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RESEARCH ARTICLE

The ACA Medicaid Expansion, Disproportionate Share Hospitals, and Uncompensated Care

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Objective. To estimate the effect of the first full year of the ACA Medicaid expansion on hospital provision of uncompensated care, with special attention paid to hospitals that treat a disproportionate share of low-income patients.

Data Sources. Data from a balanced panel of short-term, general, nonfederal, Medicare-certified hospitals were obtained from Medicare cost reports from 2011 to 2014.

Study Design/Study Setting. A series of difference-in-differences analyses were performed using hospitals in nonexpansion states as the control group. The dependent variable is hospital provision of uncompensated care.

Data Collection/Extraction Methods. The data were downloaded from the National Bureau of Economic Research website.

Principal Findings. The Medicaid expansion significantly reduced hospital provision of uncompensated care in 2014. In particular, within expansion states, DSH hospitals saw reductions beyond those experienced by non-DSH hospitals.

Conclusions. Evidence from this study indicates that the Medicaid expansion served to widen an already broad gap in provision of uncompensated care between hospitals in expansion and nonexpansion states. In addition, within expansion states, variation in uncompensated care between hospitals that treat a disproportionate share of low-income patients and those that do not was reduced, with the former experiencing significantly larger reductions. Lawmakers considering expanding Medicaid and those deciding appropriate levels of DSH payments should consider these findings.

Key Words. Medicaid, hospitals, uninsured/safety net providers

A key provision of the Patient Protection and Affordable Care Act (ACA) required states to expand Medicaid to cover more low-income Americans. Traditionally, the federal Medicaid program offered limited coverage for low-income adults, prioritizing the coverage of poor children. The Medicaid expansion under the ACA extended eligibility to nearly all adults with incomes up to 138 percent of the federal poverty line (FPL), with this expanded eligibility supported with increased federal funding. Originally

meant to be a compulsory state reform, a 2012 U.S. Supreme Court decision ruled the mandatory Medicaid expansion as unconstitutionally coercive of states, rendering it optional. As of this writing, 32 states, including DC, have adopted some form of the Medicaid expansion (The Henry J. Kaiser Family Foundation 2015), which went into full effect in 2014.

This study takes advantage of states that expanded Medicaid on January 1, 2014, using a difference-in-differences approach to examine the early effects of expanding Medicaid on hospital provision of uncompensated care. Uncompensated care includes both charity care, provided to patients who are unable to pay, and bad debts, which result from those who are able, but unwilling, to pay (Fishman and Bentley 1997; Davidoff et al. 2000; Bazzoli et al. 2006; Lo Sasso and Seamster 2007). While it is well established that hospitals in expansion states have experienced declines in uncompensated care relative to hospitals in nonexpansion states (DeLeire et al. 2014; Bazzoli 2015; Dorn et al. 2015; Nikpay, Buchmueller, and Levy 2015; Blavin 2016), there are few studies that have compared hospitals that treat a disproportionate share of low-income people to those that do not within expansion states. As these hospitals tend to serve high levels of uninsured patients, it stands that they have the most to gain from expanding Medicaid to more of the country's poor. The results suggest that hospitals in expansion states did see a significant reduction in provision of uncompensated care relative to hospitals in nonexpansion states. In addition, within expansion states, hospitals that treat a high proportion of low-income patients did see slightly larger declines in uncompensated care relative to hospitals not designated as such.

EXPANSION OF PUBLIC INSURANCE PROGRAMS: SUPPLY AND DEMAND

Economic theory suggests that as Medicaid participation increases, hospitals will experience less demand for uncompensated care and will respond by reducing their supply. Several studies empirically tested this assumption. Blewett et al. (2003) found that expanding enrollment in Minnesota's public insurance program for the working poor resulted in a 5-year cumulative

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savings of approximately \$59 million in hospital uncompensated care costs. Using a national sample of hospitals, Dubay, Norton, and Moon (1995) found that Medicaid expansions for women and infants resulted in a reduction in uncompensated care by roughly 5.4 percent per admission. An analysis by Davidoff et al. (2000) found a negative relationship between expanded Medicaid eligibility and uncompensated care in public and for-profit hospitals. Lo Sasso and Seamster (2007) also found a negative relationship between expanding public health insurance eligibility (Medicaid and State Children's Health Insurance Program) and provision of uncompensated care, although the effect was minimal.

