Cataife and Liu *Health Economics Review* (2025) 15:9
https://doi.org/10.1186/s13561-025-00599-7

Health Economics Review

RESEARCH

Open Access

Medicare Advantage penetration and the financial distress of rural hospitals

Guido Cataife[1] and Siying Liu[1*]

Abstract

Background Medicare Advantage (MA) penetration rates have shown an increase in rural areas in the past decade, increasing the bargaining power of MA plans relative to rural hospitals. We study the effect that this increase has had in the revenue of rural hospitals through reductions in the number of inpatient days paid by the plans, which has been reported to be part of the financial bargaining between the two parties.

Methods We use 2014–2020 hospital level data from the American Hospital Association's annual survey and county-level MA penetration rates. We estimate the correlation between MA penetration rates and Medicare and non-Medicare inpatient days using multivariate regressions with hospital and year fixed effects. We use results for urban areas where competition among multiple MA sponsors reduces their individual bargaining power as a falsification test.

Results We find that a 10 percentage points increase in the county-level MA penetration rate is associated with a decrease of 0.87% inpatient days paid to rural hospitals, which unveils a new main factor affecting the fragile finances of rural hospitals. Consistent with our hypothesis, urban hospitals do not exhibit similar effects, underscoring the role of MA plans in rural areas.

Conclusions As MA plans increase their penetration in rural areas, their bargaining power increases relative to rural hospitals. MA plans use this increased bargaining power to reduce the number of paid inpatient days, which creates adverse financial conditions for rural hospitals. Policymakers can safeguard rural hospitals by modifying the fee-for-service prices received by rural hospitals or strengthening the network adequacy criteria of MA plans for rural areas.

Keywords Hospital finance, Medicare Advantage, Rural hospitals, Hospital closure, Bargaining

Background

In the last decade, rural hospitals have faced substantial financial distress, with more hospitals have closed than opened every year since 2011 [1]. Many factors have contributed to this distress [2], including the shrinkage of rural health markets due to population loss [3], uncompensated care in states that have not expanded Medicaid [4], and patients bypassing local hospitals for inpatient services in favor of other hospitals due to perceived deficiencies [5].

This article proposes another complementary reason for the financial struggles of rural hospitals. Over the same decade, rural Medicare Advantage (MA) plan enrollment has increased substantially [6]. For example, just during the period of 2010–2014, rural MA enrollment grew steadily from 1.25 million enrollees in 2010 to 1.95 million enrollees in 2014, representing a 56% increase. While MA enrollment has been significant in both urban and rural areas, differences in market structure for hospital services between urban and rural areas suggest that different implications may apply.

Our hypothesis is that the increase in rural MA penetration is one of the reasons behind the financial

*Correspondence:
Siying Liu
sliu@air.org
[1] Health Division, American Institutes for Research, 1400 Crystal Drive, 10th Floor, Arlington, VA 22202-3289, USA

distress of rural hospitals. At first, this idea may seem counterintuitive, given that researchers have historically considered rural hospitals to have the upper hand in negotiations against MA plans. Indeed, the monopolistic market power of rural hospitals has often been considered a major obstacle to the growth of MA penetration in rural areas, as it hinders the MA plans' ability to form networks that satisfy Centers for Medicare & Medicaid Services (CMS) network requirements [7–9]. Nonetheless, our study makes the point that the bargaining power that rural hospitals had in the past against MA plans may have changed with the increase of MA penetration rates in rural areas. Intuitively, we argue that higher MA penetration rates have increased the bargaining power of MA plans relative to rural hospitals because the MA plans have become major payers of the Medicare patients upon which the rural hospitals must rely. This gives MA plans higher leverage against rural hospitals in negotiations, forcing hospitals to accept less favorable financial agreements than in the past when MA rates were lower.

Our hypothesis aligns well with open questions as well as evidence and conclusions from various sources. The Center for Healthcare Quality and Payment Reform has reported that low payments from private health plans, particularly MA plans, are one of the primary causes of losses at the smallest rural hospitals [10]. The 2017 Congressional Budget Office (CBO) Report demonstrates quantitatively that MA plans pay hospitals similar rates to fee-for-service (FFS) Medicare (also known as traditional Medicare) [11]. However, the CBO analysis focuses on hospitals located in metropolitan statistical areas (MSAs), leaving open the question of whether MA rates are lower than FFS rates in rural areas, especially in areas without MA plans competition. Another study used qualitative methods and concluded that even rural hospitals without competition in their catchment area (i.e., hospitals with absolute monopolistic power) find it challenging to obtain substantially better rates from MA plans than from FFS [12]. This suggests that lower rates may be a likely outcome for rural hospitals without absolute monopolistic power. Moreover, rural hospitals' CEOs have pointed out that MA sponsors use their market power to force rural hospitals to accept less favorable agreements [13]. Due to the credible threat that MA sponsors will drop them from their networks, rural hospitals end up accepting terms that negatively affect their finances, such as shorter allowed lengths of inpatient stays for Medicare beneficiaries, which is directly relevant to our hypothesis.

