JAMA | Original Investigation

Association Between the 2014 Medicaid Expansion and US Hospital Finances

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IMPORTANCE The Affordable Care Act expanded Medicaid eligibility for millions of low-income adults. The choice for states to expand Medicaid could affect the financial health of hospitals by decreasing the proportion of patient volume and unreimbursed expenses attributable to uninsured patients while increasing revenue from newly covered patients.

OBJECTIVE To estimate the association between the Medicaid expansion in 2014 and hospital finances by assessing differences between hospitals in states that expanded Medicaid and in those states that did not expand Medicaid.

DESIGN AND SETTING Observational study with analysis of data for nonfederal general medical or surgical hospitals in fiscal years 2011 through 2014, using data from the American Hospital Association Annual Survey and the Health Care Cost Report Information System from the US Centers for Medicare & Medicaid Services. Multivariable difference-in-difference regression analyses were used to compare states with Medicaid expansion with states without Medicaid expansion. Hospitals in states that expanded Medicaid eligibility before January 2014 were excluded.

EXPOSURES Medicaid expansion in 2014, accounting for variation in fiscal year start dates.

MAIN OUTCOMES AND MEASURES Hospital-reported information on uncompensated care, uncompensated care as a percentage of total hospital expenses, Medicaid revenue, Medicaid as a percentage of total revenue, operating margins, and excess margins.

RESULTS The sample included between 1200 and 1400 hospitals per fiscal year in 19 states with Medicaid expansion and between 2200 and 2400 hospitals per fiscal year in 25 states without Medicaid expansion (with sample size varying depending on the outcome measured). Expansion of Medicaid was associated with a decline of $2.8 million (95% CI, −$4.1 to −$1.6 million; $P < .001$) in mean annual uncompensated care costs per hospital. Hospitals in states with Medicaid expansion experienced a $3.2 million increase (95% CI, $0.9 to $5.6 million; $P = .008$) in mean annual Medicaid revenue per hospital, relative to hospitals in states without Medicaid expansion. Medicaid expansion was also significantly associated with improved excess margins (1.1 percentage points [95% CI, 0.1 to 2.0 percentage points]; $P = .04$), but not improved operating margins (1.1 percentage points [95% CI, −0.1 to 2.3 percentage points]; $P = .06$).

CONCLUSIONS AND RELEVANCE The hospitals located in the 19 states that implemented the Medicaid expansion had significantly increased Medicaid revenue, decreased uncompensated care costs, and improvements in profit margins compared with hospitals located in the 25 states that did not expand Medicaid. Further study is needed to assess longer-term implications of this policy change on hospitals' overall finances.

Supplemental content

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JAMA. 2016;316(14):1475-1483. doi:10.1001/jama.2016.14765

When the Affordable Care Act (ACA) was passed in 2010, it mandated the expansion of Medicaid (effective January 1, 2014), increasing eligibility for nearly all US residents with household incomes up to 138% of the federal poverty level. However, the US Supreme Court struck down the mandatory expansion of Medicaid in 2012 and ruled that each state could choose whether to expand this entitlement program. As of July 2016, 30 states and Washington, DC, have elected to expand Medicaid, whereas 20 states have not.[1] In March 2016, 72.5 million individuals were enrolled in Medicaid or the Children's Health Insurance Program compared with the 57.4 million who had been enrolled just prior to Medicaid expansion.[2]

In part related to Medicaid expansion, the number of people without health insurance declined by 17.7 million from late 2013 through early 2016.[3] This decline in the number of people without health insurance was significantly larger in states that expanded Medicaid than in states that did not expand it.[4,5]

The decision made by states to expand Medicaid could have important implications for hospitals. Medicaid expansion could decrease unreimbursed expenses attributable to uninsured patients while increasing revenue from newly covered patients. This could decrease hospitals' uncompensated care burden, which can be a significant financial challenge.[6-8]

However, whether Medicaid expansion has been associated with improved hospital finances is uncertain. Substituting Medicaid for uninsured patients may not necessarily improve profits, particularly for hospitals that receive generous support from state or local government for providing uncompensated care. Prior studies[9-13] have found that hospitals in states with Medicaid expansion experienced larger increases in Medicaid-covered discharges and reductions in patients without insurance compared with hospitals in states without Medicaid expansion. In addition, a recent study found an association between Medicaid expansion and reductions in uncompensated care costs.[14]

The objective of this study was to determine if there was an association nationwide between Medicaid expansion and hospitals' uncompensated care costs, Medicaid revenue, and profitability by using hospitals in states that did not expand Medicaid as a comparison group against which to assess changes in hospitals in states that expanded Medicaid.

