Findings Brief
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The Impact of the Low Volume Hospital (LVH) Program on the Viability of Small, Rural Hospitals

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BACKGROUND

In response to the widening gap between rural and urban hospital profitability margins, the Medicare Payment Advisory Commission (MedPAC) asserted that Medicare payment policies penalized small-scale hospital operations and recommended that Congress authorize a Low Volume Hospital (LVH) payment adjustment.[1] This designation and payment adjustment was created in the Medicare Prescription Drug, Improvement and Modernization Act of 2003 and applied only to hospitals reimbursed through the Inpatient Prospective Payment System (IPPS).[2] (Because they are reimbursed on a cost basis, Critical Access Hospitals are not eligible for the LVH payment adjustment.) The Centers for Medicare & Medicaid Services (CMS) implemented the LVH adjustment in federal fiscal year (FFY) 2005 according to the following definition: to qualify for a payment adjustment, hospitals had to have less than 200 total discharges in the most recently submitted Medicare cost report year and be located more than 25 driving miles from another IPPS acute care hospital. Under these requirements, only five hospitals qualified for the adjustment in FFY 2005. Qualifying hospitals saw a 25% increase in their Medicare inpatient revenue.[3]

KEY FINDINGS

- Low Volume Hospitals (LVHs) are typically smaller, government-owned, more geographically isolated and have lower total and operating margins than rural non-LVHs.
- Without the LVH adjustment, qualifying hospitals would have had profitability margins approximately two percentage points lower.
- Of the hospitals receiving the LVH adjustment, those that would be most affected by the loss of the LVH payment are smaller, government-owned, more geographically isolated, and more dependent on Medicare as a payer for inpatient services.
- If the LVH program reverted back to the 2005 standards as scheduled in federal fiscal year (FFY) 2018, approximately 99% of current LVHs would lose their eligibility. Policymakers should consider which hospitals will be most negatively affected by this reversion.

The Patient Protection and Affordable Care Act (ACA) enacted in 2010, temporarily but substantially expanded the LVH program. To qualify, hospitals had to have fewer than 1,600 discharges for individuals entitled to Medicare Part A and be located more than 15 miles from another IPPS hospital.[4] This led to an increase in the number of qualifying hospitals from less than five in 2005 to a little more than 500 in FFY 2012. Under the expanded ACA definition, LVHs with fewer than 200 qualifying Medicare discharges received a 25% increase in reimbursement per Medicare discharge, and LVHs with 200-1,599 Medicare discharges received sliding scale adjustments to Medicare inpatient reimbursement.[4] The ACA's more expansive definition was set to expire after FFY 2012, but has been extended four times through legislation.[5] The expanded LVH program will expire after FFY 2017 at which point the LVH classification and payment methodology will revert to the 2005 standards unless further legislative action occurs.[6] The loss of these payments could occur simultaneously with the scheduled reductions in health information technology payments[7] and Medicaid Disproportionate Share Hospital payments.[8] These reductions would coincide with an increasing number of rural hospital closures (78 rural hospitals have closed since 2010, and 15 have closed thus far in 2016)[9] and rural hospitals at risk of financial distress.[10]

This analysis compares rural LVH to non-LVH characteristics and estimates the financial impact of eliminating the LVH program and reverting to the original (2005) LVH classification and payment adjustment. This research is directly relevant to policymakers, federal and state agencies, and regulators interested in whether reverting to the original LVH classification—or eliminating the classification altogether—might impair access to care for Medicare beneficiaries residing in their service areas.

RESULTS

Descriptive analysis

Table 1 contains counts of rural IPPS hospitals and rural LVHs and the values of their LVH adjustments by state and year. The number of LVHs remained fairly consistent, ranging from 505 to 508 hospitals each year and accounting for roughly 53% of all rural IPPS hospitals. LVH adjustments ranged from $242 million to $245 million each year. Across hospitals over time, the value of the LVH adjustment ranged from approximately $2,200 to $3 million with a median adjustment of approximately $450,000. (Results not shown in table.) Six states with rural hospitals (Maryland, Montana, North Dakota, Nebraska, New Hampshire and New Jersey) had no LVHs in any of the three years. Texas had the greatest number of LVHs in each of the three years.

