Tricia Neuman, "Medicare Advantage in 2023: Enrollment Update and Key Trends," Kaiser Family Foundation August 9, 2023.

emergency transports were defined as those with HCPCS codes A0426 or A0428. Emergency transports were defined as those with HCPCS codes A0427, A0429, A0432, A0433, A0434, or A0999.

Share of Transports to or From ESRD Facilities

In our final set of analyses, we examined the share of transports that were to or from ESRD facilities—a significant use of ground ambulances. We identified Medicare fee-for-service claims where the first modifier code J or G was reported in either the first (origin) or second (destination) position. These indicated claims with origin or destination codes of hospital-based ESRD facilities (code G) or freestanding ESRD facilities (code J). Then we calculated the proportion of total claims that were to or from ESRD facilities for each year.

Results

Trends in Medicare Ground Ambulance Characteristics and Volume of Transports

After combining Medicare fee-for-service claims data and PECOS enrollment data, we evaluated how the characteristics of ground ambulance organizations serving Traditional Medicare beneficiaries and their volume of transports have changed over time. We found a slight decline in the number of Medicare ground ambulance NPIs billing Traditional Medicare for transports, from 10,640 in 2017 to 10,451 in 2022 (a 1.8 percent decline overall) (Table 2). The largest decline occurred between 2021 and 2022 with 0.6 percent fewer NPIs billing Traditional Medicare for ground ambulance transports in 2022 than in 2021.

In terms of characteristics of ground ambulance organizations, the service area population density and provider versus supplier designation of organizations remained consistent over time. There were slight changes in the ownership of ground ambulance organizations, with decreasing proportions of non-profit ground ambulance organizations and increasing proportions of government ground ambulance organizations.

Table 2. Characteristics of Traditional Medicare Ground Ambulance Organizations, 2017–2022

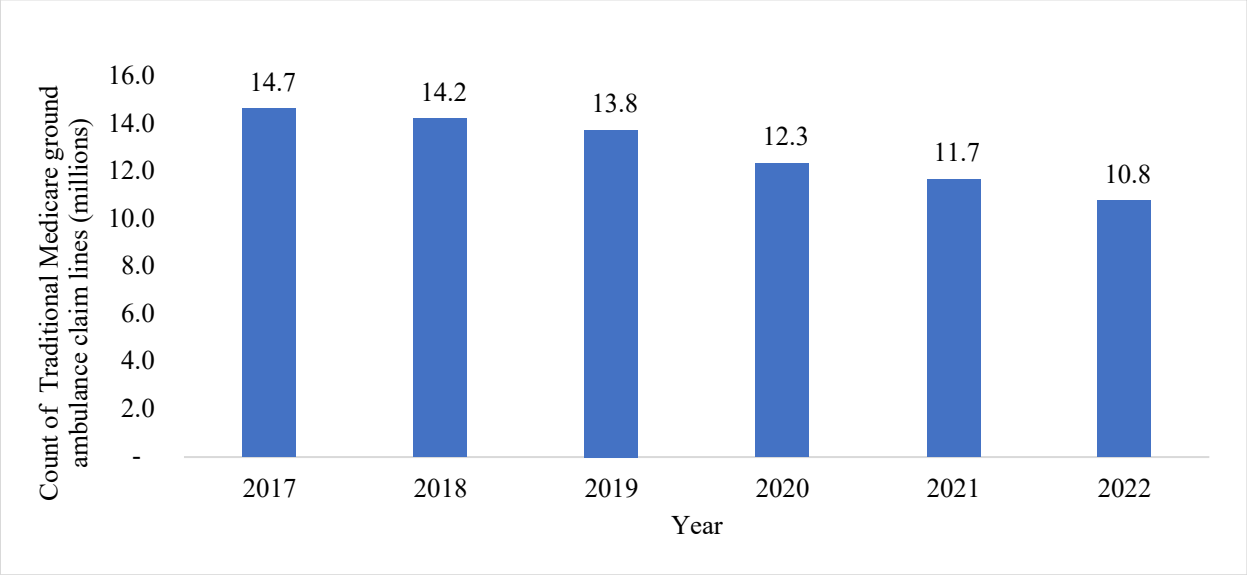
Characteristics	2017	2018	2019	2020	2021	2022
Total (*n*)	10,640	10,589	10,539	10,540	10,515	10,451
Service area urbanicity (%)						
Urban	52.6	52.6	52.6	52.9	53.2	53.3
Rural	28.1	28.3	28.3	28.1	28.0	28.0
Super rural	19.3	19.2	19.1	18.9	18.8	18.7
Designation (%)						
Provider	5.8	5.8	5.6	5.5	5.4	5.3
Supplier	94.2	94.2	94.4	94.5	94.6	94.8
Ownership category (%)						
Non-profit	29.1	28.8	28.3	27.8	27.4	27.3
Government	49.9	50.3	50.7	50.9	51.2	51.8
For-profit or unclassifiable	21.0	21.0	21.0	21.3	21.4	20.9

SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023) and PECOS data (run date May 2, 2023).