Key Points

Question What is the association between the 2014 Medicaid expansion established by the Affordable Care Act and hospitals' uncompensated care costs, Medicaid revenue, and financial margins?

Findings In this observational study, Medicaid expansion was associated with significant declines in uncompensated care costs and increases in Medicaid revenue in 2014 among hospitals in 19 states that expanded Medicaid compared with hospitals in 25 states that did not expand Medicaid. Hospitals in states that expanded Medicaid also had better financial margins.

Meaning There may be financial benefits for hospitals in states that implement Medicaid expansion, although further study is needed to assess longer-term implications of this policy change.

Methods

This study examined changes from fiscal year 2011 through 2014 in uncompensated care costs, uncompensated care costs as a percentage of total hospital expenses, Medicaid revenue, Medicaid revenue as a percentage of total hospital revenue, operating margins, and excess margins (**Box**).[15] The Medicaid expansion (effective January 1, 2014) provided a natural control group for this analysis. This analysis also explored if hospitals with high exposure to Medicaid expansion (defined by the state's baseline uninsurance rate) had a different response to the expansion compared with hospitals with low exposure to Medicaid expansion.

Data

This analysis used data from the American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System (HCRIS). This study took into account the fact that hospitals have different fiscal year reporting periods. All fiscal years were defined based on the calendar year end date (eg, fiscal year 2014 included all observations in which the fiscal year ended on January 31, 2014, or later). The data from the American Hospital Association provided information on hospitals' organizational characteristics. The HCRIS contains annual cost reports submitted by all Medicare-certified hospitals and provides hospital financial information with which to construct key financial measures.

The HCRIS has known limitations with item nonresponse and data quality, although it is widely used by the government and many other entities to track critical components of hospitals' finances. To improve the quality of the data, some erroneously reported values were coded as missing, which has been done by others.[16] Of 14 754 observations at 3914 hospitals, there were 316 observations with missing values for uncompensated care costs, 288 for Medicaid revenue, 111 for operating margins, and 285 for excess margins. The number of missing values included observations with item nonresponse or erroneously reported values.

Hospitals were classified as being located in states with low or high uninsurance rates prior to the ACA coverage expansions using estimates among the nonelderly adult population from the 2013 American Community Survey. States with high rates of uninsured adults were the states with baseline uninsurance rates above the national median.

The Urban Institute's institutional review board did not require review of this study because this research did not involve personally identifiable information from participants.

Population

The main study sample included nonfederal general medical or surgical hospitals in fiscal year 2011 through fiscal year 2014. Because this study focused on the 2014 Medicaid expansion, the study sample excluded hospitals in Massachusetts and 5 states (California, Connecticut, Minnesota, New Jersey, and

Washington) and the District of Columbia that extended Medicaid eligibility before January 2014 to low-income adults through a separate provision of the ACA. The sample also excluded hospitals with financial data that did not reflect 12 months of the fiscal year, observations with missing values for a given outcome, and observations with $0 reported for uncompensated care and Medicaid revenue models. For sensitivity analyses, the sample was limited to only the subset of hospitals that provided data for all 4 fiscal years.

Hospitals in 19 states that expanded Medicaid eligibility in early 2014 constituted the exposure group and hospitals in states that did not expand Medicaid comprised the comparison group. Michigan (which expanded Medicaid on April 1, 2014) was included in the exposure group and New Hampshire (which expanded Medicaid on August 15, 2014) was included in the comparison group.[1] The overall findings were not sensitive to this decision or to the study sample exclusions.

Statistical Analysis

This analysis used multivariable difference-in-difference models to estimate changes in outcomes associated with the ACA. Separate models were estimated for each outcome measure listed in the Methods section. Models included hospital fixed effects, a set of fiscal year–specific dummy variables, and a random error term. Robust standard errors were clustered at the hospital level to correct for possible heteroscedasticity and autocorrelation.

The primary exposure variable was a term for the interaction between whether the hospital was located in a Medicaid expansion state and the share of the fiscal year that the hospital was exposed to the 2014 Medicaid expansion. For example, if a hospital's 2014 fiscal year overlapped with 75% of calendar year 2014 (eg, hospitals with fiscal years that end on September 30, 2014), this variable would be equal to 0.75 for hospitals in states with Medicaid expansion during fiscal year 2014. Therefore, the regression results represent the association between the Medicaid expansion and each outcome for a full year of exposure rather than the descriptive data that represent partial exposure.

Models also included a set of hospital-level controls that could vary over time and that could influence each financial outcome. These included hospital ownership type, size, system status, the provision of substance abuse services, the provision of burn services,[17] urban or rural status, and the percentage of the county that was unemployed in which the hospital was located. Hospitals were classified into a set of 5 distinct groups of health system types that share common strategic and structural features based on prior research using existing theory and data from the American Hospital Association.[18] All estimates were unweighted to reflect changes in mean values associated with the sample of hospitals.

