Findings Brief
NC Rural Health Research Program

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The Low-Volume Hospital Adjustment Before and During COVID-19

Emmaline Keesee, MSPH; Susie Gurzenda, MS;
Kristie Thompson, MA; George Pink, PhD

BACKGROUND

In 2003, the Medicare Payment Advisory Commission (MedPAC) recognized that small hospitals were disadvantaged under Medicare payment policies and recommended the implementation of a low-volume hospital (LVH) adjustment.[1] The adjustment was established under the Medicare Prescription Drug, Modernization, and Improvement Act in 2003 and first implemented by the Centers for Medicare & Medicaid Services (CMS) in 2005.[2] Prospective Payment System (PPS) hospitals with fewer than 200 total acute care discharges and that were located more than 25 road miles from the next closest PPS hospitals received the LVH adjustment.[3] Only five hospitals qualified to receive the adjustment under the original criteria.[4]

Since its initial implementation, the LVH adjustment has undergone several incremental and temporary expansions because it is not a permanent program. The Affordable Care Act of 2010 expanded qualifying criteria until 2018 to include PPS hospitals with fewer than 1,600 discharges and that were located more than 15 road miles from the closest PPS hospital.[5,6] That change increased the number of qualifying hospitals from 5 to over 500.[4] The Bipartisan Budget Act of 2018 further expanded the criteria until October 2022 to PPS hospitals with fewer than 3,800 discharges and located greater than 15 road miles from the closest PPS hospitals.[5,6] A short extension was included under the Continuing Appropriations and Ukraine Supplemental Appropriations Act (2023) until December 2022.[7,8] Ultimately, the Consolidated Appropriations Act was signed on December 29th, 2022, extending the existing criteria through September 2024.[9,10] The current payment adjustment uses a continuous linear sliding scale starting at 25% for low-volume hospitals with fewer than 500 discharges to 0% for those with greater than 3,800 discharges.[7]

Our previous brief in 2016 analyzed characteristics of low-volume and non-low-volume rural PPS hospitals from 2012 to 2014 under the Affordable Care Act's qualifying criteria.[4] We found that, without the adjustment, rural LVHs would have had significantly lower profitability margins.[4] This brief provides an update to those findings and uses the current LVH adjustment qualifying criteria to compare low-volume hospitals to all other rural PPS hospitals and explore the effect of taking away the adjustment on LVHs in the two years before COVID-19 (April 2018 to March 2020) and two years during COVID (April 2020 to March 2022).[11] This analysis assesses the impact of the LVH provision on rural hospitals; it does not address the appropriateness of the qualifying criteria.

KEY FINDINGS

The Low-Volume Hospital (LVH) adjustment is for hospitals with fewer than 3,800 patient discharges in the previous year that are more than 15 miles from the nearest Inpatient Prospective Payment System acute care hospital. Qualifying hospitals receive a payment adjustment up to an additional 25% for every Medicare patient discharge. This study found that:

- The number of rural Prospective Payment System (PPS) hospitals that received a low volume hospital adjustment increased during the study period (April 2018- March 2022).
- Low-volume hospitals had lower total, operating, and Medicare inpatient margins than non-LVHs across all study years.
- Low-volume hospitals would have had substantially lower profitability margins without the LVH adjustment, with the largest impact on Medicare inpatient margins.

METHODS

We used Healthcare Cost Reporting Information System (HCRIS) data to compare acute rural PPS (R-PPS) hospital characteristics and profitability by low-volume status. We defined the start of the COVID-19 pandemic as April 1, 2020, because Public Health Emergency funding (PHE) was first distributed in April 2020. Thus, we analyzed the four year-long periods defined in Table 1, with cost reports categorized by end date.