Total transport volume decreased over time, from 14.7 million transports in 2017 to 10.8 million in 2022—a 26.4 percent decrease over the six years (Figure 1). The largest decrease in

overall volume occurred during the first year of the COVID-19 pandemic in 2020 (10.3 percent lower than in 2019) and the decline continued in the succeeding years.

Figure 1. Traditional Medicare Ground Ambulance Transport Volume, 2017–2022

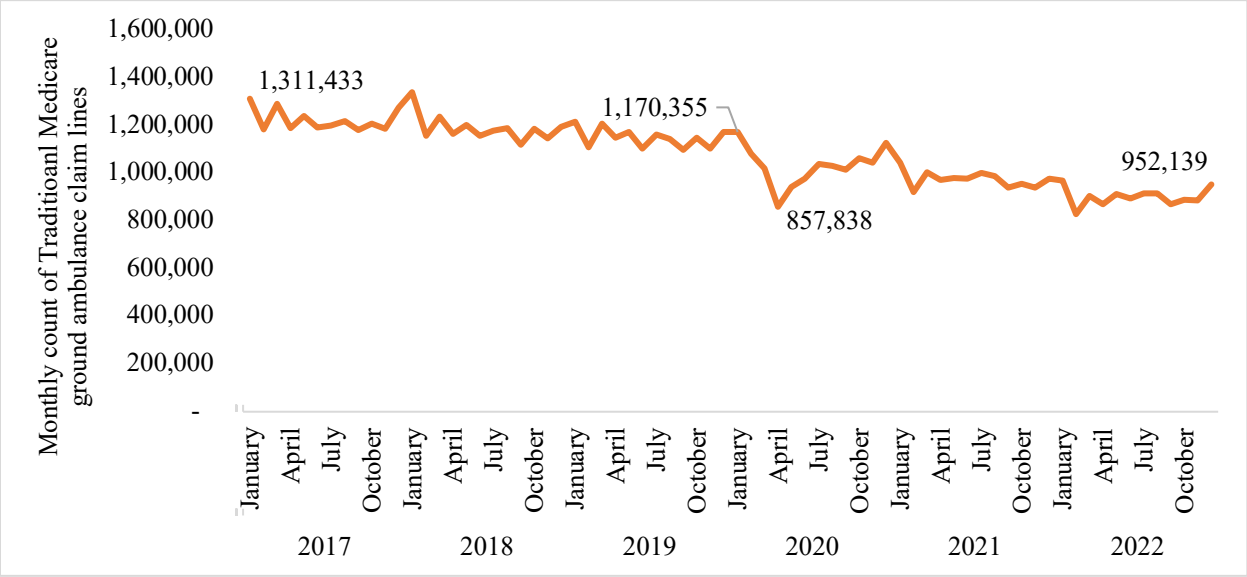


SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023).

We also calculated monthly transport volume to further explore the relationship between the COVID-19 pandemic and volume (Figure 2). There were 1,170,355 Traditional Medicare ground ambulance transports in January 2020, which decreased to 857,838 by April 2020, following the declaration of a PHE. Although transport volume rebounded somewhat toward the end of 2020, there was another sudden decrease in January 2021 that did not recover in the months that followed.

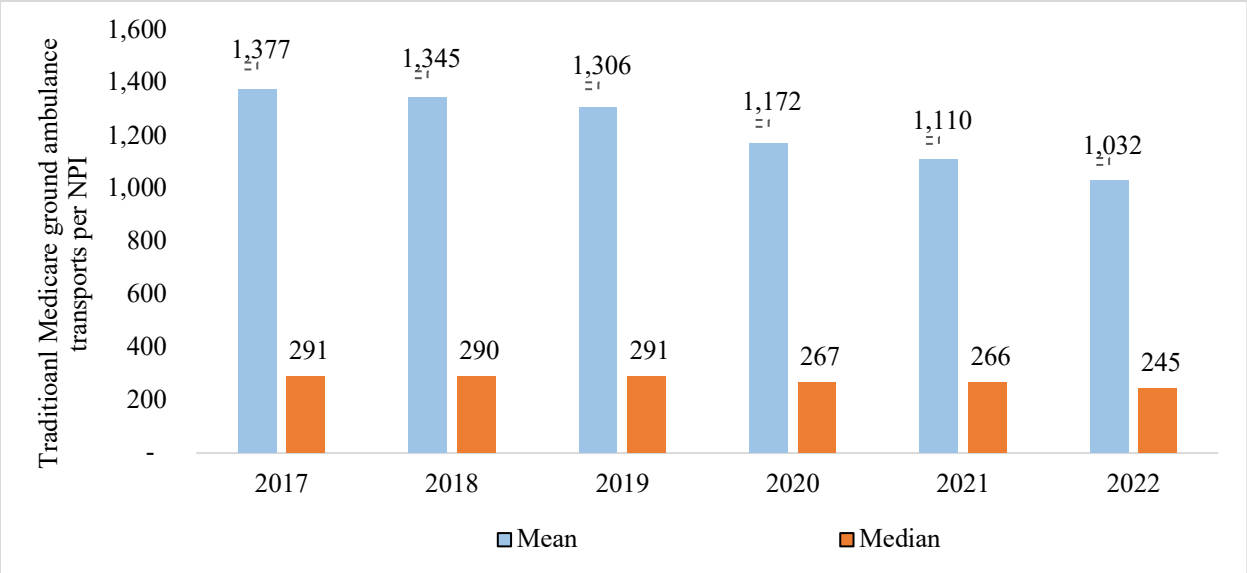
As with overall Traditional Medicare ground ambulance transport volume, average transport volume per NPI decreased over time, from an average of 1,377 transports per NPI in 2017 to 1,032 in 2022 (25 percent decline) (Figure 3). The median transport volume per NPI in each year also declined (a 16 percent decrease between 2017 and 2022).