The same difference-in-difference technique was applied to the main sample split into groups based on high and low baseline uninsurance rates. For the high baseline uninsured model, the changes in outcomes among hospitals located in states with Medicaid expansion and high rates of uninsured residents were compared with hospitals in states without Medicaid expansion and high rates of uninsured residents. The high baseline model includes states with uninsurance rates above the median. For the low baseline uninsured model, the changes in outcomes among hospitals located in states with Medicaid expansion and low rates of uninsured residents were compared with hospitals in states without Medicaid expansion and low rates of uninsured residents. The low baseline model includes states with uninsurance rates below the median.

Various robustness and sensitivity models were also estimated. First, to formally test for differences in trends between hospitals in states with Medicaid expansion and those states without expansion prior to 2014, models were estimated on the pre-2014 data and included interactions between each year and the Medicaid expansion state indicator. Second, uncompensated care costs and Medicaid revenue were log-transformed because the distribution of the untransformed variables are heavily skewed. Third, to allow nonlinear relationships with the key explanatory variable, the model included dummy variables for postexpansion periods of less than 4 months, 4 to 6 months, 7 to 9 months, and 10 to 12 months of exposure to calendar year 2014.

A 2-sided *P* value of less than .05 was considered statistically significant. Analyses were conducted using Stata version 13.0 (StataCorp).

Box. Definitions of Hospital Financial Terms

1. **Uncompensated care costs:** the sum of charity care costs and the costs of non-Medicare and nonreimbursable Medicare bad debt expenses reported by each hospital.
2. **Net Medicaid revenue:** inpatient and outpatient payments received from Medicaid-covered services, including disproportionate share payments, supplemental payments, payments for an expanded Children's Health Insurance Program, and payments from Medicaid managed care.
3. **Operating margin:** a ratio that measures the profitability of hospitals when looking at the performance of primary activities related to patient care. It is calculated as: [(net patient revenue − total operating expenses) ÷ net patient revenue]
   a. **Net patient revenue:** inpatient and outpatient revenues less allowances and discounts on patient accounts.
   b. **Operating expenses:** expenses incurred during the ordinary course of operating the hospital, including general service costs, inpatient routine service costs, ancillary service costs, outpatient service costs, other reimbursable costs, special purpose costs, and nonreimbursable costs.
4. **Excess margin:** a broader profitability indicator that includes all other sources of income (eg, income from investments, donations, parking lot receipts), not just those from patient care. It is calculated as: [(net patient revenue − total operating expenses + total other income) ÷ (net patient revenue + total other income)]

Results

Hospital Characteristics

The sample included between 1200 and 1400 hospitals per fiscal year in 19 states with Medicaid expansion and between 2200 and 2400 hospitals per fiscal year in 25 states without Medicaid expansion after excluding approximately 600 hospitals in

Table 1. Characteristics of Hospitals by Medicaid Expansion Status for Fiscal Year 2014[a]