A map of LVH locations can be found in Figure 1. The green circles indicate hospital locations that qualified as LVHs in each of the three years. The blue triangles signify hospitals that switched LVH status during the three-year period. As is evident in the map, most LVHs are in the eastern half of the country. The proportion of rural IPPS hospitals that qualified as LVHs varied by Census region: in 2014, nearly 61% of all rural IPPS hospitals in the West qualified as LVHs, while 43% of rural IPPS hospitals in the Northeast qualified as LVHs.

Table 2 compares rural hospital characteristics according to LVH status from 2012-2014. The majority of rural hospitals qualified as LVHs for the entire three-year study analysis period. LVHs that switched status during the three years had the lowest total margin and operating margin ($p<.001$). Rural hospitals that never qualified as LVHs had the lowest Medicare margin ($p<.001$). On average, compared to rural non-LVHs, LVHs had fewer total discharges ($p<.001$); slightly lower percentages of Medicare discharges ($p<.05$); and lower acute care bed average daily census ($p<.001$). LVHs were more likely to be government-owned hospitals ($p<.001$), more likely to operate a rural health clinic ($p<.001$), but less likely to provide long-term care services ($p<.001$). Finally, LVHs captured a lower percentage of the Medicare market share in their service area ($p<.001$).

Scenario analysis: Elimination of the LVH program

In order to simulate the impact of losing the LVH adjustment on qualifying hospitals' profitability margins, we calculated the margins with and without the LVH adjustment and utilized the Wilcoxon rank-sum test to determine whether there was a significant difference in the median margin. Table 3 highlights the results of this analysis. Without the LVH adjustment, the median total margin would drop by 2.14 percentage points ($p<.001$), and operating margin would fall 2.48 percentage points ($p<.001$). Without the LVH adjustment, qualifying hospitals would see their median Medicare margins fall to –9.30%.

We utilized bivariate tests (non-parametric test for equality of medians, t-test and chi-square analyses) to characterize hospitals that would be most affected by the loss of the LVH adjustment as defined by the quartile of the difference in operating margin with and without the LVH adjustment. We focused on the difference in operating margin because the LVH adjustment is incremental operating revenue for the operating expense of patient care provided to Medicare-eligible inpatients and thus is the best profitability measure for patient care. The results of this analysis are shown in Table 4.

Compared to hospitals for which the loss of the LVH adjustment would have little impact on their operating margin (quartile 1), hospitals most affected by the loss of the adjustment (quartile 4) had lower total and operating margins ($p<.001$) but higher median Medicare inpatient margins ($p<.001$). Quartile 4 hospitals had fewer total discharges ($p<.001$), and Medicare discharges represented a greater percentage of their total discharges ($p<.001$). Quartile 4 hospitals also had fewer acute care beds ($p<.001$), lower average acute care daily census ($p<0.001$) and a greater percentage of patient deductions (contractual allowances + discounts / gross total patient revenue) ($p<.001$). Quartile 4 hospitals were also more likely to be government-owned hospitals ($p<.001$) and to operate a rural health clinic compared to quartile 1 hospitals ($p<.001$).