Given that the full expansion went into effect in January of 2014, until now, there have been few opportunities for researchers to study its effects due to a lag in data availability. However, some authors have analyzed the early effects of the full expansion (DeLeire et al. 2014; Dorn et al. 2015; Blavin 2016; Dranove, Garthwaite, and Ody 2016), with several studies examining the effect of expanding Medicaid prior to 2014 (Bazzoli 2015; Nikpay, Buchmueller, and Levy 2015). In a descriptive examination of early hospital financial reporting data available through the second quarter of 2014, DeLeire et al. (2014) found that hospitals in Medicaid expansion states experienced a reduction in the volumes of uninsured/self-pay patients and uncompensated care costs, along with an increase in the volume of patients covered by Medicaid. In an examination of the first year of the full expansion, 2014, Blavin (2016) found that expanding Medicaid was associated with a \$2.8 million decline in mean annual uncompensated care costs per hospital. A recent study by Dranove, Garthwaite, and Ody (2016) also found that hospitals in expansion states experienced meaningful uncompensated care declines relative to those in nonexpansion states. In addition, the authors conclude that reductions observed within expansion states were higher for hospitals with higher pre-expansion levels of uncompensated care.

Several studies examine the effect of the early Medicaid expansions on hospital uncompensated care. States interested in getting a head start in covering additional low-income adults had the option of expanding early at their regular federal matching rate, with several states taking advantage of this option (Sommers et al. 2013; Sommers, Kenney, and Epstein 2014). A study by Nikpay, Buchmueller, and Levy (2015) examined the effect of expanding Medicaid early on hospital uncompensated care in the state of Connecticut. The authors found that post expansion, uncompensated care in hospitals in Connecticut did not increase while it did so in hospitals in the comparison group. Looking at hospitals in California, Bazzoli (2015) found that for-profit

hospitals benefited the most, as they did see a significant reduction in self-pay patients and charity care. These studies provide early evidence in support of the assumption that expanding Medicaid results in reduced provision of uncompensated care.

This analysis builds on these studies by comparing the effect of the full expansion on hospital provision of uncompensated care across multiple states in 2014, the first year of the full expansion. Furthermore, it focuses on the experience of disproportionate share hospitals (DSHs) in expansion states compared to nonexpansion states, as well as differences between DSH and non-DSH hospitals within expansion states. To date, most studies have focused on comparing uncompensated care trends among hospitals in expansion states to those in nonexpansion states. However, as the analysis by Dranove, Garthwaite, and Ody suggests, it is important to single out the experience of different types of hospitals within expansion states, as there may be effect heterogeneity. This study focuses on DSH hospitals because they treat a disproportionate share of poor and, presumably, uninsured patients, meaning they bear a higher level of the uncompensated care burden. Thus, these hospitals have the most to gain from additional Medicaid revenue and the most to lose from impending federal funding cuts scheduled to go into effect in 2018. Unlike extant studies, this paper uses a quasi-experimental triple difference research design to test whether DSH hospitals experienced greater declines in uncompensated care relative to non-DSH hospitals in expansion states.

DATA AND METHODS

The primary data source is the Centers of Medicare and Medicaid Services (CMS) Healthcare Cost Report Information System (HCRIS) for the years 2011–2014. Medicare-certified institutional providers are required to submit an annual cost report to CMS. Cost reports are comprised of a series of worksheets that include information on hospital uncompensated care, facility characteristics, utilization data, cost and charge data, and financial statement data. From this source, I obtained data for the dependent variable as well as a vector of control variables. In 2010, CMS dramatically updated the cost report forms, involving a complete redesign of the worksheet that collects information on hospital uncompensated care. Prior to the redesign, CMS did not differentiate between hospital charity care and bad debt expenses. To avoid complications involved with crosswalking uncompensated care data between the new and old worksheets, this study utilizes cost reports from 2011 to 2014,

which provide more detailed information regarding hospital provision of uncompensated care.