Table 1. Cost Report End Dates Corresponding with Periods Used in Analysis

Period	Data Label	Cost Reports Ending Between	
Pre-COVID-19 years	April 2018 – March 2019	Apr 1, 2018	Mar 31, 2019
	April 2019 – March 2020	Apr 1, 2019	Mar 31, 2020
COVID-19 years	April 2020 – March 2021	Apr 1, 2020	Mar 31, 2021
	April 2021 – March 2022	Apr 1, 2021	Mar 31, 2022

We used an unbalanced panel of R-PPS hospitals across the study years with several exclusion criteria. R-PPS hospitals were excluded from analysis if total margin, operating margin, or Medicare inpatient margin was greater than 100% or less than -100% (n = 194) or if a hospital was part of the Rural Community Hospital Demonstration (n = 102).[4] Critical Access Hospitals were not included because they are ineligible for LVH adjustments, and Indian Health Service hospitals were not included because of incomplete data. The final sample consisted of 3,379 R-PPS hospitals across all four study years.

We defined rural hospitals as those located within non-metro counties, those within metro census tracts with RUCA codes 4-10, and those within large area Metro census tracts of at least 400 square miles in area with a population density of 35 or less per square mile with RUCA codes 2-3.[12] A hospital was categorized as LVH in a given study year if it received a low-volume adjustment of greater than zero.

We compared R-PPS LVHs and rural non-LVHs in each year by three profitability indicators: total margin (net income/ total revenue), operating margin (operating income/operating revenue), and Medicare inpatient margin (Medicare net inpatient income/Medicare inpatient revenue). We calculated counterfactual profitability margins (what a margin would have been without the LVH adjustment) by subtracting the dollar amount of the LVH adjustment from both the numerator and denominator of the indicator ratio. Table 2 shows the HCRIS data used in the analysis.

Table 2. Healthcare Cost Reporting Information System Primary Line Items Used in Analysis

Indicators	Cost Report Source
LVH Adjustment	Worksheet E, Part A, Column 1, Line 70.96 + 70.97 + 70.98
Total Margin	
Net income	Worksheet G3, Column 1, Line 29
Total revenue	Worksheet G3, Column 1, Lines 3 + 25
Total Operating Margin	
Operating income	Worksheet G3, Column 1, Line 3 - 4
Net patient revenue	Worksheet G3, Column 1, Line 3
Medicare Inpatient Margin	
Medicare operating Income	Worksheet E Part A, Line 47 - 71.01-Worksheet D1, Line 53
Medicare revenue	Worksheet E Part A, Line 47 - 71.01
COVID-19 PHE funding	Worksheet G-3, Line 24.5