Scenario analysis: Reversion to the original, 2005 standards

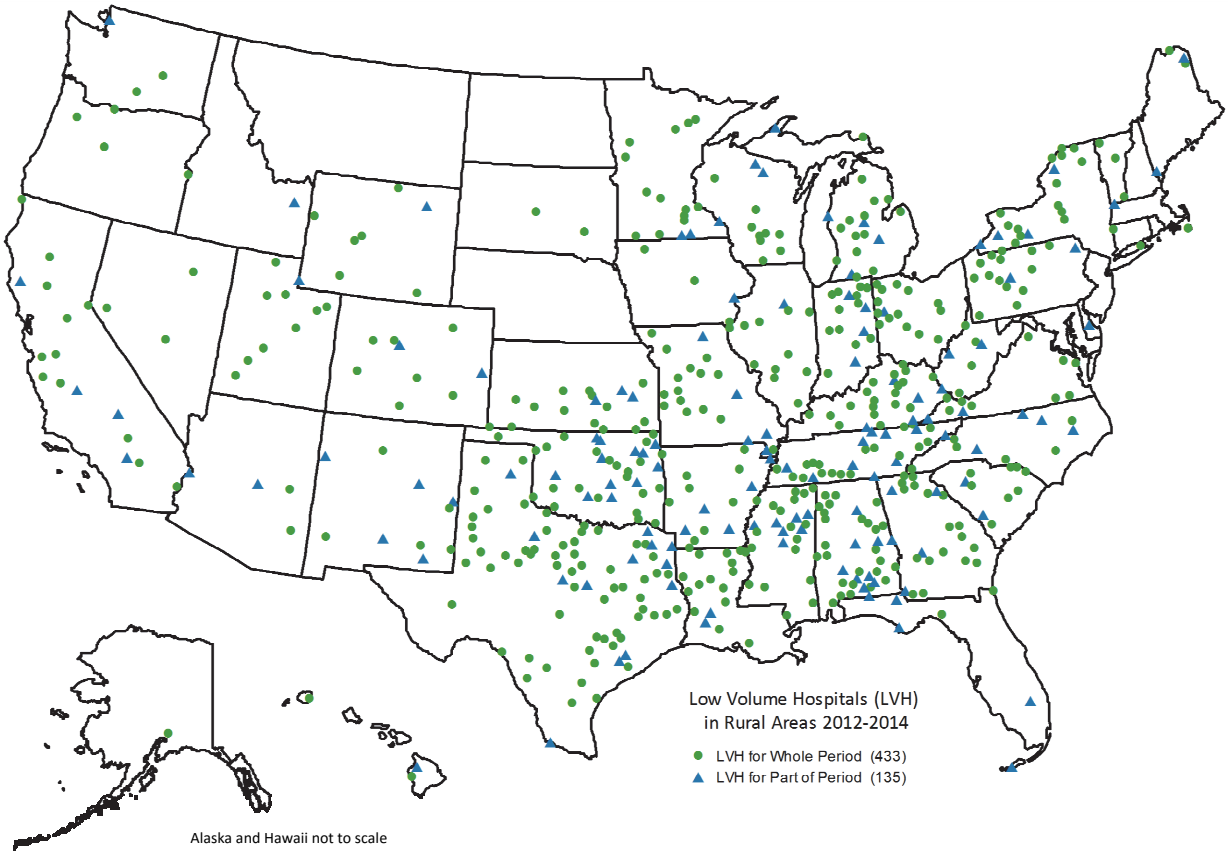
We modeled how many hospitals would retain LVH status if the program reverted to the original 2005 program standards—fewer than 200 total discharges and more than 25 miles from another acute care hospital. Based on this definition, only seven of the 505 LVHs in 2014 would retain the adjustment.

Table 1: Count of All Rural IPPS Hospitals, Rural LVHs and Amount of Low-volume Adjustment by State, 2012-2014*