Across the reporting period of fiscal years 2011–2014, 18,802 general, short-term, nonfederal hospitals in the United States submitted a Medicare cost report. The initial cleaning of the data made several exclusions, including hospitals that submitted duplicate cost reports ($n = 18,523$), those with less than one employee ($n = 18,516$), those that report negative or zero uncompensated care ($n = 18,504$), and those with fiscal reporting periods of less than 300 days or greater than 365 days to ensure that key variables were measured consistently across hospitals ($n = 18,083$; Hsieh, Clement, and Bazzoli 2010). In an attempt to mitigate threats to the internal validity of the analysis, this study imposed another key sample restriction. Medicare cost reports are organized on a fiscal year basis; however, hospitals do not all share the same fiscal year. Given that the full Medicaid expansion began on January 1, 2014, this study assumes that a hospital had to be exposed to the treatment for at least two-thirds of a year for it to have had an effect. Thus, this study restricts the sample to hospitals with fiscal years ending in September, October, November, or December ($n = 10,745$). All hospitals with nonmissing data for each of the observed years from 2011 to 2014 were retained ($n = 5,708$).

Hospitals in states that implemented the full Medicaid expansion on January 1, 2014, make up the treatment group. This excludes hospitals in Washington, D.C., and the six states that expanded early (CA, CO, CT, MN, NJ, and WA). This also excludes hospitals in states that expanded after January 1, 2014 (PA and LA), or that expanded using a Section 1115 waiver (AK, IN, IA, MI, MT, and NH). The control group is made up of hospitals in the 19 states not currently moving forward with the expansion in any form. This study is also particularly concerned with DSH hospitals. Given that the Medicaid expansion can potentially affect a hospital's DSH¹ status, the study limits the sample to those hospitals whose Medicare DSH¹ status does not change over the study period ($n = 5,392$). The final full sample includes a total of 5,392 hospital-year observations, with 1,348 unique hospitals observed in each fiscal year from 2011 to 2014. Of these 1,348 unique hospitals, 851 (63 percent) are designated as DSH for each reporting period.

Dependent Variable

The DV for this study is hospital provision of uncompensated care. Given that uncompensated care days are not directly reported in Medicare cost reports, this measure was estimated using available cost report data. This is calculated

as total uncompensated care charges (including charity care charges and bad debt expenses), divided by average charge per hospital day (including inpatient and outpatient charges), which is then divided by number of hospital beds. This measure of uncompensated care is referred to as uncompensated care days per bed and is similar to measures used in prior studies, including Hsieh and Bazzoli (2012), Gaskin (1997), Hsieh, Clement, and Bazzoli (2010), and Banks, Paterson, and Wendel (1997). By standardizing the DV relative to hospital days and hospital beds, analysts can compare provision of uncompensated care across years and different sized hospitals. It is important to note that the DV is measured as a quantity of care delivered per bed rather than an expenditure. As such, the interpretation of the results will not be in terms of dollar amounts, but in the amount of uncompensated care provided by hospitals in expansion states relative to those in nonexpansion states.

Control Variables

Other factors expected to influence provision of uncompensated care are also included in the analysis, including hospital characteristics and market characteristics. I obtained hospital characteristics from the Medicare cost reports. These include hospital size, measured as number of full-time equivalencies (FTEs); Medicare share of hospital days, measured as a percent of total hospital days; hospital ownership status, measured as a categorical variable indicating whether the hospital is government, for-profit, or nonprofit; and hospital teaching status, measured as a dichotomous dummy variable. Market characteristics include hospital competition, as measured by a Hirschman–Herfindahl index (HHI) calculated on the basis of hospital beds at the county level; demand for uncompensated care, measured as the county-level unemployment rate; and prevalence of public hospital beds, measured as the percent of the public hospital beds in the county. These variables are often included in analyses of hospital uncompensated care (Bazzoli et al. 2006; Hsieh, Clement, and Bazzoli 2010; Bazzoli 2015). All market controls are derived from the Medicare cost reports except for unemployment rate, which comes from the Area Health Resource File for 2014–2015.

Empirical Model

The effect of expanding Medicaid on hospital provision of uncompensated care is estimated using difference-in-differences in the following linear regression model:

$$Y_{it} = \beta_0 + \beta_1 \text{Expand}_i + \beta_2 \text{Year}_t + \beta_3 (\text{Expand}_i \times \text{Year}_t) + \beta_4 X_{it} + \beta_5 Z_{it} + \beta_6 \text{State}_i + \varepsilon_{it} \quad (1)$$

where Y_{it} is a continuous outcome variable for hospital i in time period t , Expand_i is a dummy variable indicating whether hospital i is assigned to the treatment ($\text{Expand}_i = 1$) or control ($\text{Expand}_i = 0$) group, Year_t is a vector of year-specific dummy variables, $\text{Expand}_i \times \text{Year}_t$ is a vector of interaction terms of the year and group indicator variables, X_{it} is a vector of hospital-level controls, Z_{it} is a vector of county-level market controls, State_i is a vector of state-specific dummy variables, and ε_{it} is the error term. The year dummies control for changes in uncompensated care common to all states, while the state dummies control for mean differences in uncompensated care across states. The coefficient on the difference-in-differences interaction, β_3 , is the difference estimator that identifies differential time trends in uncompensated care between hospitals in expansion states and hospitals in nonexpansion states. This equation is used to estimate two models. The first includes all hospitals in the analysis, while the second limits the sample to only DSH hospitals.