Figure 2. Monthly Traditional Medicare Ground Ambulance Transport Volume, 2017–2022



SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023).

Figure 3. Traditional Medicare Ground Ambulance Transport Volume per NPI, 2017–2022

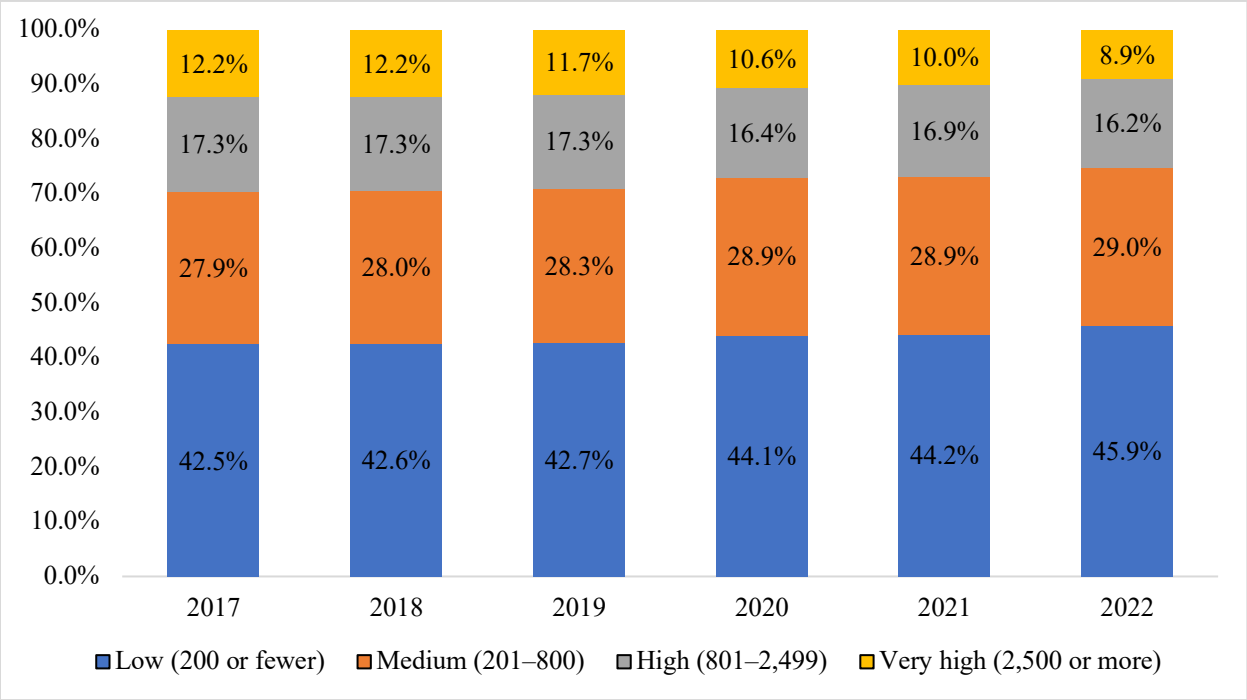


SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023).

Because volume declined over time, the share of NPIs categorized as low, medium, high, or very high might also have changed. In fact, the percentage of NPIs in each year that had low volume increased over time, from 42.5 percent in 2017 to 45.9 percent in 2022 (Figure 4). The percentage of NPIs in each year with medium transport volumes also increased, although to a

lesser degree (from 27.9 percent in 2017 to 29.0 percent in 2022). The percentage of NPIs with high and very high transport volumes, on the other hand, both decreased over time, with the highest drop occurring among the NPIs with very high volume (12.2 percent in 2017 to 8.9 percent in 2022—a 27.0 percent decrease).

Figure 4. Distribution of Traditional Medicare Ground Ambulance Transport Volume per NPI, 2017–2022