	2012			2013			2014		
State	Number of Rural IPPS	Number of Rural LVHs	Low-volume Adjustment (in $)	Number of Rural IPPS	Number of Rural LVHs	Low-volume Adjustment (in $)	Number of Rural IPPS	Number of Rural LVHs	Low-volume Adjustment (in $)
US	968	508	243,549,819	944	505	245,243,968	930	505	242,475,626
AK	1	1	440,340	1	1	317,456	1	1	300,340
AL	46	32	11,637,861	41	28	11,029,921	42	31	11,474,484
AR	20	13	6,055,999	20	12	5,219,374	20	12	5,943,355
AZ	7	3	2,369,180	7	3	1,668,112	8	4	2,418,118
CA	28	16	10,985,729	27	13	10,737,738	26	12	10,922,915
CO	11	9	6,587,035	11	8	6,444,669	10	8	6,400,291
CT	3	1	929,015	3	1	856,589	3	1	615,053
DE	2	0	-	2	1	3,032,098	2	1	926,883
FL	11	4	2,050,621	9	5	2,008,377	9	4	1,674,679
GA	43	20	8,856,724	39	20	9,150,236	39	19	8,495,010
HI	4	3	3,281,959	3	2	1,946,129	4	3	2,436,148
IA	10	5	2,576,701	10	4	1,938,774	10	5	2,204,906
ID	2	0	-	3	1	691,045	3	1	840,109
IL	25	10	5,284,517	25	11	5,682,256	25	11	6,298,499
IN	22	14	7,100,171	22	14	6,540,682	23	14	6,036,872
KS	24	16	8,460,413	23	16	9,118,587	23	16	10,480,272
KY	45	20	9,218,647	46	21	8,442,753	46	24	8,894,559
LA	28	17	7,695,530	30	18	7,636,083	28	17	7,676,007
MA	3	2	969,147	3	2	1,070,954	2	1	371,369
MD	5	0	-	5	0	-	5	0	-
ME	7	3	1,857,459	8	4	2,585,139	7	3	2,294,168
MI	31	18	8,616,271	30	17	9,155,122	27	15	7,263,373
MN	19	15	9,343,547	19	16	8,910,817	17	14	7,637,297
MO	32	19	8,761,481	30	18	7,715,085	32	17	6,985,014
MS	42	22	8,400,454	42	20	8,301,650	40	20	8,696,979
MT	5	0	-	5	0	-	5	0	-
NC	38	6	2,676,917	38	9	7,206,305	34	9	4,557,797
ND	1	0	-	1	0	-	1	0	-
NE	7	0	-	7	0	-	7	0	-
NH	2	0	-	4	0	-	4	0	-
NJ	1	0	-	1	0	-	1	0	-
NM	11	6	3,098,798	11	7	4,013,141	10	8	4,728,029
NV	3	3	1,259,744	3	3	1,310,575	3	3	1,275,990
NY	40	17	8,365,871	40	19	8,093,842	38	17	8,042,193
OH	39	15	5,806,958	38	14	6,099,423	39	15	6,595,942
OK	41	24	8,445,448	45	31	10,740,440	47	31	11,033,711
OR	8	4	2,593,201	8	4	2,795,936	8	4	3,149,320
PA	36	14	5,949,256	35	15	5,431,340	35	16	5,667,104
SC	21	10	4,689,371	19	8	4,233,126	21	8	3,834,001
SD	7	2	1,257,098	8	2	1,286,713	8	2	1,304,297
TN	50	24	9,269,918	46	21	8,196,511	43	23	7,702,913
TX	100	70	28,971,000	93	68	26,857,502	92	70	28,572,757
UT	9	9	4,380,904	9	9	4,484,626	9	9	4,154,216
VA	26	10	4,049,346	26	11	4,855,679	24	10	4,608,207
VT	5	3	3,386,735	5	3	2,539,768	5	3	2,646,054
WA	6	3	1,823,506	6	2	1,457,744	6	2	1,514,084
WI	19	11	5,667,919	15	9	4,572,396	19	11	7,793,197
WV	15	7	3,152,352	14	6	2,575,508	13	4	1,638,993
WY	7	7	7,226,676	8	8	8,293,747	6	6	6,370,121

*Count represents only rural hospitals that submitted cost reports for the respective year. States with no rural hospitals are not shown.

Figure 1: Map of Low-volume Hospitals in Rural Areas, 2012-2014



Source: North Carolina Rural Health Research and Policy Analysis Center, Cecil G. Sheps Center for Health Services Research, University of North Carolina at Chapel Hill, November 2015
http://www.shepscenter.unc.edu/programs-projects/rural-health/