To examine whether DSH hospitals and non-DSH hospitals within Medicaid expansion states were differentially affected, a third model is analyzed using the following difference-in-differences-in-differences equation:

$$Y_{it} = \beta_0 + \beta_1 \text{Expand}_i + \beta_2 \text{Year}_t + \beta_3 \text{DSH}_i + \beta_4 (\text{Expand}_i \times \text{Year}_t) + \beta_5 (\text{Expand}_i \times \text{Year}_t \times \text{DSH}_i) + \beta_6 (\text{DSH}_i \times \text{Year}_t) + \beta_7 (\text{DSH}_i \times \text{Expand}_i) + \beta_8 X_{it} + \beta_9 Z_{it} + \beta_{10} \text{State}_i + \varepsilon_{it} \quad (2)$$

where DSH_i is a dummy variable indicating whether hospital i is designated as a DSH hospital ($\text{DSH}_i = 1$) or not ($\text{DSH}_i = 0$). The coefficient on the difference-in-differences-in-differences interaction, β_5 , is the difference estimator that identifies differential time trends in the outcome between DSH and non-DSH hospitals within expansion states relative to hospitals in nonexpansion states.

RESULTS

Descriptive Statistics

Overall variable means and proportions for FY 2013, prior to the implementation of the full expansion, are compared in Table 1, which indicates significant differences between hospitals in expansion states and hospitals in

Table 1: Pretreatment Means and Proportions (2013)

| | <i>Expansion States</i> | <i>Nonexpansion States</i> |
|----------------------------------|-------------------------|----------------------------|
| | Means/Proportions | |
| UC days per bed | 11.49 (8.73)* | 13.00 (11.20) |
| DSH | 0.74** | 0.58 |
| Employees (FTEs) | 1568 (2313)** | 800 (1363) |
| Teaching hospital | 0.39** | 0.15 |
| Nonprofit | 0.89** | 0.46 |
| For-profit | 0.06** | 0.24 |
| Government | 0.06** | 0.30 |
| Medicare days (county level) | 0.42 (0.15)** | 0.49 (0.19) |
| HHI (by beds at county level) | 0.58 (0.35)** | 0.75 (0.31) |
| Unemployment rate (county level) | 7.87 (2.00)** | 6.84 (2.21) |
| Public beds (county level) | 0.06 (0.19)** | 0.32 (0.43) |
| <i>N</i> | 451 | 897 |

Notes: Results generated using 2013 data from a balanced panel of hospitals in each period from 2011 to 2014. Standard deviations are reported in brackets for each of the continuous variables.

*A statistically significant difference from the nonexpansion states at the .01 level.

**A statistically significant difference from the nonexpansion states at the .001 level.

nonexpansion states. In particular, hospitals in expansion states experienced, on average, fewer uncompensated care days per bed in 2013. While differences between hospitals in expansion and nonexpansion states are interesting to note, difference-in-differences analysis does not require the treatment and control groups to have the same mean in observed covariates prior to the implementation of the treatment, only that the pretreatment trends for the outcome of interest be parallel. Results for the parallel trends test are discussed below.

Difference-in-Differences Regression Results

Regression results for all three models are presented in Table 2. The standard errors reported are clustered at the state level to account for nonindependence of the data due to within-group correlation and pooling across years. This analysis includes three models examining the effect of the Medicaid expansion on hospital provision of uncompensated care. The model in column (1) includes both DSH and non-DSH hospitals in the analysis, while the model in column (2) only includes DSH hospitals in the analysis. These models are represented by equation (1). In columns (1) and (2), the coefficient on the $\text{Expand} \times 2014$ variable represents the difference-in-differences estimator and measures the differential change in hospital provision of uncompensated care between hospitals in expansion states and hospitals in nonexpansion states. The coefficients