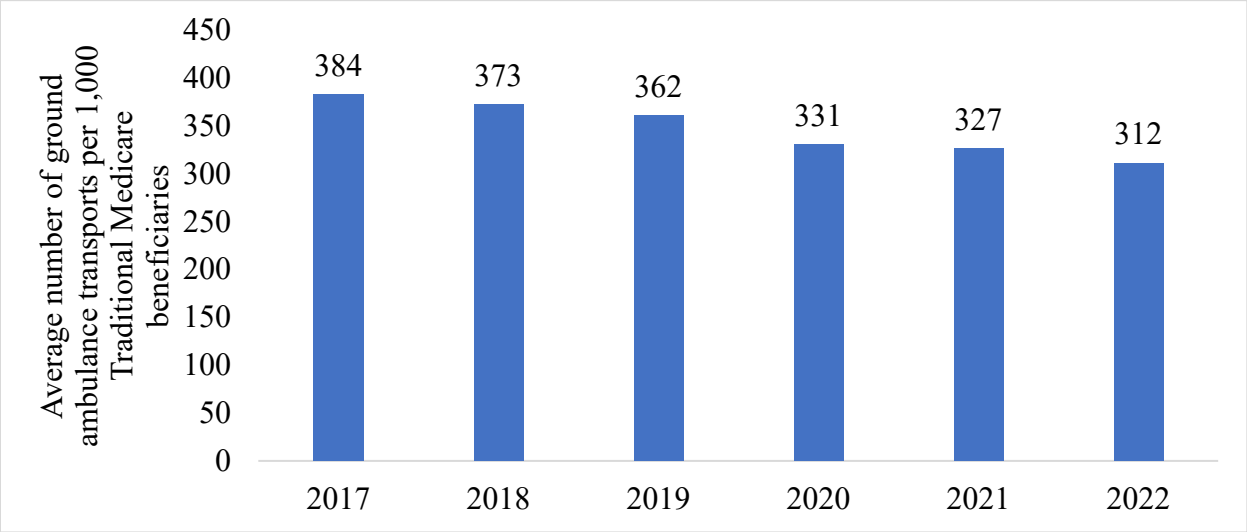


SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023).

Trends in Volume per Traditional Medicare Beneficiary

We also examined ground ambulance transport volume per thousand Traditional Medicare beneficiaries, which declined over time (Figure 5). Overall, ground ambulance volume per thousand Traditional Medicare beneficiaries decreased from 384 in 2017 to 312 in 2022. While volume per thousand Traditional Medicare beneficiaries decreased each year, the largest decrease occurred between 2019 and 2020.

Figure 5. Ground Ambulance Volume per Traditional Medicare Beneficiary, 2017–2022



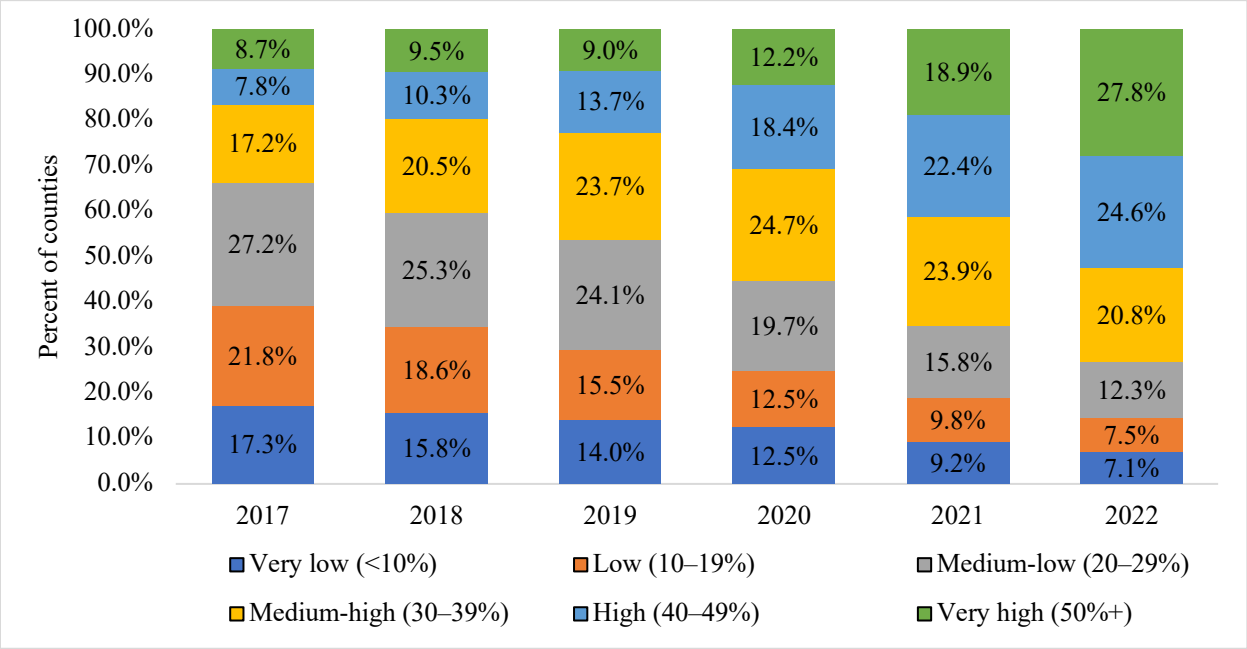
SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run dates March 21, 2022, to June 7, 2023) and Traditional Medicare enrollment data.

Adjusting for Changes in Medicare Advantage Enrollment

To explore the potential role of MA enrollment on transport volume over time, we first examined how county-level MA penetration rates changed over time. Between 2017 and 2022, the percentage of counties with very high MA penetration rates (50 percent or higher) increased from 8.7 percent in 2017 to 27.8 percent in 2022 (Figure 6).