	States With Medicaid Expansion[b]	States Without Medicaid Expansion[b]	*P* Value
No. of hospitals	1306	2314	
Proportion of fiscal year 2014 that included Medicaid expansion	73.3 (71.9 to 74.7)		
Organizational status			
Nonprofit	74.0 (71.6 to 76.3)	51.9 (49.9 to 54.0)	<.001
For profit	9.0 (7.5 to 10.6)	21.1 (19.5 to 22.8)	<.001
Government	17.0 (15.0 to 19.0)	26.9 (25.1 to 28.7)	<.001
Hospital size by No. of beds			
6-24	10.1 (8.5 to 11.7)	13.1 (11.8 to 14.5)	.007
25-49	22.6 (20.3 to 24.9)	25.3 (23.5 to 27.1)	.07
50-99	15.5 (13.5 to 17.4)	17.2 (15.6 to 18.7)	.19
100-199	20.7 (18.5 to 22.9)	19.2 (17.6 to 20.8)	.30
200-299	12.9 (11.1 to 14.8)	10.0 (8.8 to 11.2)	.006
300-399	7.1 (5.7 to 8.5)	5.6 (4.7 to 6.6)	.07
400-499	4.6 (3.5 to 5.7)	3.5 (2.7 to 4.2)	.09
≥500	6.5 (5.2 to 7.8)	6.1 (5.1 to 7.1)	.62
System status			
Not part of a system	37.9 (35.3 to 40.5)	40.2 (38.2 to 42.2)	.18
Centralized health system	6.0 (4.8 to 7.3)	6.3 (5.3 to 7.3)	.76
Centralized physician or insurance system	6.4 (5.1 to 7.3)	3.7 (2.9 to 4.4)	<.001
Moderately centralized system	16.7 (14.7 to 18.7)	14.6 (13.1 to 16.0)	.09
Decentralized system	25.6 (23.2 to 27.9)	27.8 (26.0 to 29.7)	.14
Independent system	7.2 (5.8 to 8.6)	6.1 (5.1 to 7.1)	.20
Part of system, unknown type or cluster	0.15 (−0.06 to 0.04)	1.3 (0.87 to 1.80)	<.001
Core Based Statistical Area status			
Metro	55.4 (52.7 to 58.1)	52.4 (50.4 to 54.5)	.09
Micro	20.4 (18.1 to 22.6)	17.1 (15.6 to 18.7)	.02
Rural	24.2 (21.9 to 26.5)	30.4 (28.5 to 32.2)	<.001
Hospital provision of alcohol or chemical dependency services			
Yes	8.3 (6.8 to 9.8)	6.7 (5.6 to 7.7)	.07
No	75.3 (73.0 to 77.7)	76.8 (75.1 to 78.6)	.31
Missing	16.4 (14.4 to 18.4)	16.5 (15.0 to 18.0)	.92
Hospital provision of burn services			
Yes	4.2 (3.1 to 5.3)	3.2 (2.5 to 3.9)	.11
No	79.4 (77.2 to 81.6)	80.3 (78.7 to 81.9)	.52
Missing	16.4 (14.4 to 18.4)	16.5 (15.0 to 18.0)	.92
County unemployment rate	6.4 (6.3 to 6.5)	5.9 (5.8 to 6.0)	<.001

[a] Data are from the American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System.

[b] Data are expressed as mean percentage (95% CI) unless otherwise indicated.

the states with early expansion of Medicaid and observations with missing outcomes, $0 reported outcomes, or financial data that did not reflect 12 months. When the sample was limited to the hospitals that contributed data during all 4 study years, there were between 3200 and 3300 hospitals per fiscal year. Among hospitals in the main sample, 36% (n = 1297) had fiscal years that perfectly aligned with the calendar year in 2014. Other common fiscal year reporting periods were from July 1, 2013, through June 30, 2014 (33%, n = 1202) and October 1, 2013, through September 30, 2014 (19%, n = 677). Among hospitals in states with Medicaid expansion, the mean proportion of fiscal year 2014 that hospitals were exposed to the 2014 Medicaid expansion was 73.3% (95% CI, 71.9%-74.7%) (**Table 1**).

In fiscal year 2014, hospitals in states with Medicaid expansion were more likely to be nonprofit, larger, and located in urban areas than hospitals in states without Medicaid expansion (Table 1). The mean county-level unemployment rate in fiscal year 2014 was 0.5 percentage points higher among hospitals in states with Medicaid expansion (6.4%; 95% CI, 6.3%-6.5%) than among hospitals in states without Medicaid expansion (5.9%; 95% CI, 5.8%-6.0%).

Uncompensated Care Costs, Medicaid Revenues, and Hospital Finances

The unadjusted uncompensated care costs, Medicaid revenues, and hospital finances across states with and without Medicaid are illustrated in **Figure 1**, **Figure 2**, and **Figure 3**. There were no differences in the trends in uncompensated care costs, Medicaid revenues, or hospital margins between the states with Medicaid expansion and states without Medicaid expansion

prior to the Medicaid expansion effective date (eTable 1 in the Supplement). However, from fiscal year 2013 to fiscal year 2014, the mean annual uncompensated care costs declined by $2.0 million (95% CI, −$3.3 to −$0.7 million) among hospitals in states with Medicaid expansion, and increased by $180 000 (95% CI, −$1.3 to $1.7 million) among hospitals in states without Medicaid expansion (Figure 1). Uncompensated care costs as a percentage of total expenses declined by 1.1 percentage points (95% CI, −1.4 to −0.8 percentage points) among expansion states but declined by only 0.1 percentage points (95% CI, −0.4 to 0.1 percentage points) among states without Medicaid expansion during this same period.

Mean annual Medicaid revenue increased by $2.3 million (95% CI; −$2.4 to $7.1 million) from fiscal year 2013 to fiscal year 2014 among hospitals in states with Medicaid expansion (Figure 2) compared with $300 000 (95% CI, −$1.9 to $2.5 million) among hospitals in states without Medicaid expansion. Medicaid revenue as a percentage of total revenue increased by 1.4 percentage points (95% CI, 0.6 to 2.2 percentage points) among states with Medicaid expansion and decreased by 0.1 percentage points (95% CI, −0.5 to 0.5 percentage points) among states without Medicaid expansion during this same period.