To test our hypothesis empirically, we estimate the effect of higher MA penetration rates on a crucial financial outcome for rural hospitals: Medicare inpatient days. Researchers have identified inpatient days as a crucial outcome for the financial viability of rural hospitals, as inpatient services can be more profitable than outpatient services (which produce higher operating losses) and provide revenue needed to cover the high administrative overhead costs of these hospitals [14]. To further confirm our hypothesis, we produce estimates for both urban and rural hospitals, as well as for Medicare and non-Medicare inpatient days.

Methods

Our hypothesis is that MA plans use their capacity to steer a larger number of patients away from rural hospitals to impose stricter financial conditions on rural hospitals. We study the association between MA penetration rates and proxies for hospital revenue.

Data

Our outcome panel data come from the American Hospital Association's annual survey for fiscal years 2014–2020. We study two hospital-level outcomes: Medicare and non-Medicare inpatient days. Non-Medicare inpatient days are defined as all inpatient days minus total facility Medicare inpatient days. We use utilization measures as proxies for hospitals' financial outcomes, with a higher number of hospitalizations resulting in increased revenue. We use the log measures. Observations with missing log Medicare or non-Medicare inpatient days are excluded from the sample.

Our main explanatory variable is MA penetration rate. Monthly MA penetration rates at the county level are obtained from the CMS website. The MA penetration rate is defined as the number of beneficiaries enrolled in any MA plan divided by the number of Medicare beneficiaries eligible in a county in a month. We calculate the log average monthly penetration rate in a county for each fiscal year.

We define rurality based on county-level metropolitan status designations that are used to assess MA plans' network adequacy from the MA Health Service Delivery (HSD) files provided by CMS [15]. MA plans are required to provide enrollees healthcare services through a contracted network of providers that is consistent with the pattern of care in the network service area. CMS monitors the plans' compliance with network access requirements using network adequacy criteria that require that organizations contract with a sufficient number of providers and facilities to ensure that at least 90 percent of enrollees within a county can access care within specific travel time and distance maximums. The criteria take into account differences in utilization across provider/facility types and patterns of care in urban and rural areas. Network adequacy is assessed at the county level, and counties are classified into five county type designations:

Large Metro, Metro, Micro, Rural, or CEAC (Counties with Extreme Access Considerations). The designation is based on the population size and density parameters of individual counties. A county must meet both the population and density thresholds for inclusion in a given county type designation. Table A1 in the supplemental file lists the population and density parameters applied to determine county type designations.

The county-level population and area (square mile of land) estimates are from the U.S. Census Bureau. We use the American Community Survey Integrated Public Use Microdata Series (IPUMS) to determine the characteristics of the population covered by Medicare at the county-year level (or state-year level in cases where county information is missing in the microdata series) [16].

Model specfications

We estimate the following ordinary least squares (OLS) model:

$$y_{ict} = \alpha + \beta_1 MA_{ct} + \beta_2 MA_{ct} \times Rural_i + X_{ct} + \theta_i + \theta_t + \epsilon_{ict} \quad (1)$$

where i denotes hospital, c denotes county, and t denotes fiscal year. y_{ict} denotes the outcomes of interest. MA_{ct} denotes the log MA penetration rate in fiscal year t in county c. $Rural_i$ is an indicator for rural county, which we define as counties with CEAC, Rural, or Micro designations in 2014. A CEAC county may have any population count but must have a density of less than 10 people per square mile of land (/mi^2). A Rural county has either a population of 10,000–49,999 and a density of 10–49.9/mi^2, or a population less than 10,000 and a density of 10–4,999.9/mi^2. A Micro county has either a population of 50,000–199,999 and a density of 10–99.9/mi^2, or a population of 10,000–49,999 and a density of 50–999.9/mi^2.

X_{ct} denotes the county-year level characteristics. These characteristics include density (population per square mile of land), population, the percentage of the population covered by Medicare, and a series of demographic and socioeconomic variables among those covered by Medicare. Specifically, these variables include average age, percentage of females, percentage of married individuals with a spouse present, percentage of Black non-Hispanic, percentage of Hispanics, percentage of individuals from other races (percentage of White non-Hispanics is omitted due to multicollinearity), percentage of individuals with a high school education or above, percentage of individuals employed, percentage of individuals in the labor force, average percentage of the federal poverty level, and average household income. θ_i and θ_t denote hospital and fiscal year fixed effects, respectively. ϵ_{ict} represents the random error. The fixed effects exploit intra-hospital and year-specific variability to eliminate confounding factors. Our primary focus is the interaction of MA penetration rate with the rural indicator, which tests for differential effects between urban and rural hospitals.

Results

Table 1 displays summary statistics for the MA penetration rates, county type designations, outcomes of interest, and covariates. The table provides figures for the entire sample period, as well as specific figures for urban and rural hospitals. The average MA penetration rate at the county level during the sample period was 30.0%, with higher rates in urban area (35.3%) than in rural area (21.5%). Most hospitals (42.7%) were in Metro counties, followed by Large Metro counties (19.2%), Rural counties (15.9%), Micro counties (15.5%), and CEAC (6.7%). As expected, there were significant differences in the main outcomes between urban and rural areas. Hospitals in urban areas had over four times as many Medicare inpatient days (23,381.6 days) compared to rural hospitals (4,755.5 days). In terms of covariates, hospitals in rural areas had a slightly higher percentage of the county population covered by Medicare. Additionally, among residents covered by Medicare, hospitals in rural area had potential patients that were slightly younger, had fewer females, were more likely to be married with a spouse present, were more likely to be White, less likely to be Black, Hispanic, or from other races, had more education, were more likely to be employed, were less likely to be in the labor force, were more likely to be in poverty, and had lower household income.