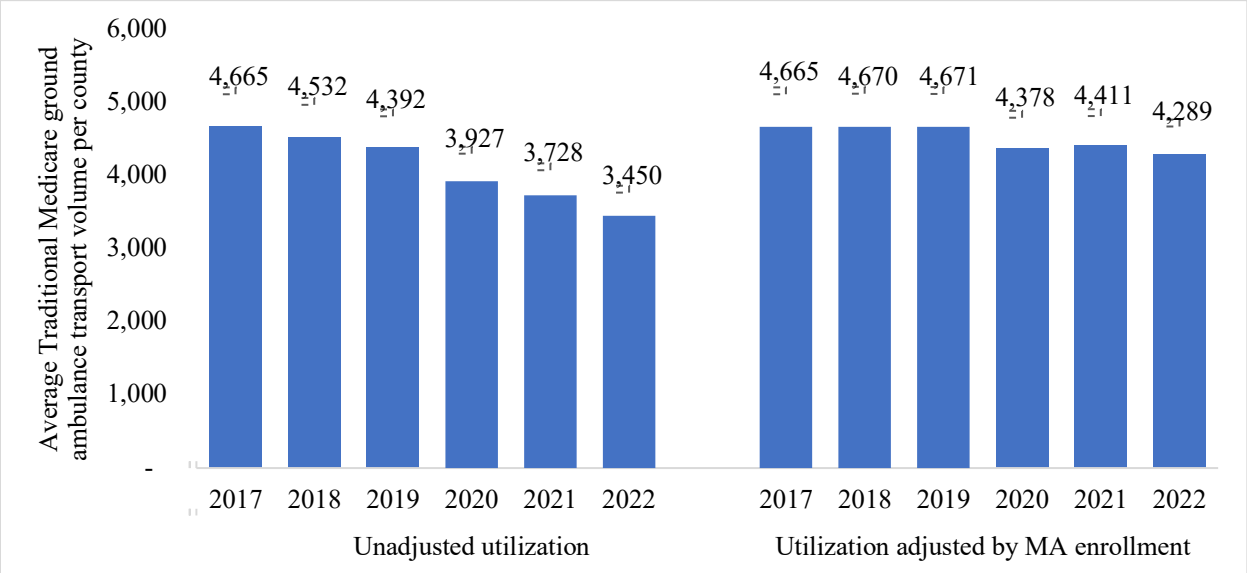
We next calculated adjusted county-level annual utilization. We accounted for changes in the percentage of Medicare beneficiaries enrolled in Traditional Medicare (as opposed to MA) by multiplying the county-level volume by the adjustment factor described in the Analytic Approach section. Applying this adjustment factor made it possible to calculate the adjusted average annual county-level Traditional Medicare ground ambulance transport volume in each year, assuming enrollment in Traditional Medicare remained the same as in the baseline year (2017). Figure 7 shows the unadjusted and adjusted average annual county-level Traditional Medicare ground ambulance transport volumes from 2017 to 2022. After accounting for changes in county-level Traditional Medicare enrollment, we found that while county-level transport volume still decreases over time—from an adjusted average of 4,665 transports in 2017 to 4,289 transports in 2022 (an 8.1 percent decrease)—the decrease is much smaller than the unadjusted enrollment (a 26.0 percent decrease).

Figure 6. County-Level Medicare Advantage Penetration Rates, 2017–2022



SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 8, 2023) and MA penetration rates.

Figure 7. Average County-Level Traditional Medicare Ground Ambulance Transport Volume, Unadjusted and Adjusted for Changes in MA Enrollment, 2017–2022



SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 8, 2023) and Traditional Medicare enrollment data.

Trends in Frequent ICD-10-CM Diagnosis Codes Reported for Ground Ambulance Transports

To examine whether ICD-10-CM diagnosis codes reported for ground ambulance transports were consistent across years, we identified the top ten ICD-10-CM diagnosis codes for each year, examining non-emergency and emergency transports separately. Table 3 shows the top ten ICD-10-CM diagnosis codes in 2017 and 2022 for non-emergency ground ambulance transports (defined as transports with HCPCS codes A0426 or A0428). The most frequent ICD-10-CM diagnosis code reported for non-emergency ground ambulance transports in all years, 2017–2022, was ESRD (N18.6). In 2022, non-emergency ESRD (N18.6) transports accounted for 4.3 percent of all transports and 12.8 percent of non-emergency transports. However, this was lower than in 2017, when non-emergency ESRD (N18.6) transports made up 6.4 percent of all ground ambulance transports and 16.2 percent of non-emergency ground ambulance transports.