Table 2: Rural Hospital Characteristics by LVH Status, 2012-2014

	All Rural IPPS Hospitals	Never LVH	Switched LVH Status	Always LVH	P-value
Number of hospitals 2012-2014	2,842	1,242	301	1,299	-
Profitability indicators, median (IQR)					
% total margin	2.48 (-2.71, 7.96)	3.44 (-0.70, 8.34)	1.22 (-4.88, 8.44)	1.81 (-4.03, 7.24)	<.001
% operating margin	1.89 (-4.09, 7.60)	2.78 (-1.65, 8.19)	-0.35 (-8.01, 7.62)	0.92 (-5.66, 7.14)	<.001
% Medicare inpt margin with LVH adjustment	-0.81 (-14.20, 11.97)	-3.61 (-15.97, 7.56)	-0.17 (-15.81, 14.15)	2.44 (-11.38, 14.57)	<.001
LVH adjustment, mean (sd)					
LVH adjustment as a % of Medicare inpt revenue	-	-	8.14 (8.64)	13.2 (6.69)	<.001
LVH adjustment as a % of Medicare inpt cost	-	-	7.41 (8.23)	11.9 (6.09)	<.001
Hospital characteristics, mean (sd)					
Driving distance to the nearest acute care hospital	21.5 (10.6)	19.0 (10.0)	23.1 (10.1)	23.6 (10.7)	<.001
Total discharges	3,144.79 (2,835.48)	4,961.22 (3,367.42)	2,025.59 (1,215.65)	1,668.79 (890)	<.001
Medicare discharges as a % of total discharges	48.7 (12.0)	49.4 (10.4)	48.6 (13.2)	48.2 (13.1)	0.046
Number of acute care beds	83.1 (60.9)	118 (69.8)	61.5 (31.2)	54.3 (33.2)	<.001
Acute beds average daily census	32.0 (34.1)	53.1 (41.9)	18.9 (11.9)	14.9 (8.46)	<.001
% patient deduction	61.5 (12.7)	64.1 (12.2)	61.2 (13.9)	59.1 (12.4)	<.001
Hospital ownership, mean % (n)					
Not for profit	56.6 (1,609)	63.0 (783)	50.8 (153)	51.8 (673)	<.001
For profit	16.9 (480)	19.3 (240)	23.6 (71)	13.0 (169)	<.001
Government	26.5 (754)	17.7 (220)	25.6 (77)	35.2 (457)	<.001
Operates Rural Health Clinic, mean % (n)	27.7 (788)	17.6 (218)	28.2 (85)	37.3 (485)	<.001
Provides long term care services, mean % (n)	24.9 (707)	29.2 (362)	23.3 (70)	21.2 (275)	<.001
% Medicare market share	25.0 (10.8)	27.4 (11.6)	22.8 (10.1)	23.1 (9.6)	<.001

Notes: p-value based on non-parametric test for equality of medians, t-test and chi-square analyses. IQR = Interquartile range (25th and 75th percentiles). sd = standard deviation

Table 3: How Eliminating the LVH Adjustment Impacts Qualifying Hospitals' Profitability Margins: Wilcoxon Rank-Sum Test on Rural LVHs' Median Profitability Margins, FFY 2012-2014

	With LVH Adjustment	Without LVH Adjustment	z Statistic, P-value
Percent total margin, median (IQR)	2.48 (-2.71, 7.96)	0.34 (-5.84, 6.13)	33.74 (<.001)
Percent operating margin, median (IQR)	1.89 (-4.09, 7.60)	-0.59 (-7.55, 5.81)	33.74 (<.001)
Percent Medicare inpatient margin, median (IQR)	-0.81 (-14.20, 11.97)	-9.30 (-26.96, 4.75)	33.74 (<.001)

Notes: A positive margin means that revenues exceeded expenses and a proft was earned. A negative margin means that expenses exceeded revenues, and a loss was incurred. IQR = interquartile range.