Table A2 in the supplemental file presents the characteristics of hospitals for FY 2014 and 2020. We found a 36.7% increase in the average MA penetration rate (from 25.9% to 35.4%) and a 4.9% increase in Medicare inpatient days during 2014–2020. Additionally, we compared the characteristics of hospitals with high versus low MA growth rates during 2014–2020 (Table A3 in the supplemental file). Hospitals with high MA growth rates are defined as those in the top 50 percentile of the distribution of the percent change in county-level MA penetration rate. On average, hospitals with high MA growth rates had a lower MA penetration rate (22.7%) compared to hospitals with low MA growth rates (36.8%). Additionally, hospitals with high MA growth rates had fewer Medicare inpatient days on average (14,585.8 days) than hospitals with slow MA growth rates (17,847.1 days).

Table 2 displays the estimates corresponding to Eq. 1. Columns 1–3 show estimates for Medicare inpatient days, while Columns 4–6 show the estimates for non-Medicare inpatient days. Based on Column 2, a 10 percentage points increase in the county-level MA penetration

Table 1 Summary statistics

VARIABLES	(1) Mean	(2) SD	(3) Mean	(4) SD	(5) Mean	(6) SD
	All		Urban Hospitals		Rural Hospitals	
MA Penetration Rate (%)	30.0	15.1	35.3	13.4	21.5	13.8
County Designation in 2014 (%)						
CEAC	6.7	25.0	0.0	0.0	17.6	38.1
Rural	15.9	36.5	0.0	0.0	41.6	49.3
Micro	15.5	36.2	0.0	0.0	40.7	49.1
Metro	42.7	49.5	69.0	46.3	0.0	0.0
Large Metro	19.2	39.4	31.0	46.3	0.0	0.0
Outcomes						
Medicare Inpatient Days	16,284.8	23,251.7	23,381.6	26,685.4	4,755.5	6,880.7
Non-Medicare Inpatient Days	19,540.4	31,664.9	27,619.2	37,094.3	6,415.6	10,859.1
Medicare Discharges	2,818.5	4,008.1	4,029.5	4,601.8	851.1	1,227.4
Medicare ALOS	8.9	56.8	8.7	22.4	9.2	87.5
Inpatient Revenue ($Million)	324.8	704.9	516.7	861.9	49.3	123.1
County Characteristics						
Density (Population per Square Mile)	1,244.3	4,733.8	1,982.8	5,896.6	44.3	57.4
Population	729,623.9	1,572,539.6	1,157,655.5	1,874,458.3	34,243.9	31,836.1
%Covered by Medicare	17.9	3.6	17.6	4.1	18.3	2.5
Characteristics of County Residents Covered by Medicare						
Age	71.0	1.2	71.1	1.4	70.9	1.0
%Female	55.3	1.6	55.6	1.8	54.7	1.2
%Married, Spouse Present	53.0	5.0	52.2	5.8	54.3	2.7
%White, non-Hispanic	76.2	16.0	72.9	17.2	81.7	12.0
%Black, non-Hispanic	11.2	10.7	12.6	11.7	8.8	8.3
%Hispanic	7.4	10.2	8.7	11.3	5.2	7.4
%Other	5.2	6.5	5.8	7.0	4.3	5.3
%High School or Above	86.0	5.6	85.8	6.1	86.4	4.7
%Employed	94.8	2.5	94.5	2.8	95.4	1.7
%In Labor Force	17.1	2.8	17.1	3.0	16.9	2.4
%Federal Poverty Level	298.2	27.0	301.7	30.1	292.4	19.8
Household Income ($)	111,996.9	18,092.5	113,642.7	20,003.4	109,323.1	14,054.9
#Observations	37,663		23,313		14,350	

Rural status is defined as counties with extreme access considerations (CEAC), Rural, or Micro counties in 2014. The number of observations for inpatient revenue for the full sample period is 31,000. The number of observations for inpatient revenue is 18,270 for urban and 12,730 for rural

Abbreviations: *ALOS* average length of stay, *CEAC* counties with extreme access considerations, *MA* Medicare Advantage, *SD* standard deviation

rate (e.g., when MA penetration rate increases from 20 to 30%) is associated with a 0.53% increase in Medicare inpatient days for urban hospitals but a decrease of 0.87% ([−0.140 + 0.053] * 10) for rural hospitals, relative to what would have been observed in the absence of an increase in the MA penetration rate for that particular year. Column 5 suggests that a 10 percentage points increase in the county-level MA penetration rate is associated with a 1.55% increase in non-Medicare inpatient days for urban hospitals, but a decrease of 0.27% for rural hospitals. These coefficient estimates are illustrated in Fig. 1. In summary, the negative correlation between MA penetration rate and inpatient days is unique to rural areas, and this correlation is approximately three times stronger for Medicare stays compared to non-Medicare stays. The results obtained from the more simplified model that excludes time-variant characteristics (Columns 1 and 4) or the model that controls for the characteristics of the county residents covered by Medicare (Columns 3 and 6) are consistent with the earlier findings.