Table 2: Difference-in-Differences Regression Results, 2011–2014

| | <i>Dependent Variable: Uncompensated Care Days per Bed</i> | | |
|---------------------|--|--------------------------|----------------------|
| | <i>All Hospitals (1)</i> | <i>DSH Hospitals (2)</i> | <i>DDD (3)</i> |
| Expand × 2011 | 1.777* (0.784) | 1.958 (0.970) | 1.192 (0.654) |
| Expand × 2012 | 0.709 (0.416) | 0.636 (0.593) | 0.793 (0.438) |
| Expand × 2014 | -2.695*** (0.659) | -3.108*** (0.777) | -1.685* (0.649) |
| Expand × 2011 × DSH | | | 0.891 (0.914) |
| Expand × 2012 × DSH | | | -0.099 (0.804) |
| Expand × 2014 × DSH | | | -1.360* (0.656) |
| Expand | 0.075 (0.769) | -2.412* (1.132) | 1.18 (1.783) |
| Constant | 16.242*** (2.210) | 24.308*** (2.693) | 14.491*** (3.209) |
| R-squared | 0.282 | 0.298 | 0.284 |
| N | 5,392 | 3,404 | 5,392 |

Notes: Results generated using a balanced panel of hospitals observed in each period from 2011 to 2014 with 2013 as the base year. All dollar figures used in the analysis are adjusted to 2014 dollars. Control variables include the following: number of employees, teaching hospital, ownership status (nonprofit, for-profit, or government), Medicare days (as percent of total hospital days), HHI (by beds per county), county-level unemployment rate, percent public beds (by county), and state-level fixed effects. Standard errors reported in the parentheses are robust and clustered at the state level.

* $p < .05$, ** $p < .01$, *** $p < .001$.

indicate a negative and statistically significant difference ($p < .001$) in provision of uncompensated care between hospitals in expansion and nonexpansion states in the postexpansion period for both models.

To get an idea of the substantive effect of expanding Medicaid on hospital provision of uncompensated care, one can compare the unadjusted pre- and postexpansion averages in the outcome for hospitals in expansion and nonexpansion states. In fiscal years 2011–2013, prior to the implementation of the full Medicaid expansion, hospitals in expansion states had an average of 12.0 uncompensated care days per bed. This figure decreased approximately 34 percent by 2014, resulting in an average of 7.9 uncompensated care days per bed. In comparison, hospitals in nonexpansion states averaged 12.8 uncompensated care days per bed from 2011 to 2013. By 2014, this figure was practically unchanged, falling to 12.3. When looking only at DSH hospitals,

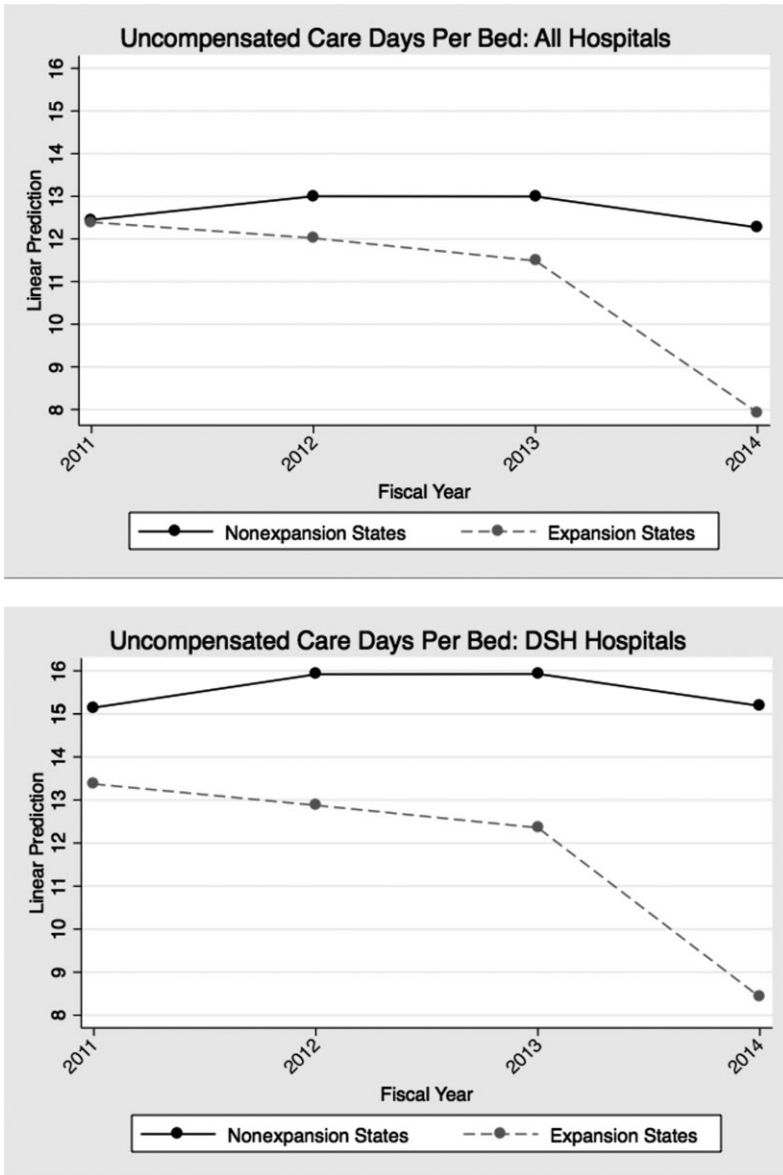
those in expansion states averaged 12.9 uncompensated care days per bed in fiscal years 2011–2013. By 2014, this figure decreased by approximately 35 percent to 8.4. However, similar declines did not materialize for DSH hospitals in nonexpansion states, which averaged 15.7 uncompensated care days per bed in fiscal years 2011–2013, falling slightly to 15.2 in 2014. Figure 1 depicts the pre- and postexpansion time trends in provision of uncompensated care for hospitals in expansion states relative to those in nonexpansion states for these two models, which appear consistent with the results in Table 2.