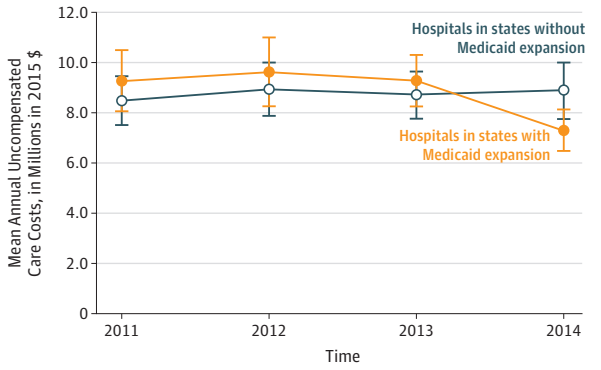
After Medicaid expansion, both operating and excess margins increased among hospitals in states with Medicaid expansion and decreased among hospitals in states without Medicaid expansion. Operating margins in states with Medicaid expansion improved by 0.8 percentage points (95% CI, −0.4 to 2.0 percentage points) from −5.0% (95% CI, −5.9% to −4.1%) in fiscal year 2013 to −4.2% (95% CI, −5.1% to −3.4%) in fiscal year 2014, whereas operating margins declined by 0.4 percentage points (95% CI, −1.8 to 0.9 percentage points) in states without Medicaid expansion from −5.8% (95% CI, −6.8% to −4.8%) in fiscal year 2013 to −6.2% (95% CI, −7.2% to −5.2%) in fiscal year 2014. Mean excess margins were positive, but the patterns and trends among states with or without Medicaid expansion were consistent with those observed for operating margins.

Multivariable Analysis

In the fully adjusted difference-in-difference analyses, Medicaid expansion was associated with a significant decline in mean uncompensated care costs of $2.8 million (95% CI, −$4.1 to −$1.6 million; $P < .001$) and a significant mean decline in uncompensated care as a percentage of total expenses by 1.5 percentage points (95% CI, −1.8 to −1.2 percentage points; $P < .001$) per hospital (**Table 2** and eTable 2 in the Supplement). The $2.8 million decline in uncompensated care costs represents a 30.3% decrease relative to the baseline mean of $9.4 million for fiscal years 2011 through 2013 among hospitals in states with Medicaid expansion.

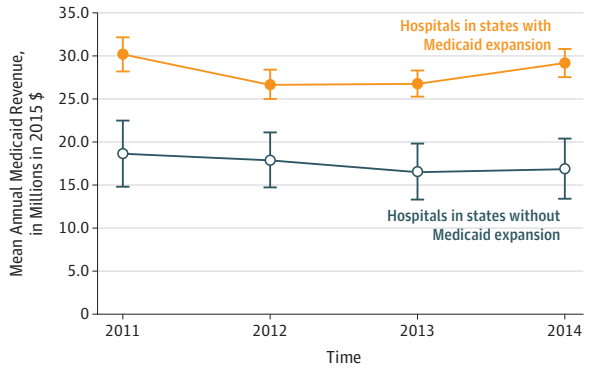
The expansion of Medicaid was also significantly related to an increase in Medicaid revenue. In adjusted analyses, expansion was associated with a mean annual increase in Medicaid revenue per hospital of $3.2 million (95% CI, $0.9-$5.6 million; $P = .008$) and an increase of 2.5 percentage points (95% CI, 1.9-3.1 percentage points; $P < .001$) in Medicaid revenue as a percent of total revenue. Compared with the baseline mean of $27.9 million among hospitals in states with Medicaid expansion, the $3.2 million increase represents an estimated 11.6% increase in Medicaid revenue.

Figure 1. Trends in Mean Annual Uncompensated Care Costs for Hospitals in States With and Without Medicaid Expansion for Fiscal Years 2011-2014



Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. The sample for uncompensated care costs included 5138 hospital-year observations in states with Medicaid expansion and 9082 observations in states without Medicaid expansion. The estimates are among hospitals with nonzero and nonmissing uncompensated care costs. Error bars indicate 95% CIs.