Table 4: Estimated Impact of Eliminating LVH Adjustment: Hospital Characteristic Shown by Quartile of the Operating Margin Difference (operating margin with LVH minus operating margin without LVH), FFY 2012-2014

	Quartile 1: Least Affected by LVH Adjustment	Quartile 2	Quartile 3	Quartile 4: Most Affected by LVH Adjustment	P-value
Number of hospitals	380	379	380	379	-
Profitability indicators with LVH adjustment					
Percent total margin, median (IQR)	4.32 (-0.02, 10.56)	3.28 (-1.80, 8.88)	0.76 (-4.14, 5.01)	-2.69 (-11.02, 3.96)	<.001
Percent operating margin, median (IQR)	4.35 (-0.50, 11.79)	2.78 (-3.11, 8.81)	-0.07 (-6.04, 4.50)	-5.46 (-14.24, 1.47)	<.001
% Medicare inpatient margin, median (IQR)	-3.01 (-18.36, 9.14)	0.65 (-12.46, 11.19)	2.98 (-9.63, 14.66)	9.91 (-7.32, 22.00)	<.001
LVH adjustment, mean (sd)					
LVH adjustment as a % of Medicare inpt revenue	5.86 (5.93)	12.4 (5.73)	15.4 (5.22)	17.9 (4.26)	<.001
LVH adjustment as a % of Medicare inpatient cost	5.07 (4.67)	10.9 (4.74)	13.7 (4.76)	16.9 (4.85)	<.001
Hospital characteristics, mean (sd)					
Driving distance to the nearest acute care hospital	22.3 (8.85)	23.8 (13.0)	24.7 (12.0)	23.5 (7.77)	0.023
Total discharges	2,491.15 (875)	1,816.96 (771)	1,405.71 (673)	1,028.13 (693)	<.001
Medicare discharges as a % of total discharges	46.1 (12.1)	45.3 (11.8)	47.8 (12.8)	54.6 (14.1)	<.001
Number of acute care beds	68.0 (26.6)	53.5 (22.2)	52.8 (44.7)	44.3 (28.2)	<.001
Acute beds average daily census	22.6 (9.4)	15.8 (7.62)	12.6 (6.78)	9.6 (5.88)	<.001
Percent patient deduction	59.6 (11.1)	57.4 (12.0)	58.9 (12.3)	61.1 (14.5)	0.001
Hospital ownership, mean % (n)					
Not for profit	67.6 (257)	59.1 (224)	40.3 (153)	39.3 (149)	<.001
For profit	14.2 (54)	13.7 (52)	14.2 (54)	16.1 (61)	0.799
Government	18.2 (69)	27.2 (103)	45.5 (173)	44.6 (169)	<.001
Operates Rural Health Clinic, mean % (n)	21.8 (83)	38.5 (146)	41.8 (159)	43.5 (165)	<.001
Provides long term care services, mean % (n)	25.0 (95)	29.8 (113)	20.3 (77)	10.6 (40)	<.001
Percent Medicare market share	25.8 (9.3)	23.6 (9.3)	22.8 (10.6)	19.8 (8.81)	<.001

Notes: p-value based on non-parametric test for equality of medians, t-test and chi-square analyses. IQR = Interquartile range (25th and 75th percentiles). sd = standard deviation

DISCUSSION & CONCLUSION

The purpose of this research was to investigate the financial experience of LVHs in comparison to other rural hospitals. The expanded LVH program has been an important source of financial support for small rural hospitals. Based on 2014 data, 505 rural hospitals in 43 states received LVH adjustments amounting to $242 million. Compared to other rural IPPS hospitals, the rural LVHs were more likely to be government-owned and had significantly lower total and operating margins. Rural LVHs had significantly higher Medicare inpatient margins than rural non-LVHs, but this is likely attributable to the LVH adjustment. As intended by the program, rural LVHs were located farther from other acute care hospitals, had fewer beds and lower average acute care bed daily census than rural non-LVHs. Without the LVH adjustment, LVHs would see significant drops in their total, operating and Medicare inpatient margins. The hospitals that would be most affected by the loss of the LVH adjustment are smaller, government-owned, more geographically isolated, and more reliant on Medicare as a payer for inpatient services.

Without additional action from policymakers, the ACA LVH program will expire on October 1, 2017, and the program will revert to the original 2005 standards. Based on this analysis, only one percent of current LVHs will continue to qualify for the LVH adjustment under the 2005 standards. Allowing the LVH program to revert to the 2005 standards is likely to have a negative financial impact on LVHs and could impair access to care for Medicare beneficiaries residing in more isolated rural areas.