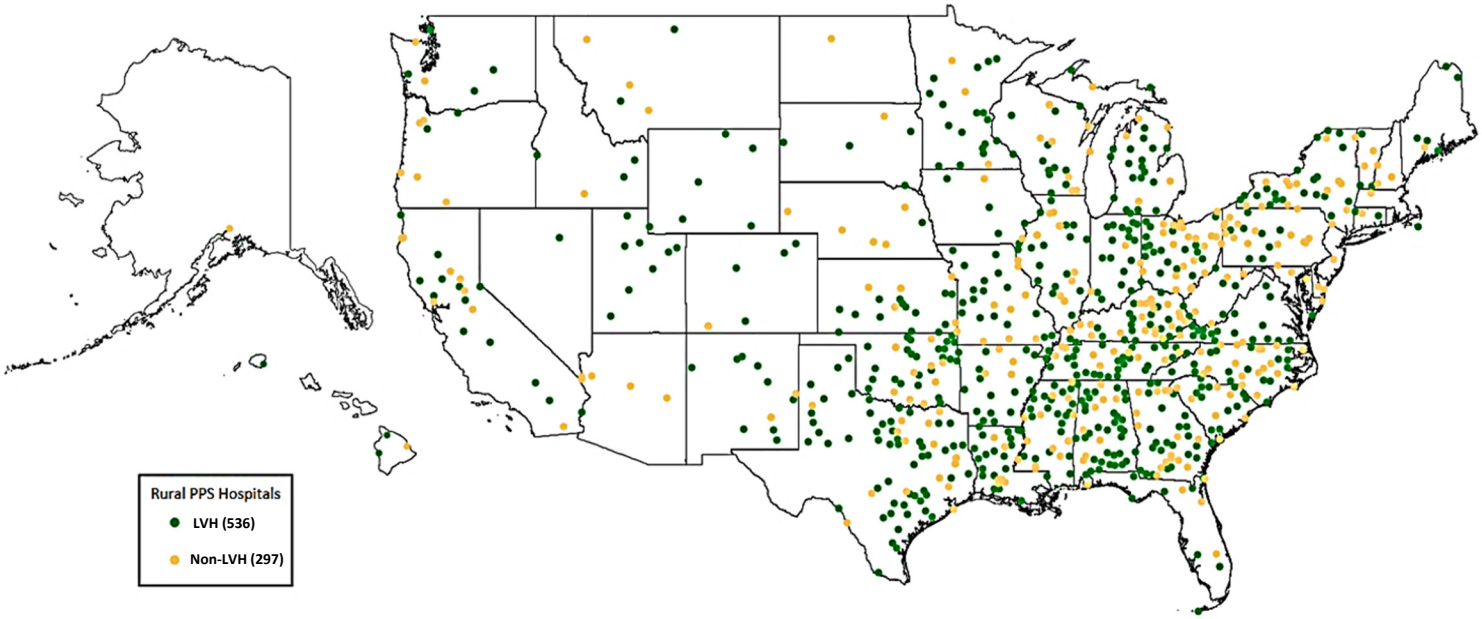
RESULTS

Comparing LVH and Non-LVH Hospital Characteristics

Figure 1 presents the location of all LVH and non-LVH PPS hospitals in rural areas from April 2021 – March 2022 and shows that LVHs are concentrated in the South and Midwest. Figure 2 includes the proportion of R-PPS hospitals that received the LVH adjustment between April 2018 and 2022. Overall, the number of LVHs increased from 506 to 536 during the study period, climbing from 58.8% to 64.3% of all R-PPS hospitals (percentages not shown).