To determine whether the decline in Medicare days for rural hospitals is related to the number of

Table 2 Associations between Medicare Advantage penetration and hospital Medicare and non-Medicare inpatient days

VARIABLES	(1) Log (Medicare Inpatient Days)	(2) Log (Medicare Inpatient Days)	(3) Log (Medicare Inpatient Days)	(4) Log (Non-Medicare Inpatient Days)	(5) Log (Non-Medicare Inpatient Days)	(6) Log (Non-Medicare Inpatient Days)
Log (MA)	0.051*	0.053**	0.055**	0.153***	0.155***	0.154***
	(0.027)	(0.027)	(0.027)	(0.030)	(0.030)	(0.030)
Rural in 2014 × Log (MA)	−0.144***	−0.140***	−0.137***	−0.187***	−0.182***	−0.178***
	(0.030)	(0.030)	(0.030)	(0.035)	(0.035)	(0.035)
FY2015	0.030***	0.028***	0.022***	−0.016**	−0.019***	−0.021***
	(0.007)	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
FY2016	0.019**	0.014*	0.006	−0.022***	−0.028***	−0.033***
	(0.008)	(0.008)	(0.010)	(0.008)	(0.008)	(0.010)
FY2017	0.008	0.002	−0.006	−0.025***	−0.032***	−0.039***
	(0.009)	(0.009)	(0.012)	(0.009)	(0.009)	(0.012)
FY2018	0.016	0.009	−0.001	−0.061***	−0.070***	−0.080***
	(0.010)	(0.010)	(0.014)	(0.011)	(0.011)	(0.015)
FY2019	0.005	−0.003	−0.022	−0.079***	−0.089***	−0.103***
	(0.011)	(0.012)	(0.018)	(0.013)	(0.013)	(0.020)
FY2020	−0.056***	−0.064***	−0.081***	−0.103***	−0.114***	−0.132***
	(0.013)	(0.014)	(0.022)	(0.015)	(0.015)	(0.025)
Density (Population per Square Mile)		0.000	0.000		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)
Population		0.000***	0.000***		0.000***	0.000***
		(0.000)	(0.000)		(0.000)	(0.000)
%Medicare Insurance			0.148			0.415
			(0.431)			(0.439)
Age			0.006			0.010***
			(0.004)			(0.004)
%Female			−0.224			0.161
			(0.255)			(0.188)
%Married, Spouse Present			−0.034			−0.094
			(0.116)			(0.106)
%Black			0.195			−0.193
			(0.203)			(0.190)
%Hispanic			0.377			0.020
			(0.253)			(0.236)
%Other			0.020			0.299
			(0.347)			(0.258)
%High School or Above			−0.307			−0.044
			(0.188)			(0.157)
%Employed			0.128			0.060
			(0.109)			(0.095)
%In Labor Force			−0.093			0.249*
			(0.150)			(0.139)
%Federal Poverty Level			0.000			−0.000
			(0.000)			(0.000)
Household Income			0.000***			0.000***
			(0.000)			(0.000)
Constant	8.753***	8.493***	8.070***	8.880***	8.573***	7.749***
	(0.035)	(0.079)	(0.324)	(0.040)	(0.086)	(0.334)
Observations	37,663	37,663	37,663	37,663	37,663	37,663
R-squared	0.008	0.008	0.009	0.007	0.008	0.009
Hospital FE	Y	Y	Y	Y	Y	Y
FY FE	Y	Y	Y	Y	Y	Y

Standard errors clustered at the hospital level in parentheses

Abbreviations: *ALOS* average length of stay, *FE* fixed effects, *FY* fiscal year, *MA* Medicare Advantage

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

admissions or the average length of stay (ALOS), our study estimated the model for log Medicare discharges and Medicare ALOS, where Medicare ALOS is defined as the number of Medicare inpatient days divided by the number of Medicare discharges. Note that ALOS is different from allowed inpatient days. Allowed inpatient days determines the days paid for, while ALOS represents the days with or without payment received. However, allowed inpatient days information is not available in the data. Our analysis revealed a statistically significant decrease in Medicare discharges (Table 3, Columns 1–3) but no statistically significant effect on Medicare ALOS (Columns 4–6) for rural hospitals. These findings support the hypothesis that MA plans reduce Medicare days for rural hospitals by reducing admissions. Consistently, for urban hospitals, we found that the Medicare inpatient days increases were related to a statistically significant increase in Medicare discharges.

In addition, we estimated our model for a direct financial outcome, total inpatient revenue, using CMS Healthcare Cost Report Information System (HCRIS) data. Note that Medicare only revenue is not available; we only have data on total (i.e., across payer) inpatient revenue. This analysis revealed a statistically significant decrease in total inpatient revenue associated with MA penetration rates for rural hospitals (Table 3, Columns 7–9), which is consistent with our main hypothesis. For urban hospitals, the statistically significant increase in total inpatient revenue is consistent with the earlier findings as well.