Figure 2. Trends in Mean Annual Medicaid Revenue for Hospitals in States With and Without Medicaid Expansion for Fiscal Years 2011-2014

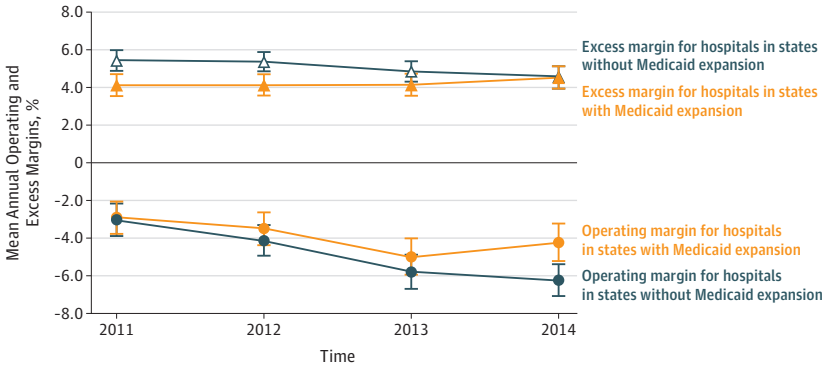


Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. The sample for Medicaid revenue included 5044 hospital-year observations in states with Medicaid expansion and 8943 observations in states without Medicaid expansion. The estimates are among hospitals with nonzero and nonmissing Medicaid revenue. Error bars indicate 95% CIs.

The Medicaid expansion was also significantly associated with improved excess margins (1.1 percentage points [95% CI, 0.1 to 2.0 percentage points]; $P = .04$), but not with improved operating margins (1.1 percentage points [95% CI, −0.1 to 2.3 percentage points]; $P = .06$). The 1.1 percentage point increase in excess margins represents a 25.4% increase relative to the baseline mean of 4.1 among hospitals in states with Medicaid expansion. Although Medicaid expansion was associated with improved profitability, these estimates have larger margins of error relative to the uncompensated care and Medicaid revenue findings.

A number of sensitivity analyses yielded similar findings. When the sample was limited to only those hospitals that

Figure 3. Trends in Mean Annual Operating and Excess Margins for Hospitals in States With and Without Medicaid Expansion for Fiscal Years 2011-2014



Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. The operating margins sample included 5243 hospital-year observations in states with Medicaid expansion and 9400 observations in states without Medicaid expansion. The excess margins sample includes 5175 hospital-year observations in states with Medicaid expansion and 9294 observations in states without Medicaid expansion. The estimates are among hospitals with nonmissing margins. Error bars indicate 95% CIs.

Table 2. Changes in Mean Uncompensated Care, Medicaid Revenue, and Operating Margins Among All Hospitals in Sample[a]

	Mean for FY 2011-2013	Mean for FY 2014	Change in Means	Difference-in-Difference Estimates		
				Unadjusted Difference in Change	Regression-Adjusted Difference in Change, % (95% CI)[b]	*P* Value[c]
Uncompensated Care Costs (n = 14 220)						
Dollar amount in millions						
States with Medicaid expansion	9.4	7.3	−2.1	−2.3	−2.8 (−4.1 to −1.6)	<.001
States without Medicaid expansion	8.7	8.9	0.2			
Percentage of total expenses						
States with Medicaid expansion	5.1	4.1	−1.0	−1.2	−1.5 (−1.8 to −1.2)	<.001
States without Medicaid expansion	6.0	6.2	0.2			
Medicaid Revenue (n = 13 987)						
Dollar amount in millions						
States with Medicaid expansion	27.9	29.2	1.3	2.1	3.2 (0.9 to 5.6)	.008
States without Medicaid expansion	17.7	16.9	−0.8			
Percentage of total revenue						
States with Medicaid expansion	11.9	13.5	1.6	1.8	2.5 (1.9 to 3.1)	<.001
States without Medicaid expansion	10.7	10.5	−0.2			
Profitability Ratios						
Operating margin (n = 14 643)						
States with Medicaid expansion	−3.8	−4.2	−0.4	1.5	1.1 (−0.1 to 2.3)	.06
States without Medicaid expansion	−4.3	−6.2	−1.9			
Excess margins (n = 14 469)						
States with Medicaid expansion	4.1	4.5	0.4	1.0	1.1 (0.1 to 2.0)	.04
States without Medicaid expansion	5.2	4.6	−0.6			

[a] Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. The sample varies slightly from year to year based on reporting. Uncompensated care and Medicaid revenue models were estimated among observations with nonzero dollars. Estimates inflated to 2015 dollars using the consumer price index for hospitals and related services.

[b] The key exposure variable is defined as the share of the fiscal year (FY) the hospital was exposed to the Medicaid expansion. Models control for hospital and year fixed effects, hospital ownership type, size, the provision of substance abuse and burn services, urban or rural status, and percentage of the county that is unemployed.