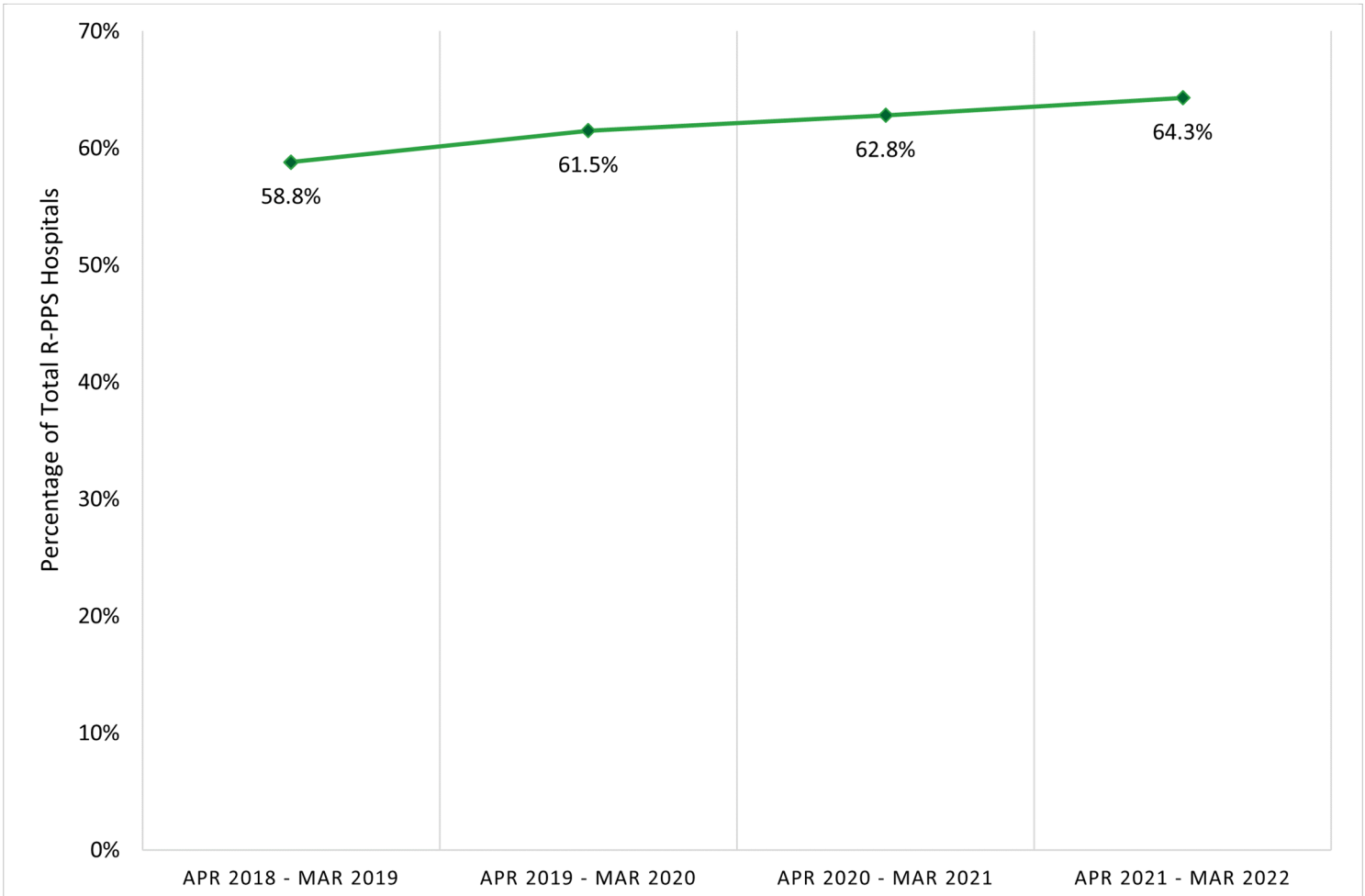
The number of distinct R-PPS hospitals in our sample decreased from 861 to 833 during the study period. This analysis does not explore the reasons for decreased total R-PPS numbers, though it likely relates to a mixture of closures, mergers, and cost report delays. While the total R-PPS sample declined, total number and proportion of R-PPS hospitals receiving an LVH adjustment rose.

Figure 1. Map of Rural Hospitals Receiving a Low-Volume Hospital Adjustment (April 2021 – March 2022)



Note: This map shows rural PPS hospitals by receipt of an LVH adjustment of greater than zero on cost reports ending between April 1st, 2021, and March 31st, 2022. Alaska and Hawaii are not to scale. U.S. boundary data is derived from public use Esri files and map was generated using ArcGIS software.

Figure 2. Low-Volume Hospitals as a Percentage of all R-PPS Facilities



LVH R-PPS	**506**	**521**	**526**	**536**
Non-LVH R-PPS	355	326	312	297
Total	861	847	838	833

Table 3 includes R-PPS hospital characteristics according to LVH status. LVHs were smaller than non-LVHs, averaging 51.9 to 52.4 total acute care beds compared with 119.3-124.5 during the study period. LVHs averaged 1,562.5 total discharges compared with 5,201.7 for non-LVHs in the study period (not shown), and the proportion of discharges that were paid by Medicare was about the same for LVHs across all years. LVHs were more likely to be government owned and less likely to be not-for-profit than non-LVHs. LVHs and non-LVHs were similarly likely to provide long-term care, but LVHs were more likely to operate a rural health clinic. Across all years, LVHs were more likely to be Medicare Dependent Hospitals and Sole Community Hospitals.