Table 3. Top Ten ICD-10-CM Diagnosis Codes Reported for Non-Emergency Ground Ambulance Transports, as a Share of All Transports and Non-Emergency Transports, 2017 and 2022

Top ICD-10-CM Diagnosis Codes	All Transports	Non-Emergency Transports
2017		
Total number of transports	14,652,995	5,805,197
Share of transports (all and non-emergency)		
ESRD (N18.6)	6.4%	16.2%
Unspecified lack of coordination (R27.9)	3.2%	8.1%
Weakness (R53.1)	1.5%	3.7%
Altered mental status, unspecified (R41.82)	1.5%	3.7%
Other lack of coordination (R27.8)	1.1%	2.8%
Bed confinement status (Z74.01)	1.0%	2.6%
Muscle weakness (generalized) (M62.81)	0.7%	1.8%
Delirium due to known physiological condition (F05)	0.7%	1.7%
Unspecified kidney failure (N19)	0.6%	1.6%
Chronic kidney disease, unspecified (N18.9)	0.6%	1.6%
2022		
Total number of transports	10,787,064	3,615,848
Share of transports (all and non-emergency)		
ESRD (N18.6)	4.3%	12.8%
Weakness (R53.1)	2.5%	7.5%
Unspecified lack of coordination (R27.9)	2.2%	6.6%
Altered mental status, unspecified (R41.82)	2.1%	6.3%
Other abnormalities of gait and mobility (R26.89)	1.0%	2.9%
Bed confinement status (Z74.01)	0.9%	2.8%
Muscle weakness (generalized) (M62.81)	0.8%	2.5%
Transient alteration of awareness (R40.4)	0.8%	2.4%
Other lack of coordination (R27.8)	0.6%	1.8%
COVID-19 (U07.1)	0.6%	1.8%

SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 24, 2023).
NOTE: The All Transports column uses transports with the HCPCS codes A0426, A0427, A0428, A0429, A0432, A0433, A0434, and A0999. The Non-Emergency Transports column uses transports with HCPCS codes A0426 and A0428.

Table 4 shows the top ten ICD-10-CM diagnosis codes for emergency ground ambulance transports (defined as transports with HCPCS codes A0427, A0429, A0432, A0433, A0434, and A0999) in 2017 and 2022. The most frequent ICD-10-CM diagnosis code reported for emergency ground ambulance transports in all years was shortness of breath (R06.02). In 2022, emergency transports for shortness of breath (R06.02) accounted for 4.5 percent of all ground

ambulance transports and 6.7 percent of emergency ground ambulance transports. This was similar to 2017, when emergency transports for shortness of breath (R06.02) were 4.1 percent of all ground ambulance transports and 6.8 percent of emergency ground ambulance transports.

Although the data are not shown, we also examined whether the top ten ICD-10-CM diagnosis codes in each year were in at least the top 20 ICD-10-CM diagnosis codes in the other years to see whether the top diagnosis codes were stable over time. We did this separately for non-emergency and emergency transports. All but one of the top ten non-emergency ICD-10-CM diagnosis codes in 2020, 2021, and 2022 were also in the top 20 ICD-10-CM diagnosis codes in every other year. The non-emergency ICD-10-CM diagnosis code that was not in the top 20 in every year was U07.1 (COVID-19). Although U.07.1 did not exist as a diagnosis code prior to 2020, it was the seventh most frequent non-emergency ICD-10-CM diagnosis code reported in 2020, the eighth most frequent non-emergency ICD-10-CM diagnosis code reported in 2021, and the tenth most frequent non-emergency ICD-10-CM diagnosis code reported in 2022. All of the top ten emergency ICD-10-CM diagnosis codes in each year were also in the top 20 ICD-10-CM diagnosis codes reported for ground ambulance transports in the other examined years.

Table 4. Top Ten ICD-10-CM Diagnosis Codes Reported for Emergency Ground Ambulance Transports, as a Share of All Transports and Emergency Transports, 2017 and 2022