Given that hospitals in expansion states did experience a significant reduction in provision of uncompensated care relative to hospitals in nonexpansion states, as evidenced by the results in columns (1) and (2), the next analysis compares the change in uncompensated care across DSH and non-DSH hospitals within expansion states relative to hospitals in nonexpansion states. Prior to the expansion in 2014, DSH hospitals in expansion states bore a higher level of uncompensated care burden relative to non-DSH hospitals, averaging 3.5 more uncompensated care days per bed from fiscal years 2011–2013. The model in column (3) provides the results for the difference-in-differences analysis, represented by equation (2). The coefficient on the difference-in-difference-in-differences estimator, $\text{Expand} \times 2014 \times \text{DSH}$, is negative and statistically significant ($p < .05$), indicating that DSH hospitals in expansion states experienced 1.4 fewer uncompensated care days per bed than non-DSH hospitals in 2014, relative to hospitals in nonexpansion states.² As evidenced in Figure 2, trends in uncompensated care for DSH hospitals and non-DSH hospitals in nonexpansion states remained static across all study years.

Test of the Parallel Trends Assumption

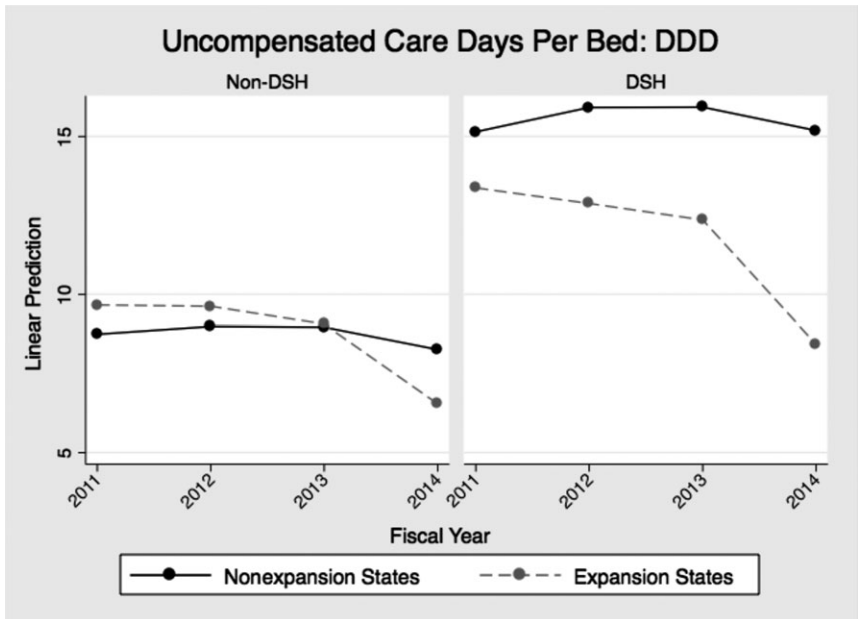
The key identifying assumption of the difference-in-differences research design is that the outcome in the treatment and control groups would follow the same trend in the absence of the treatment, which is, in this case, the full Medicaid expansion. Given that the counterfactual state is not observable, pretreatment data are often used to verify the parallel trends assumption. The coefficients on the group and time interactions for the pre-expansion periods [$\text{Expand} \times 2011$ and $\text{Expand} \times 2012$ in columns (1) and (2); $\text{Expand} \times 2011 \times \text{DSH}$ and $\text{Expand} \times 2012 \times \text{DSH}$ in column (3)] in Table 2 indicate whether there were differential changes in provision of uncompensated care between the two groups prior to the full expansion of Medicaid in 2014. For the model including only DSH hospitals under column