[c] For regression-adjusted change.

contributed data throughout the study period, findings were consistent with the main model (**Table 3**). In most instances, the estimates were slightly larger in magnitude and more precise compared with the estimates in the main model. When the sample was split into states with low vs high baseline rates of uninsured residents, the estimated associations with the Medicaid expansion were larger in states with high uninsurance rates prior to the ACA (**Table 4**). When exposure to the

Table 3. Changes in Mean Uncompensated Care, Medicaid Revenue, and Operating Margins Among Hospitals With Data for All 4 Years[a]

	Mean for FY 2011-2013	Mean for FY 2014	Change in Means	Difference-in-Difference Estimates		
				Unadjusted Difference in Change	Regression-Adjusted Difference in Change, (95% CI)[b]	*P* Value[c]
Uncompensated Care Costs (n = 12 964)						
Dollar amount in millions						
States with Medicaid expansion	9.6	7.4	−2.2	−2.3	−2.9 (−4.2 to −1.6)	<.001
States without Medicaid expansion	9.1	9.2	0.1			
Percentage of total expenses						
States with Medicaid expansion	5.1	4.1	−1.0	−1.1	−1.5 (−1.8 to −1.2)	<.001
States without Medicaid expansion	6.0	6.1	0.1			
Medicaid Revenue (n = 12 756)						
Dollar amount in millions						
States with Medicaid expansion	28.9	30.1	1.2	2.3	3.3 (0.8 to 5.7)	.009
States without Medicaid expansion	18.8	17.7	−1.1			
Percentage of total revenue						
States with Medicaid expansion	11.9	13.6	1.7	1.9	2.5 (1.9 to 3.1)	<.001
States without Medicaid expansion	10.7	10.5	−0.2			
Profitability Ratios						
Operating margins (n = 13 268)						
States with Medicaid expansion	−3.6	−3.9	−0.3	1.6	1.5 (0.3 to 2.7)	.01
States without Medicaid expansion	−4.3	−6.5	−2.2			
Excess margins (n = 13 124)						
States with Medicaid expansion	4.4	4.7	0.3	1.2	1.2 (0.3 to 2.2)	.01
States without Medicaid expansion	5.5	4.7	−0.8			

[a] Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. Uncompensated care and Medicaid revenue models were estimated among observations with nonzero dollars. Estimates inflated to 2015 dollars using the consumer price index for hospitals and related services.

[b] The key exposure variable is defined as the share of the fiscal year (FY) the hospital was exposed to the Medicaid expansion. Models control for hospital and year fixed effects, hospital ownership type, size, the provision of substance abuse and burn services, urban or rural status, and percentage of the county that is unemployed.

[c] For regression-adjusted change.

Table 4. Changes in Mean Uncompensated Care, Medicaid Revenue, and Operating Margins Among All Hospitals in the Sample by Baseline Uninsurance Rates[a]

	States by Baseline Uninsurance Rates			
	Low Rates[b]		High Rates[c]	
	Change in Mean (95% CI)[d]	*P* Value[e]	Change in Mean (95% CI)[d]	*P* Value[e]
Uncompensated Care Costs				
No. in sample	6587		7633	
Dollar amount in millions	−2.6 (−3.9 to −1.3)	<.001	−2.9 (−4.4 to −1.4)	<.001
Percentage of total expenses	−1.0 (−1.4 to −0.7)	<.001	−2.2 (−2.6 to −1.7)	<.001
Medicaid Revenue				
No. in sample	6497		7490	
Dollar amount in millions	1.8 (−1.6 to 5.3)	.30	4.3 (2.4 to 6.3)	<.001
Percentage of total revenue	2.4 (1.7 to 3.1)	<.001	3.0 (2.1 to 4.0)	<.001
Profitability Ratios				
Operating margins				
No. in sample	6737		7906	
Percentage point	0.6 (−1.0 to 2.2)	.48	2.0 (−0.1 to 4.1)	.06
Excess margins				
No. in sample	6652		7817	
Percentage point	1.00 (−0.37 to 2.40)	.15	1.3 (−0.3 to 2.9)	.10

[a] Data are from the 2014 American Hospital Association Annual Survey merged with the US Centers for Medicare & Medicaid Services Health Care Cost Report Information System. The key exposure variable is defined as the share of the fiscal year the hospi tal was exposed to the Medicaid expansion. The sample varies slightly from year to year based on reporting. Uncompensated care and Medicaid revenue models were estimated among observations with nonzero dollars.

[b] The low baseline model includes states with uninsurance rates below the median.

[c] The high baseline model includes states with uninsurance rates above the median.

[d] Data are expressed as mean (95% CI) unless otherwise indicated. Estimates are inflated to 2015 dollars using the consumer price index for hospitals and related services. Models control for hospital and year fixed effects, hospital ownership type, size, the provision of substance abuse and burn services, urban or rural status, and percentage of the county that is unemployed.