Under COVID-19 Years in Table 3, we show that non-LVHs received more PHE funding. This finding was expected because the Public Health Emergency funding was based on operating expenses, which is highly correlated with patient volume and revenue. However, PHE funding made up a higher percentage of total revenue for LVHs. PHE funding made up 5.8% of LVH total revenue in the first year of the pandemic (April 2020 – March 2021) and 4.5% in the second year (April 2021 – March 2022), compared with 4.7% and 2.8% for non-LVHs in the same years.

Table 3. Low-Volume versus Non-Low-Volume R-PPS Hospital Characteristics, April 2018 – March 2022

Pre-COVID-19 Years	April 2018 – March 2019		April 2019 – March 2020	
	LVH	Non-LVH	LVH	Non-LVH
Number of hospitals	506	355	521	326
Hospital characteristics, mean (SD)				
Total discharges	1,577.2 (877.4)	5,127.3 (3,807.4)	1,600.3 (939.3)	5,316.4 (3,942.0)
Medicare discharges as a percent of total discharges (%)	41.9 (12.3)	41.5 (9.9)	40.6 (11.9)	40.1 (10.0)
Number of acute care beds	51.9 (24.3)	119.3 (74.5)	52.1 (24.6)	121.8 (80.2)
Average daily census	14.1 (9.3)	54.1 (46.2)	14.5 (9.8)	56.7 (48.7)
Patient deduction (%)	66.3 (11.9)	69.7 (11.0)	67.4 (11.2)	70.5 (11.8)
Ownership, N (%)				
Not-for-profit	268 (52.9)	221 (62.3)	288 (55.3)	200 (61.4)
For-profit	100 (19.8)	71 (20.0)	99 (19.0)	69 (21.2)
Government	138 (27.3)	63 (17.8)	134 (25.7)	57 (17.5)
Operates Rural Health Clinic, N (%)	208 (41.1)	75 (21.1)	228 (43.8)	68 (20.9)
Provides Long-term Care, N (%)	93 (18.4)	67 (19.9)	92 (17.7)	58 (17.8)
Medicare Dependent Hospital, N (%)	93 (18.4)	39 (11.0)	98 (18.8)	44 (13.5)
Sole Community Hospital, N (%)	240 (47.4)	122 (34.3)	247 (47.4)	111 (34.0)
COVID-19 Years	**April 2020 – March 2021**		**April 2021 – March 2022**	
	LVH	Non-LVH	LVH	Non-LVH
Number of hospitals	526	312	536	297
Hospital characteristics, mean (SD)				
Total discharges	1,510.7 (900.9)	5,157.3 (3,854.7)	1,552.9 (956.4)	5,193.6 (3,963.2)
Medicare discharges as a percent of total discharges (%)	37.3 (11.1)	36.4 (10.4)	34.0 (10.4)	33.2 (9.9)
Number of acute care beds	52.0 (26.0)	124.6 (83.6)	52.4 (27.2)	124.5 (86.0)
Average daily census	14.3 (9.6)	55.9 (47.9)	16.5 (11.4)	61.9 (53.0)
Patient deduction (%)	67.7 (11.3)	70.2 (12.3)	67.8 (10.7)	70.4 (12.0)
Ownership, N (%)				
Not-for-profit	289 (54.9)	199 (63.8)	301 (56.2)	185 (62.3)
For-profit	98 (18.6)	60 (19.2)	95 (17.7)	59 (19.9)
Government	139 (26.4)	53 (16.9)	140 (26.1)	53 (17.9)
Operates Rural Health Clinic, N (%)	245 (46.6)	63 (20.2)	268 (50.0)	65 (21.9)
Provides Long-term Care, N (%)	90 (17.1)	56 (17.9)	85 (15.9)	47 (15.8)
Medicare Dependent Hospital, N (%)	89 (16.9)	43 (13.8)	95 (17.7)	39 (13.1)
Sole Community Hospital, N (%)	261 (49.6)	110 (35.3)	259 (48.3)	106 (35.7)
Public Health Emergency Funds, mean (SD)				
PHE Funds (Million USD)	3.6 (4.0)	7.4 (8.7)	2.5 (3.5)	4.3 (6.5)
PHE Funds/Total Revenue (%)	5.8 (6.1)	4.7 (4.6)	4.5 (7.2)	2.8 (4.6)