Discussion

Our study found that, for urban hospitals, increases in MA penetration rates are associated with increases in Medicare inpatient days, resulting in increases in total

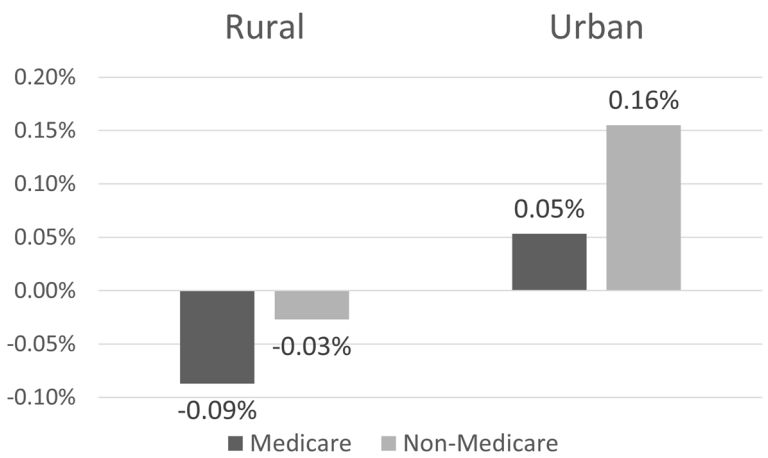

Fig. 1 Association between Medicare Advantage penetration and hospital Medicare and non-Medicare inpatient stays, by hospital rural status. Note: Data from the authors' analysis (Table 2, Columns 2 and 5). The estimate for Medicare is the association between MA penetration rate and the Log (Medicare Inpatient Days). The estimate for non-Medicare is the association between MA penetration rate and the Log (Non-Medicare Inpatient Days)

inpatient revenue. Despite MA admissions paying lower unit prices relative to FFS Medicare across geographies [11, 17], our findings suggest that urban hospitals benefit from increasing MA penetration rates on net.

However, unlike their urban counterparts, when MA penetration rates increase, rural hospitals lose Medicare and (to a lesser extent) non-Medicare inpatient days. Combined with arguably lower unit prices for MA admissions, the total inpatient revenue should decrease. Consistently, we also observed decreases in total inpatient revenue.

The asymmetric findings for urban and rural hospitals align well with our hypothesis. In rural settings, increases in MA penetration rates may have strengthened the bargaining power of MA sponsors relative to rural hospitals, everything else constant. As rural hospitals' CEOs have noted, MA sponsors may force a renegotiation of the contracts with rural hospitals, which could take the form of a reduction in the number of covered days for Medicare MA beneficiaries [13, 18], a reduction in rates, or inpatient admission restrictions such as allowing observations instead of admissions. In urban settings, there are multiple competing MA sponsors, and hospitals have access to a larger variety of payers. However, in rural settings, an increase in MA penetration rate implies that if the hospital does not accept the terms of the often-unique MA sponsor in the area, the MA sponsor could drop the hospital, causing the rural hospital a significant reduction in admissions. In rural settings, such lost admissions cannot be easily replaced with admissions coming from patients from other MA sponsors, Medicare FFS, or commercial payers.

Interestingly, our findings also provide evidence of an increase in non-Medicare inpatient days for urban hospitals. Urban hospitals show a large and significant increase in non-Medicare inpatient days, which includes stays covered by commercial payers, when there are increases in MA penetration rate. We can attribute this finding to various potential reasons, including hospital enhancements such as renovations and technology acquisition made possible by a higher volume of patients, and the hospitals' attempt at compensating the lower MA unit prices with an increase in days from commercial payers [19]. This latter reason, i.e., compensation of price with volume to maintain revenue, could also potentially explain the slight increase in Medicare inpatient days observed for urban hospitals. In contrast to urban hospitals, rural hospitals show a slight decrease in non-Medicare inpatient days, which exacerbates the asymmetric impact of MA penetration rate increases on the finances of rural hospitals compared to urban hospitals.

Our research results are consistent with prior literature suggesting that plans in the MA market have substantive market power [20]. Prior studies found that MA plans paid on average 5.6% less for hospital services than FFS Medicare [17]. In combination with our finding that higher MA penetration is associated with reduced Medicare inpatient days and inpatient revenue, these findings suggest that higher MA penetration in the rural versus metro areas may have played a substantive role in rural hospitals' financial stress in the last decade and could have acted as a contributing factor to rural hospital closures.