Figure 1: Time Trends of Uncompensated Care Days per Bed in Expansion and Nonexpansion States



Source: Author's analysis of Medicare cost reports from 2011 to 2014 for general, short-term, non-federal hospitals that participate in Medicare and are observed in each year of the study.

Figure 2: Time Trends of Uncompensated Care Days per Bed in Expansion and Nonexpansion States for DSH and Non-DSH Hospitals



Source: Author's analysis of Medicare cost reports from 2011 to 2014 for general, short-term, non-federal hospitals that participate in Medicare and are observed in each year of the study.

(2) and the triple difference model under column (3), these coefficients are not statistically significant for either of the pre-expansion periods, indicating that in the absence of the Medicaid expansion, hospitals in each group would have exhibited similar trends in provision of uncompensated care in 2014.

For the model including all hospitals in the sample under column (1), the coefficient on the $\text{Expand} \times 2011$ is positive and statistically significant ($p < .05$), indicating a difference in pretreatment trends in the outcome for all hospitals in expansion states relative to all hospitals in nonexpansion states. However, while important to recognize, this difference should not invalidate the findings, as it is the only instance of the parallel trends assumption being violated out of the three models. Additionally, the results provide strong causal evidence that the Medicaid expansion effectively reduced hospitals' burden of uncompensated care, as a clear and precipitous drop in provision of uncompensated care is evident for hospitals in expansion states in 2014, as depicted in Figures 1 and 2.

DISCUSSION

Limitations

This study is not without its limitations. Medicare cost report data, although commonly used by researchers and government officials, have some known quality problems. One challenge associated with the use of these data is the fact that CMS cost reports are organized in terms of a fiscal year, whereas the treatment variable was determined based on a calendar year. This required the sample be restricted to only hospitals with fiscal years ending in September, October, November, or December to align the timing of the Medicaid expansion with the timing of the uncompensated care data. To the extent that these hospitals are not representative of the study population, the generalizability of the results may be limited. These data also have issues with item nonresponse, further reducing the size of the sample and limiting generalizability. A final data challenge involves the complete redesign of the worksheets in 2010, rendering comparisons in uncompensated care trends between hospitals in expansion and nonexpansion states prior to 2011 unreliable, at best. Having the ability to include additional time periods in the test of the parallel trends assumption would provide a more complete understanding of long-term changes in hospital provision of uncompensated care.

Additionally, there were difficulties associated with determining appropriate treatment and control groups for this analysis. Hospitals in states that chose to expand using a Section 1115 waiver could have been included in the analysis, falling into either the treatment or control group depending on the timing of their expansion. In addition, hospitals in states expanding after January 1, 2014, could have been included in the control group, while those in states that expanded prior to 2014 could have been included in the treatment group. Ultimately, the priority was to mitigate the confounding influence of different types of expansions and/or timing of expansions. Although this study opted to only include hospitals in states that implemented the full Medicaid expansion on January 1, 2014, in the treatment group, with those in states not moving forward with the expansion in any form in the control group, sensitivity analyses using models consisting of different samples of hospital data were also performed. The results, reported in the Appendix SA1, show substantively similar findings. Finally, although this study did use the most recent data available to the public, it only includes 1 year of the full Medicaid expansion, 2014, in the post-treatment period. Future research should investigate

the effects of the expansion over a longer time frame to determine whether initial reductions in uncompensated care are sustained in the long run.