Limitations

This report has several limitations. First, we utilized bivariate statistics to explore variation in hospital characteristics according to the LVH adjustment. Therefore, a causal effect of the LVH adjustment cannot be inferred from this analysis. Second, this analysis relied on Medicare cost report data, which can be subject to reporting error. Third, the analysis was limited to the years 2012-2014 because prior to 2012, some hospitals were still using the 1996 form for the Medicare cost report, which did not accurately capture low-volume hospital status. As a result, this analysis did not explore the role of the LVH adjustment on qualifying hospitals in 2011, the first year of the expanded LVH program. Fourth, this study did not evaluate the efficacy of the LVH program or whether the "right" hospitals were targeted.

METHODS

Data

The Healthcare Cost Report Information System (HCRIS, "Medicare cost reports") was the data source for financial and hospital characteristic variables. The Hospital Service Area File was used for hospital market information, and the Provider of Services data file for calculation of driving miles to nearest acute care hospital. The analysis utilized data from 2012-2014, the first time period when all hospitals were using the 2010 format of the Medicare Cost Report. The 1996 format did not include specific accounts for the LVH adjustment and attempts to estimate the adjustment produced unreliable data.

Some hospitals were excluded from this analysis: Hospitals participating in the Rural Community Hospital Demonstration Program (N=106 cost report observations) were excluded because these hospitals initially received the LVH adjustment but subsequently the Centers for Medicare & Medicaid Services decided that hospitals participating in the demonstration would not be able to receive the LVH adjustment.[11] Critical access hospitals (N=3,959 cost report observations) were excluded from the analysis because they were not eligible for the LVH adjustment under Medicare. Hospitals with fewer than 360 days in the cost reporting period (N=468 cost report observations) were excluded because seasonal patterns in health care utilization would skew annualized partial-year data. Hospitals were also excluded from the analysis due to invalid LVH adjustments (N=3 cost report observations) (e.g., negative adjustments). Finally, hospital observations in the lower and upper 0.5% of the distribution of profitability and volume measures (N=42 cost report observations) were dropped from this analysis because these outlier observations were likely to be cost report errors (e.g., total margins and operating margins of more than 100%).

Variable definitions

The key variables of interest were three profitability indicators: 1) total margin (net income / total revenue); 2) operating margin (operating income / operating revenue); and 3) Medicare inpatient margin (Medicare inpatient net income / Medicare inpatient revenue). For years 2013 onward, Medicare inpatient margin was reduced to incorporate the 2% sequester cut enacted in the Budget Control Act of 2011.[12]

Rural hospitals were defined as facilities located outside metropolitan Core Based Statistical Areas (CBSAs) or within metropolitan areas (in 2013) and having Rural-Urban Commuting Area (RUCA) codes of 4 or greater (in 2010). This is the definition used by the Federal Office of Rural Health Policy, among other federal programs.[13] Medicare discharges included both Part A and Part C (Medicare Advantage) discharges. Hospital ownership was classified into three categories: government-owned, not for profit, and for profit.

Statistical analysis

Descriptive and bivariate statistics (non-parametric equality of medians, Wilcoxon rank-sum, t-test and chi-square) were used to identify rural LVHs, compare rural LVH characteristics to those of rural non-LVHs, and to simulate the potential profitability consequences of changes to the LVH program. To facilitate comparison, all rural hospitals were subdivided into three categories: hospitals that never received a LVH adjustment in the study period ("Never LVH"); hospitals that received a LVH adjustment in one or two years of the study ("Switched LVH status"); and hospitals that received a LVH adjustment in all three years of the study period ("Always LVH"). A hospital profitability margin without the LVH adjustment was simulated by subtraction of the dollar value of the adjustment from net income in the numerator and revenue in the denominator. All analyses were conducted in Stata, version 14.1. A map of LVH locations was created using ArcGIS software.

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