There are regulations related to MA that partially safeguard the finances of rural hospitals. For example,

Table 3 Associations between Medicare Advantage penetration and hospital Medicare discharges, Medicare average length of stay, and inpatient revenue

VARIABLES	(1) Log (Medicare Discharges)	(2) Log (Medicare Discharges)	(3) Log (Medicare Discharges)	(4) Medicare Average Length of Stay	(5) Medicare Average Length of Stay	(6) Medicare Average Length of Stay	(7) Log (Inpatient Revenue)	(8) Log (Inpatient Revenue)	(9) Log (Inpatient Revenue)
Log (MA)	0.086***	0.088***	0.091***	−2.543	−2.567	−2.513	0.118***	0.116***	0.112***
	(0.023)	(0.023)	(0.023)	(3.892)	(3.919)	(3.894)	(0.024)	(0.024)	(0.024)
Rural in 2014 × Log (MA)	−0.195***	−0.191***	−0.189***	0.176	0.129	0.232	−0.206***	−0.196***	−0.192***
	(0.024)	(0.024)	(0.024)	(1.786)	(1.759)	(1.690)	(0.027)	(0.027)	(0.027)
FY2015	0.016***	0.013***	0.009	0.857***	0.883***	0.787***	0.041***	0.038***	0.034***
	(0.005)	(0.005)	(0.006)	(0.263)	(0.285)	(0.295)	(0.004)	(0.004)	(0.005)
FY2016	0.003	−0.001	−0.006	1.010**	1.057**	0.830**	0.073***	0.069***	0.063***
	(0.006)	(0.007)	(0.008)	(0.397)	(0.443)	(0.358)	(0.005)	(0.005)	(0.007)
FY2017	0.013*	0.007	0.003	1.805	1.869	1.646	0.104***	0.098***	0.089***
	(0.007)	(0.007)	(0.009)	(1.530)	(1.601)	(1.579)	(0.006)	(0.007)	(0.008)
FY2018	0.013	0.006	0.001	1.959	2.034	1.701	0.136***	0.128***	0.118***
	(0.008)	(0.008)	(0.011)	(1.665)	(1.748)	(1.762)	(0.007)	(0.008)	(0.010)
FY2019	0.004	−0.004	−0.017	1.887	1.971	1.485	0.150***	0.141***	0.129***
	(0.009)	(0.009)	(0.015)	(1.844)	(1.938)	(2.005)	(0.009)	(0.009)	(0.013)
FY2020	−0.105***	−0.113***	−0.120***	2.528	2.620	1.506	0.180***	0.170***	0.157***
	(0.011)	(0.011)	(0.017)	(2.030)	(2.134)	(2.132)	(0.010)	(0.011)	(0.016)
Density (Population per Square Mile)		0.000	0.000		−0.000	−0.000		0.000	0.000
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
Population		0.000***	0.000***		−0.000	−0.000		0.000***	0.000***
		(0.000)	(0.000)		(0.000)	(0.000)		(0.000)	(0.000)
%Medicare Insurance			−0.038			52.343*			0.174
			(0.383)			(30.994)			(0.306)
Age			0.006			0.169			0.005
			(0.004)			(0.132)			(0.004)
%Female			−0.116			−2.654			0.227
			(0.227)			(26.818)			(0.157)
%Married, Spouse Present			−0.097			5.398			0.114
			(0.107)			(4.234)			(0.088)
%Black			0.087			−3.298			−0.376
			(0.180)			(4.818)			(0.332)
%Hispanic			0.315			−12.779			0.204
			(0.232)			(15.884)			(0.226)
%Other			−0.104			40.383			0.419*
			(0.294)			(30.626)			(0.223)
%High School or Above			−0.378**			−26.457			−0.071
			(0.162)			(21.397)			(0.134)
%Employed			0.096			−0.973			0.292***
			(0.091)			(4.254)			(0.086)
%In Labor Force			0.029			19.610			0.215*
			(0.129)			(17.159)			(0.117)
%Federal Poverty Level			0.001*			0.006			−0.000
			(0.000)			(0.026)			(0.000)

Table 3 (continued)

VARIABLES	(1) Log (Medicare Discharges)	(2) Log (Medicare Discharges)	(3) Log (Medicare Discharges)	(4) Medicare Average Length of Stay	(5) Medicare Average Length of Stay	(6) Medicare Average Length of Stay	(7) Log (Inpatient Revenue)	(8) Log (Inpatient Revenue)	(9) Log (Inpatient Revenue)
Household Income			0.000*			−0.000			0.000***
			(0.000)			(0.000)			(0.000)
Constant	6.957***	6.714***	6.425***	4.073	6.798**	5.153	17.934***	17.664***	16.862***
	(0.027)	(0.074)	(0.280)	(5.535)	(2.898)	(12.145)	(0.026)	(0.086)	(0.311)
Observations	37,663	37,663	37,663	37,663	37,663	37,663	31,000	31,000	31,000
R-squared	0.024	0.025	0.025	0.000	0.000	0.001	0.074	0.077	0.079
Hospital FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
FY FE	Y	Y	Y	Y	Y	Y	Y	Y	Y

Standard errors clustered at the hospital level in parentheses

Abbreviations: *FE* fixed effects, *FY* fiscal year, *MA* Medicare Advantage

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

consider network adequacy standards designed to ensure that beneficiaries have reasonable access. These network adequacy standards may indirectly protect hospitals too, because when they are the only acute care provider in the area, their bargaining power relative to MA plans increases. Also, out-of-network payment regulations preclude MA plans from paying out-of-network hospitals rates lower than FFS, which may improve the bargaining power of hospitals. Similarly, under FFS critical access hospitals (CAHs) are reimbursed at 101% of reasonable and allowable costs, giving these hospitals a profitable alternative to MA plans. However, when the MA penetration rate increases, the bargaining power of MA plans conditional on all these pre-existing regulations increases. As a result, hospitals not contracting with MA plans may struggle with their volume of patients and hospitals joining MA plans may observe denials of care and admissions by plans, a practice that has recently being denounced by rural hospitals which is in line with our findings. For example, a news outlet has reported concrete cases of rural hospitals complaining that MA plans are financially harming them by denying inpatient visits, long-term acute care, rehabilitation, and laboratory tests, and sometimes agreeing to pay only for "observation" rather than inpatient care [21].