Note: Table includes median and standard deviation (SD)

Profitability Indicators for LVH versus Non-LVH Hospitals

Table 4 includes percent total margin, operating margin, and Medicare inpatient margin for LVHs and non-LVHs. The non-LVH median was higher across all study years for each profitability indicator. The overall median total margin for LVHs was 4.0% compared with 5.2% for non-LVHs (not shown). Overall median operating margin was -7.3% for LVHs and -1.9% for non-LVHs. Finally, median Medicare inpatient margin was 5.6% and 10.0% for LVHs and non-LVHs, respectively (not shown). We include LVH adjustment as a percent of Medicare inpatient revenue and Medicare inpatient cost for LVHs in table 4. The average LVH adjustment as a percent of Medicare inpatient revenue remained consistent throughout the study period, while its average as a percent of Medicare inpatient costs increased from 8.8% to 9.8%.

Table 4. Low-Volume versus Non-Low-Volume R-PPS Hospital Profitability Indicators, April 2018 – March 2022

Pre-COVID-19 Years	April 2018 – March 2019		April 2019 – March 2020	
	LVH	Non-LVH	LVH	Non-LVH
Profitability indicators, median (IQR)				
Total margin (%)	0.6 (-5.6, 7.0)	2.9 (-1.5, 9.5)	2.3 (-4.2, 8.3)	4.3 (-1.0, 10.5)
Operating margin (%)	-6.5 (-16.8, 2.2)	-1.7 (-7.8, 6.4)	-5.5 (-14.1, 3.0)	-0.9 (-7.6, 8.0)
Medicare inpatient margin (%)	1.7 (-13.0, 15.2)	7.9 (-3.6, 17.0)	5.3 (-9.1, 16.7)	9.0 (-1.2, 19.8)
LVH adjustment, mean (SD)				
LVH adjustment as a percent of Medicare inpatient revenue (%)	14.6 (7.3)		15.8 (7.2)	
LVH adjustment as a percent of Medicare inpatient cost (%)	15.0 (8.8)		17.0 (9.8)	
COVID-19 Years	**April 2020 – March 2021**		**April 2021 – March 2022**	
	LVH	**Non-LVH**	**LVH**	**Non-LVH**
Profitability indicators, median (IQR)				
Total margin (%)	5.3 (-0.8, 11.2)	6.3 (0.6, 11.9)	7.8 (2.2, 16.0)	10.6 (2.9, 18.0)
Operating margin (%)	-10.7 (-21.0, -1.7)	-4.9 (-15.0, 4.5)	-5.8 (-16.1, 3.0)	0.1 (-9.1, 8.8)
Medicare inpatient margin (%)	6.2 (-11.8, 19.2)	11.5 (-1.0, 21.5)	8.1 (-6.0, 20.9)	11.6 (-0.8, 22.8)
LVH adjustment, mean (SD)				
LVH adjustment as a percent of Medicare inpatient revenue (%)	16.0 (7.1)		16.1 (7.3)	
LVH adjustment as a percent of Medicare inpatient cost (%)	17.7 (10.9)		18.0 (9.8)	

Note: Table includes median and interquartile range (IQR is the difference between the 25th and 75th percentile values).