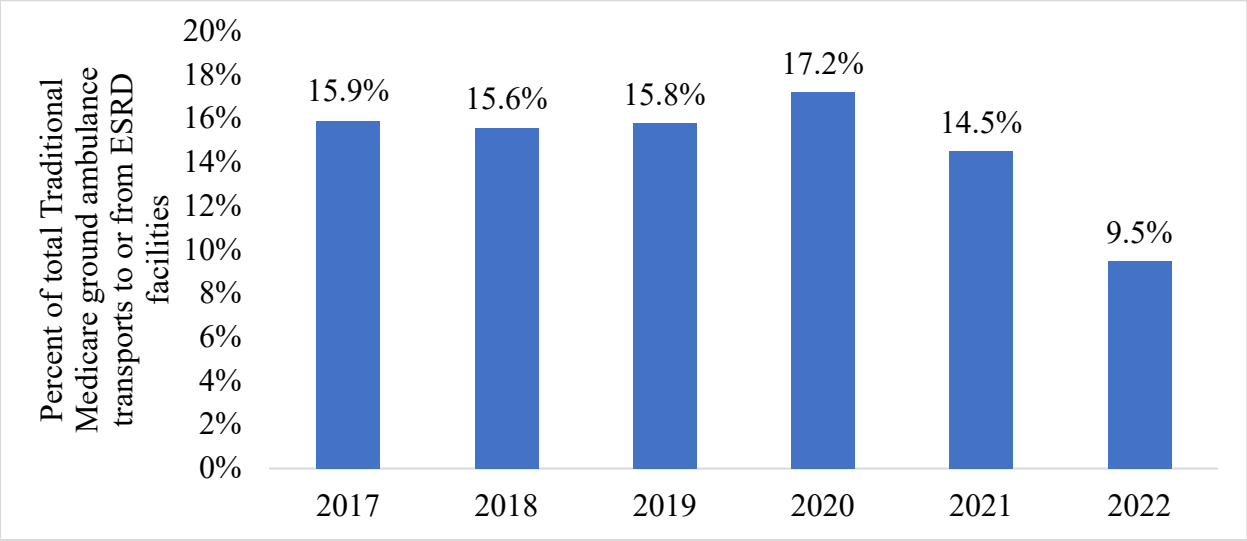
Top ICD-10-CM Diagnosis Codes	All transports	Emergency transports
2017		
Total number of transports	14,652,995	8,847,798
Share of transports (all and emergency)		
Shortness of breath (R06.02)	4.1%	6.8%
Chest pain, unspecified (R07.9)	3.6%	6.0%
Altered mental status, unspecified (R41.82)	2.9%	4.8%
Weakness (R53.1)	2.4%	4.0%
Syncope and collapse (R55)	2.3%	3.8%
Pain, unspecified (R52)	1.6%	2.6%
Dyspnea, unspecified (R06.00)	1.4%	2.3%
Unspecified abdominal pain (R10.9)	1.4%	2.3%
Dizziness and giddiness (R42)	1.1%	1.8%
Transient alternation of awareness (R40.4)	1.1%	1.8%
2022		
Total number of transports	10,787,064	7,171,216
Share of transports (all and emergency)		
Shortness of breath (R06.02)	4.5%	6.7%
Altered mental status, unspecified (R41.82)	3.7%	5.6%
Weakness (R53.1)	3.4%	5.0%
Chest pain, unspecified (R07.9)	3.0%	4.5%
Syncope and collapse (R55)	2.4%	3.6%
Unspecified injury of head, initial encounter (S09.90XA)	1.8%	2.7%
Pain, unspecified (R52)	1.7%	2.6%
Dizziness and giddiness (R42)	1.4%	2.2%
Unspecified abdominal pain (R10.9)	1.4%	2.2%
Transient alternation of awareness (R40.4)	1.1%	1.7%

SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 24, 2023).
NOTE: All transports include transports with the HCPCS codes A0426, A0427, A0428, A0429, A0432, A0433, A0434, and A0999. Emergency transports include transports with HCPCS codes A0427, A0429, A0432, A0433, A0434, and A0999.

Trends in the Share of Transports to or From ESRD Facilities

We calculated the percentage of total transports that were to or from ESRD facilities in each year. The share of total transports to or from ESRD facilities remained fairly steady from 2017 through 2019 before increasing slightly in 2020 (Figure 8). However, in 2022, there was a sharp decrease in the share of total transports to or from ESRD facilities, down to only 9.5 percent of all transports.

Figure 8. Trend in Share of Total Traditional Medicare Ground Ambulance Transports to or From ESRD Facilities, 2017–2022



SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 23, 2023).
NOTE: We identified claims with origin or destination codes of hospital-based or ESRD facilities (codes G and J).

At the NPI level, there has been a similar trend over time (Table 5). Between 2017 and 2019, the NPI-level share of total ground ambulance transports to or from ESRD facilities decreased only slightly from 6.6 percent to 6.5 percent. In 2020, there was a slight increase to 6.8 percent (up from 6.5 percent in 2019). However, larger decreases occurred in 2021 and 2022, and by 2022, the NPI-level share of total ground ambulance transports that were to or from ESRD facilities decreased to 4.4 percent.

Table 5. NPI-Level Share of Total Traditional Medicare Ground Ambulance Transports to or From ESRD Facilities, 2017–2022

Year	Min.	1st Percentile	Median	75th Percentile	99th Percentile	Max.	Mean	SD
2017	0.0%	0.0%	0.0%	1.6%	93.3%	100.0%	6.6%	18.2%
2018	0.0%	0.0%	0.0%	1.4%	94.5%	100.0%	6.5%	18.2%
2019	0.0%	0.0%	0.0%	1.5%	95.8%	100.0%	6.5%	18.4%
2020	0.0%	0.0%	0.0%	1.6%	96.4%	100.0%	6.8%	19.1%
2021	0.0%	0.0%	0.0%	1.1%	96.2%	100.0%	6.0%	18.0%
2022	0.0%	0.0%	0.0%	0.8%	91.6%	100.0%	4.4%	15.3%

SOURCE: Authors' analysis of Medicare fee-for-service claims accessed via CMS' IDR (run date August 23, 2023).
NOTE: We identified claims with origin or destination codes of hospital-based or freestanding ESRD facilities (codes G and J). Max. = maximum; Min. = minimum; SD = standard deviation.

Discussion

Using this longitudinal analysis of Traditional Medicare ground ambulance transports, we assessed the potential representativeness of the GADCS sampling frame for the current population of Medicare ground ambulance organizations. We found decreasing volume of Traditional Medicare ground ambulance transports over time, with particularly notable decreases following the COVID-19 pandemic and PHE in the early months of 2020. Although increasing proportions of Medicare beneficiaries enrolling in MA plans may have caused some of the decreases in Traditional Medicare ground ambulance transport volume, this change does not completely explain the decreases in volume in Medicare fee-for-service claims data. We also found that the other organizational characteristics used for GADCS sampling remained stable over time with the exception of a slight increase in the proportion of government organizations. Overall, our findings suggest that the ground ambulance organizations selected for the GADCS based on historical data prior to the pandemic are, with the exception of volume of transports, generally representative of more recent cohorts of ground ambulance organizations.