Our study has several limitations. First, we cannot separate the effects for MA and FFS Medicare, as the AHA survey does not report separate MA and FFS Medicare inpatient days data during our study period. Second, we used utilization measures as proxies for financial outcomes, due to unavailability of more direct financial outcomes (e.g., revenue) in the AHA data. Although HCRIS data include financial outcomes, such as inpatient revenue we studied, they do not include variables specific for Medicare. Third, we have not accounted for any state-level measures or Special Needs Plans regulations that could provide some level of protection to some rural hospitals against MA practices. In addition, we have not adjusted for the effect of accountable care organizations (ACOs) operating in rural areas, whose efforts towards efficiency could confound to some extent with our results [22, 23]. However, given that ACOs are more prevalent in urban areas and that the reduction found in inpatient stays only applies to rural hospitals, this concern seems relatively minor. Finally, all our estimates represent associations only and not necessarily causal effects.

Our study has several policy implications. First, MA plans seem to provide less expensive care than FFS Medicare partially by transferring costs to rural hospitals, which contributes to their financial pressure [24]. Section 42 of the Social Security Act stipulates that out-of-network hospitals receive FFS prices for their services. Rural hospitals that depend heavily on Medicare beneficiaries cannot, then, credibly threaten MA plans with leaving their networks because by leaving the network, they would obtain prices capped at the FFS levels [25]. Indeed, a 5% higher unit price obtained through FFS Medicare for some out-of-network patients would not compensate for the loss of many admissions that could potentially be steered away. One potential policy for consideration would be setting higher FFS prices for rural hospitals. This approach could favorably impact rural hospitals' finances both directly and indirectly, giving these hospitals more bargaining power vis-a-vis MA sponsors by increasing the profitability of the scenario in

which rural hospitals and MA sponsors do not reach an agreement.

Second, policymakers could consider decreasing the bargaining power of MA plans by making the network adequacy criteria for rural areas more stringent. However, this could result in fewer available MA plans and a lower MA penetration rate, potentially reducing competition among MA plans and lowering the quality of care for beneficiaries, as MA plans generally offer better quality care compared to FFS [24].

Finally, policymakers could consider regulating the administrative aspects of the relationship between hospitals and MA plans to provide some alleviation for rural hospitals, such as increasing transparency and providing oversight over issues impacting number of admissions (e.g., prior authorizations) as well as ensuring speedier payments from MA plans to hospitals.

Conclusions

In conclusion, our study provides evidence that as MA plans increase their penetration in rural areas, their bargaining power increases relative to rural hospitals. MA plans use this increased bargaining power to reduce the number of paid inpatient days (among other potential effects), which exacerbates the already fragile financial conditions of rural hospitals, particularly due to their key role in providing the revenue needed to cover the high administrative overhead costs of these hospitals. Policymakers can safeguard rural hospitals by modifying the fee-for-service prices received by rural hospitals or strengthening the network adequacy criteria of MA plans for rural areas.

Abbreviations

ACO	Accountable care organizations
ALOS	Average length of stay
CBO	Congressional Budget Office
CEAC	Counties with extreme access considerations
CMS	Centers for Medicare & Medicaid Services
FFS	Fee-for-service
HCRIS	Healthcare Cost Report Information System
HSD	Health Service Delivery
IPUMS	Integrated Public Use Microdata Series
MA	Medicare Advantage
MSA	Metropolitan statistical areas
OLS	Ordinary least squares

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13561-025-00599-7.

Supplementary Material 1.

Acknowledgements

Not applicable.

Authors' contributions

Both authors contributed to the idea and methodological design. SL analyzed the data and drafted the methods and results sections. GC drafted the background and discussion sections. Both authors reviewed and approved the final manuscript.

Funding

Not applicable.