The Impact of Losing the LVH Adjustment for Low-Volume Hospitals

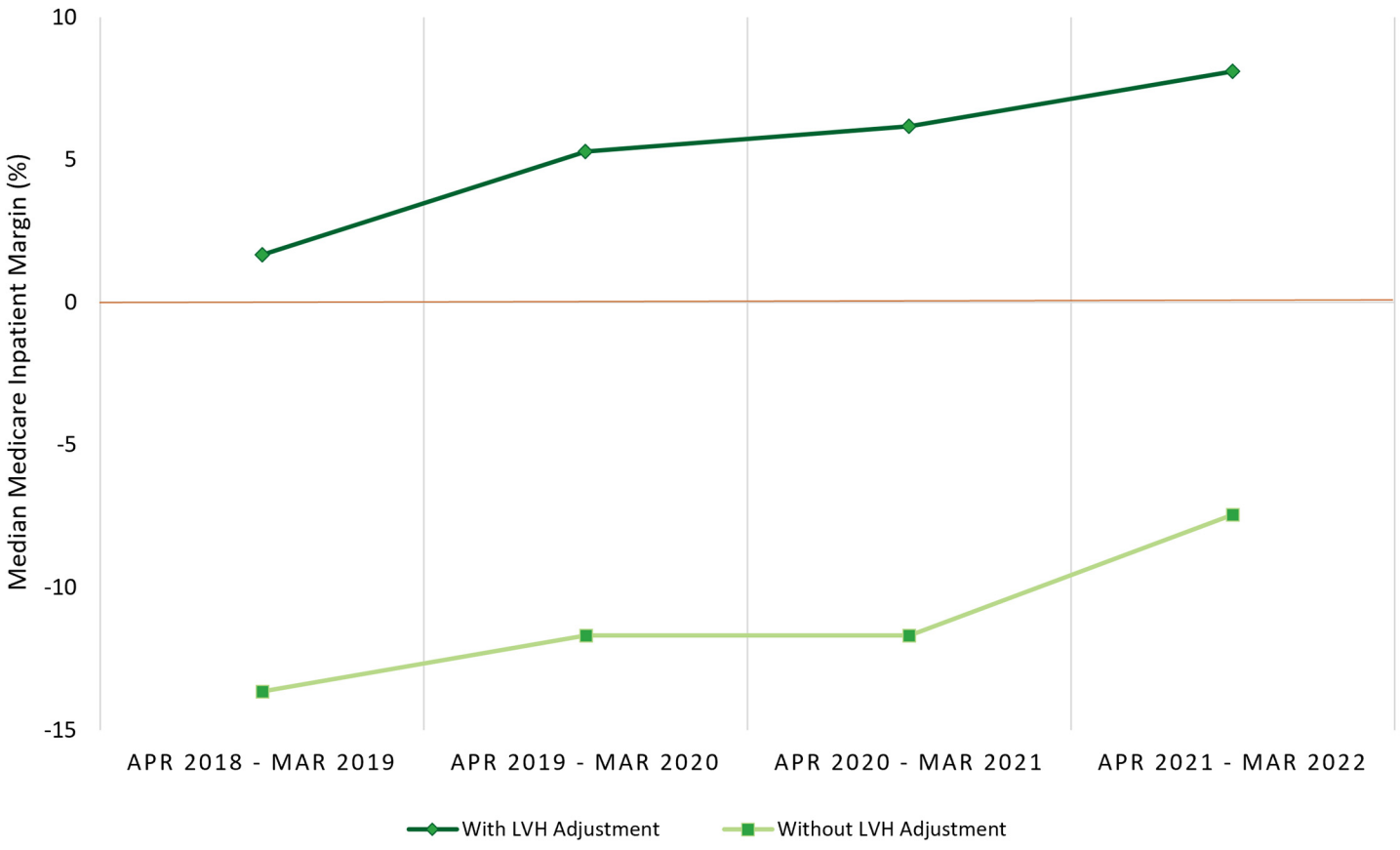
Table 5 includes the median profitability margins for LVHs including and excluding the LVH adjustment for each study year. Without the LVH adjustment, the median total margin decreased by between 0.9 and 1.6 percentage points each study year. The median operating margin dropped by between 1.4 and 1.8 percentage points with the LVH adjustment excluded. Removing the LVH adjustment had the largest impact on Medicare inpatient margin, shown in Figure 3. Without the LVH adjustment, the median Medicare inpatient margin decreased by between 15.4 and 17.9 percentage points each year.