[e] For regression-adjusted change.

2014 expansion was treated as a categorical rather than linear predictor, hospitals in states with greater exposure to Medicaid expansion still experienced sequentially larger declines in uncompensated care and larger increases in Medicaid revenue (eTable 3 in the Supplement). Log-transformed difference-in-difference estimates were also consistent with the main model, suggesting that the analyses were not biased by skewed data or potential outliers (eTable 4 in the Supplement).

Discussion

In this analysis, Medicaid expansion was associated with substantial changes in payer mix. Hospitals in states with Medicaid expansion experienced reductions in uncompensated care costs and increases in Medicaid revenue compared with hospitals in states without Medicaid expansion. These findings were accentuated for hospitals located in states with high rates of uninsured adult residents prior to the ACA.

Medicaid expansion also was associated with improvements in hospitals' financial margins; however, the estimates were less precise and robust compared with the other findings. This is not surprising given the various factors that can influence the overall profitability of hospitals. Increases in overall net patient revenue for hospitals in states with Medicaid expansion relative to states without Medicaid expansion could be smaller than the differential change in net patient revenue from Medicaid. For example, hospitals in states without Medicaid expansion could have experienced a larger increase in private insurance revenue from enrollees in Marketplace plans relative to hospitals in states with Medicaid expansion. Relatedly, increases in hospital profitability in states with Medicaid expansion could have been smaller than expected if those states provided generous subsidies for uncompensated care at baseline or had particularly low Medicaid reimbursements.

For states still considering Medicaid expansion, these findings suggest that expansion may be associated with improvements in hospitals' payer mix and overall financial outlook. However, changes in financial outcomes for hospitals in any specific state will likely depend on a host of factors, such as the state's pre-ACA income and coverage distribution, Medicaid eligibility thresholds, Medicaid reimbursement levels, and the subsidies hospitals receive for providing uncompensated care. For example, the ACA is expected to substantially reduce Medicaid Disproportionate Share payments to hospitals in fiscal year 2018, which provide additional funding to help cover uncompensated care in qualifying hospitals that serve a large number of Medicaid and uninsured individuals. These reductions were developed to help offset some of the federal costs associated with Medicaid expansion, with the idea that the costs would be replaced with Medicaid revenues from newly eligible beneficiaries. However, states that have chosen not expand Medicaid will be subject to cuts in this funding source without the offsetting benefit of an influx of new Medicaid patients.[19] The financial gap between hospitals in states with Medicaid expansion and those without expansion could further increase if current policy remains the same.

The findings of this study are consistent with a recent report by Dranove et al[14] that found uncompensated care declined by 1.32 percentage points of operating margins for hospitals at the median in states that expanded Medicaid compared with little or no change among hospitals in states without Medicaid expansion. However, that study focused exclusively on uncompensated care costs, did not explore the relationship between the Medicaid expansion and changes in profit margins, and was restricted to hospitals (n = 1249) that submitted a Medicare cost report that covered exactly January 1, 2014, through December 31, 2014, which eliminated 64% of hospitals in the remaining sample.

The present study has several limitations. First, the HCRIS has some well-known data quality problems, including missing values and erroneously reporting information for certain measures; this was addressed by replacing some implausible values with missing, though other strategies would also be reasonable.[16,20] The difference-in-difference analysis also reduces potential biases due to accounting or reporting errors, assuming such errors did not emerge differentially between hospitals in both states with and without Medicaid expansion after 2013. Second, even though this analysis used the most recent data available, it did not capture the full calendar year exposure to the January 1, 2014, Medicaid expansion. Future research should assess the Medicaid expansion over a longer time frame and explore additional distributional patterns associated with the expansion.

Conclusions

The hospitals located in the 19 states that implemented the Medicaid expansion had significantly increased Medicaid revenue, decreased uncompensated care costs, and improvements in profit margins compared with hospitals located in the 25 states that did not expand Medicaid. Further study is needed to assess longer-term implications of this policy change on hospitals' overall finances.

ARTICLE INFORMATION

Author Contributions: Dr Blavin had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Conflict of Interest Disclosures: The author has completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

Funding/Support: This study was supported by the Robert Wood Johnson Foundation.

Role of the Funder/Sponsor: The Robert Wood Johnson Foundation had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. The Robert Wood Johnson Foundation reviewed an early draft.

Additional Contributions: I thank John Holahan, PhD, Linda Blumberg, PhD, and Stephen Zuckerman, PhD, for providing comments on an earlier draft and Patricia Solleveld, BA (all with the Health Policy Center at the Urban Institute), for providing research assistance in putting together the Tables. None received personal compensation beyond project funding.

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