Limitations

Our analysis focused only on Medicare fee-for-service claims, and our assignment of ground ambulance organizations to volume categories and other characteristics was based solely on Medicare fee-for-service claims and administrative data. This may result in misclassification relative to a ground ambulance organization's overall operation in some cases, such as for ground ambulance organizations that serve areas around higher-education institutions where larger-than-average shares of the population are under age 65 (and therefore less likely to be Medicare beneficiaries). Relatedly, areas with high MA penetration (versus Traditional Medicare enrollment) may have a higher overall transport volume relative to their Traditional Medicare volume. In addition, as this was a descriptive analysis, we did not conduct tests of statistical significance across years.

Conclusions

Our analyses explored whether and how the characteristics of ground ambulance organizations that provide ambulance services to Medicare beneficiaries have changed over time in terms of service area population density, ownership type, provider versus supplier designation, and ground ambulance service volume. These analyses show how the landscape of ground ambulance organizations has shifted regarding their annual Traditional Medicare transport volume after the sampling of organizations for GADCS submission, and particularly through the onset of the COVID-19 pandemic in early 2020.

Generally, we found stable trends in service area population density, ownership type, and provider versus supplier designation between 2017 and 2022, with some slight increases in the proportion of government ground ambulance organizations. Most notably, however, the volume of ground ambulance transports changed over time, declining each year since 2017. Much of the initial decline in ground ambulance service volume through the early pandemic recovered to near prepandemic levels by the end of 2020. However, an underlying decreasing downward trend continued after the recovery through 2021 and 2022, even as health care use in other sectors has returned to close to prepandemic levels. The overall decrease in ground ambulance transport volume is also reflected in the volume per NPI, with more NPIs categorized as low- or medium-volume organizations (800 or fewer transports per NPI per year). Accordingly, ground ambulance organizations previously selected for GADCS submission may no longer have the same volume of transports as when they were originally chosen.

Our exploratory analysis of the influence of MA enrollment on the volume of ground ambulance transports found increasing proportions of counties with very high MA penetration rates. To further investigate how accounting for MA enrollment affects the trend in Traditional Medicare ground ambulance transport volume, we calculated average annual county-level transport volume adjusted for changes in the percentage of Medicare beneficiaries enrolled in Traditional Medicare. Following these adjustments, we found that decreases in county-level Traditional Medicare ground ambulance transport volume between 2017 and 2022 were partially but not completely driven by changes in the share of beneficiaries enrolled in MA.

The top diagnosis codes associated with emergency and non-emergency transports remained steady over time, with the exception of the COVID-19 diagnosis code that was introduced with the pandemic. We also found that although the share of total transports that were to or from ESRD facilities remained fairly steady from 2017 through 2019, and increased slightly in 2020, there was a sharp decrease in 2022, down to only 9.5 percent of all transports. There was a policy change in 2021 that may have contributed to this decrease in 2022. Starting in 2021, Medicare beneficiaries with ESRD could enroll in MA plans without additional cost-sharing compared with Traditional Medicare. Future work should further explore how these policy changes and trends in Traditional Medicare enrollment have played a role in decreasing shares of transports to or from ESRD facilities.

Implications

Should there be future rounds of GADCS data collection, changes to the ground ambulance service volume thresholds used to categorize NPIs as low, medium, high, and very high volume should be investigated. These volume thresholds could decline (or, as applicable, increase) year-to-year to preserve a similar distribution of NPIs across categories over time. In another approach, NPI-specific volume could be adjusted upward to reflect decreasing Traditional Medicare enrollment. Both of these changes would prevent shifts in the number of NPIs in

relatively higher and lower volume categories over time as overall Traditional Medicare ground ambulance service volume declines.

Separately, further investigation into the implications of the dramatic decline in Traditional Medicare ground ambulance transports to or from ESRD facilities is warranted. Adjustments that incorporate the changing enrollment patterns in MA versus Traditional Medicare for ESRD patients could help explain the observed decline and tease out whether there are factors at play other than changing Medicare policies regarding enrollment in MA plans.

Abbreviations

ALS	advanced life support
BLS	basic life support
CMS	Centers for Medicare & Medicaid Services
COVID-19	coronavirus disease 2019
CY	calendar year
ESRD	end-stage renal disease
GADCS	Ground Ambulance Data Collection System
HCPCS	Healthcare Common Procedure Coding System
HHS	U.S. Department of Health and Human Services
ICD-10-CM	International Classification of Diseases, Tenth Revision, Clinical Modification
IDR	Integrated Data Repository
MA	Medicare Advantage
NPI	National Provider Identifier
PECOS	Provider Enrollment, Chain, and Ownership System
PFS	Physician Fee Schedule
PHE	public health emergency

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