Table 5. Change in Median Profitability Margins with and without LVH Adjustment for Low-Volume R-PPS Hospitals

Pre-COVID-19 Years	April 2018 – March 2019		April 2019 – March 2020	
	With LVH Adjustment	Without LVH Adjustment	With LVH Adjustment	Without LVH Adjustment
Total margin (%)	0.6 (-5.6, 7.0)	-0.5 (-7.5, 5.8)	2.3 (-4.2, 8.3)	0.7 (-6.4, 7.2)
Operating margin (%)	-6.5 (-16.8, 2.2)	-7.9 (-18.6, 1.1)	-5.5 (-14.1, 3.0)	-7.3 (-16.0, 2.2)
Medicare inpatient margin (%)	1.7 (-13.0, 15.2)	-13.7 (-33.4, 2.3)	5.3 (-9.1, 16.7)	-11.7 (-33.0, 3.4)
COVID-19 Years	**April 2020 – March 2021**		**April 2021 – March 2022**	
	With LVH Adjustment	Without LVH Adjustment	With LVH Adjustment	Without LVH Adjustment
Total margin (%)	5.3 (-0.8, 11.2)	4.4 (-2.5, 10.2)	7.8 (2.2, 16.0)	6.8 (0.8, 15.0)
Operating margin (%)	-10.7 (-21.0, -1.7)	-12.5 (-23.4, -3.1)	-5.9 (-16.1, 3.0)	-7.5 (-18.3, 2.0)
Medicare inpatient margin (%)	6.2 (-11.8, 19.2)	-11.7 (-33.3, 5.6)	8.1 (-6.0, 20.9)	-7.4 (-28.2, 7.8)

Note: Table includes median and interquartile range (IQR is the difference between the 25th and 75th percentile values).

Figure 3. Low-Volume Hospital Medicare Inpatient Margin with and without LVH Adjustment



DISCUSSION

We found that the number of LVHs increased steadily from 2018 to 2022. This finding aligns with a recent study by Malone et al., which demonstrated that all rural hospital patient volume decreased on average by 13% from 2011 to 2017, and R-PPS hospital patient volume decreased by 8%.[13] Low patient volumes are a risk factor for hospital closure, and more hospitals may qualify and depend on the LVH adjustment to strengthen profitability if discharges continue to decline.

Further, our comparison of LVH profitability margins with and without an LVH adjustment indicated that median total margin and operating margin would decrease by between 1 and 2 percentage points without the LVH adjustment. Median Medicare inpatient margin, however, would decrease by between 15 and 17 percentage points. Our results reflect those of our previous brief which found profitability margins reduced by approximately two percentages points without the LVH adjustment from 2012-2014. Medicare inpatient margin without the LVH adjustment was estimated to fall by about eight percentage points in the previous brief.[4]

Declining patient volumes and the demonstrated role of the adjustment in boosting profitability margins point to the importance of the LVH designation and adjustment for small rural hospitals. There is previous evidence that the adjustment has made a particularly large difference for hospitals located in the South with higher poverty rates and proportions of Black and uninsured residents.[14] As policy makers consider legislation to maintain or alter the LVH adjustment before its expiration on December 31, 2024, the impact on more vulnerable communities is a relevant consideration.[6]

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11. To offset losses during COVID-19 and keep hospital doors open during the pandemic, the Federal Government instituted the Coronavirus Aid, Relief, and Economic Security (CARES) Act in March of 2020. The CARES Act included the Provider Relief Fund (PRF), which distributed a total of $178 billion to providers; the American Rescue Plan (ARP), which supplied rural hospitals with an additional $8.5 billion to maintain access to services for rural residents; and the Paycheck Protection Program (PPP), which has allocated $100 billion in PPP loans to health care providers. PRF funding was rolled out in four targeted phases from April 2020 through January 2022 with ARP funds being distributed alongside phase 4 funding from November 2021 through January 2022. In this study, the funds described above are referred to collectively as “PHE funding.”
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