Data availability

The data that support the findings of this study are available from American Hospital Association, but restrictions apply to the availability of these data, which were used under license. Data are available from the authors upon reasonable request and with permission of American Hospital Association.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Received: 13 July 2023 Accepted: 5 February 2025
Published online: 12 February 2025

References

1. Frakt A. The rural hospital problem. JAMA Forum Archive. Published online May 1, 2019. https://doi.org/10.1001/jamahealthforum.2019.0018.
2. Bai G, Yehia F, Chen W, Anderson GF. Varying trends in the financial viability of US rural hospitals, 2011–17. Health Aff. 2020;39(6):942–8.
3. Parker K, Horowitz J, Brown A, Fry R, Cohn DV, Igielnik R. What unites and divides urban, suburban and rural communities. Washington, DC: Pew Research Center; 2018.
4. Lindrooth RC, Perraillon MC, Hardy RY, Tung GJ. Understanding the relationship between Medicaid expansions and hospital closures. Health Aff. 2018;37(1):111–20.
5. Medicare Payment Advisory Commission. Report to the Congress: Medicare and the health care delivery system. 2021. https://www.medpac.gov/wp-content/uploads/import_data/scrape_files/docs/default-source/reports/jun21_medpac_report_to_congress_sec.pdf.
6. American Hospital Association. Rural report: Challenges facing rural communities and the roadmap to ensure local access to high-quality, affordable care. 2019. https://www.aha.org/system/files/2019-02/rural-report-2019.pdf.
7. Casey M. Serving rural Medicare risk enrollees: HMOs' decisions, experiences, and future plans. Health Care Financ Rev. 1998;20(1):73–81.
8. McGuire TG, Newhouse JP, Sinaiko AD. An economic history of Medicare part C. Milbank Q. 2011;89(2):289–332.
9. Moscovice I, Casey M, Krein S. Expanding rural managed care: enrollment patterns and prospects. Health Aff (Millwood). 1998;17(1):172–9.
10. Saving Rural Hospitals. (n.d.). 2. The causes of rural hospital problems.https://ruralhospitals.chqpr.org/Problems.html.
11. Maeda JL, Nelson L. An analysis of private-sector prices for hospital admissions. Congressional Budget Office Working Paper. Congressional Budget Office Working Paper; 2017 [cited 2022 Feb 15]. https://www.cbo.gov/publication/52567.
12. Berenson RA, Sunshine JH, Helms D, Lawton E. Why Medicare advantage plans pay hospitals traditional Medicare prices. Health Aff (Millwood). 2015;34(8):1289–95.
13. Luthi S. Medicare Advantage plans underpay rural providers. Is that a problem? Modern Healthcare. 2018. [cited 2022 Feb 15]; https://www.modernhealthcare.com/article/20180210/NEWS/180219989/medicare-advantage-plans-underpay-rural-providers-is-that-a-problem.

14. Miller HD. New approaches to both health care delivery and payment systems are needed in rural areas. J Ambul Care Manage. 2019;42(2):89–91. https://doi.org/10.1097/JAC.0000000000000272. PMID: 30768431.
15. Centers for Medicare & Medicaid Services. Contract Year (CY) 2017 Medicare Advantage health service delivery (HSD) provider and facility specialties and network adequacy criteria guidance and methodology. https://www.cms.gov/Medicare/Medicare-Advantage/MedicareAdvantageApps/Downloads/CY__2017_MA_HSD_Network_Criteria_Guidance_020916.pdf.
16. Ruggles S, Flood S, Sobek M, Backman D, Chen A, Cooper G, et al. IPUMS USA: Version 15.0 . Minneapolis, MN: IPUMS. 2024. https://doi.org/10.18128/D010.V15.0.
17. Baker LC, Bundorf MK, Devlin AM, Kessler DP. Medicare Advantage plans pay hospitals less than traditional Medicare pays. Health Aff (Millwood). 2016;35(8):1444–51.
18. Mueller KJ, Alfero C, Coburn AF, Lundblad JP, MacKinney AC, McBride TD, et al. Insuring rural America: health insurance challenges and opportunities. 2018. https://rupri.org/wp-content/uploads/20180802nsuring-Rural-America.pdf.
19. Lind KD, Noel-Miller CM, Sangaralingham LR, Shah ND, Hess EP, Morin P, et al. Increasing trends in the use of hospital observation services for older Medicare Advantage and privately insured patients. Med Care Res Rev. 2019;76(2):229–39.
20. Song Z, Landrum MB, Chernew ME. Competitive bidding in Medicare Advantage: effect of benchmark changes on plan bids. J Health Econ. 2013;32(6):1301–12.
21. Morgenson G. "Deny, deny, deny": By rejecting claims, Medicare Advantage plans threaten rural hospitals and patients, says CEOs. NBC News; 2023. https://www.nbcnews.com/health/rejecting-claims-medicare-advantage-rural-hospitals-rcna121012.
22. Scarpati LM, McWilliams, JM, McPheron, H, Fout BT, Trombley MJ. How ACOs in rural and underserved areas responded to Medicare's ACO Investment Model. Health Affairs Blog, November 10, 2020. https://doi.org/10.1377/forefront.20201104.974760.
23. Geng F, Lake D, Meyers DJ, Resnisk LJ, Teno JM, Gozalo P, et al. Increased Medicare Advantage penetration is associated with lower postacute care use for traditional Medicare patients. Health Affairs. 2023;42(4). https://doi.org/10.1377/hlthaff.2022.00994.
24. Afendulis CC, Chernew ME, Kessler DP. The effect of Medicare Advantage on hospital admissions and mortality. Am J Health Econ. 2017;3(2):254–79.
25. Pelech D. An analysis of private-sector prices for physicians' services. Congressional Budget Office Working Paper. 2018 [cited 2022 Feb 15]. https://www.cbo.gov/publication/53441.

Publisher's Note