Policy Implications

The results of this analysis have implications for state-level policy makers still considering expanding Medicaid, federal policy makers considering the appropriate level of DSH payments, and hospital administrators in both expansion and nonexpansion states that continue to experience high levels of uncompensated care. Hospitals in expansion states saw a reduction in their provision of uncompensated care relative to hospitals in nonexpansion states, with hospitals that treat a larger proportion of low-income patients experiencing greater declines. Prior to the expansion, hospitals in nonexpansion states experienced higher levels of uncompensated care relative to those in expansion states, a gap that has grown since expanding Medicaid in 2014. Lawmakers in states that have thus far decided against expanding Medicaid should take this into consideration moving forward, as revenue loss due to uncompensated care may jeopardize the financial health of the hospitals in these states (Gapenski, Vogel, and Langland-Orban 1993; Vogel, Langland-Orban, and Gapenski 1993; Rosko 2004) with implications for payroll, staffing, and the quality of care produced by the hospital (Duffy and Friedman 1993; Aiken et al. 2002; Needleman et al. 2002; Cho et al. 2003; Person et al. 2004; Bazzoli et al. 2007). Furthermore, there is mounting evidence that hospitals treating low-income patients in rural areas are struggling to survive, with the majority of recent closures happening in nonexpansion states (Kaufman et al. 2016). An injection of additional Medicaid revenue could help these hospitals offset the cost of providing care to low-income patients in rural communities.

Of particular concern for hospitals in nonexpansion states are the pending cuts to DSH Medicaid payments, which constitute a major funding source for hospitals that provide uncompensated care. The framers of the ACA assumed that the Medicaid expansion would increase coverage of previously uninsured individuals, resulting in less demand for uncompensated care. Based on this assumption, the ACA introduced cuts in federal DSH payments originally scheduled to begin in fiscal year 2014 but delayed until fiscal year 2018. Given that the Medicaid expansion was envisioned as a mandatory reform, the effects of the scheduled DSH payment cuts could have serious financial implications for hospitals in nonexpansion states, as they depend on this funding to help offset the cost of providing indigent care.

Reduced DSH payments will also have financial implications for hospitals within expansion states. In the face of declining Medicaid DSH payments, evidence suggests that hospitals may respond by reducing their provision of uncompensated care (Hsieh and Bazzoli 2012). While the decrease in low-income uninsured patients in states that expanded Medicaid is expected to offset the effect of these financial losses, the expansion of insured individuals resulting from the ACA will not eliminate all uncompensated care. A study by Neuhausen et al. (2014) examining the effect of ACA DSH payment reductions on public hospitals in California found that decreases in uncompensated care resulting from insurance expansions may not match the payment cuts due to remaining uninsured patients, low Medicaid reimbursement rates, and medical cost inflation. The results of the present study offer additional evidence that although hospitals in expansion states experienced a marked decline in their provision of uncompensated care, it did not eliminate it altogether. Furthermore, while the expansion did have a greater effect on reducing uncompensated care for DSH hospitals, these institutions are still providing more uncompensated care than non-DSH hospitals postexpansion. Thus, hospital officials and state policy makers in expansion states will need to consider how to close any remaining funding gaps left by DSH payment cuts.

Hospitals in states that do not expand Medicaid may experience similar reductions in DSH payments, but without the concomitant increase in Medicaid revenue and decrease in demand for uncompensated care to offset the financial losses. Studies predicting the level of DSH payment cuts in nonexpansion states find that these hospitals may induce DSH payment cuts by increasing the number of insured through the health care exchanges (Graves 2012; Price and Eibner 2013). However, those most in need of uncompensated care, low-income adults, would most likely remain uninsured, resulting in financial shortfalls for hospitals faced with treating high numbers of poor patients. Given that pre-expansion differences in uncompensated care between hospitals in expansion and nonexpansion states were widened even further in 2014, policy makers in nonexpansion states should consider the financial burden DSH hospitals will continue to encounter if changes are not made.

CONCLUSION

The framers of the ACA expected the Medicaid expansion to reduce hospital provision of uncompensated care by increasing insurance coverage rates among those most likely to be dependent on free or reduced cost medical care

—the low-income population. The ACA based other reforms on this assumption, particularly cuts in federal payments to hospitals that treat large numbers of low-income, and presumably uninsured, individuals. Early evidence from the results of this quasi-experimental analysis indicates that while the expansion was successful in reducing hospital provision of uncompensated care, it did not eliminate it completely. The findings also suggest that within expansion states, the variation in uncompensated care between hospitals that treat a disproportionate share of low-income patients and those that do not was reduced, with the former experiencing larger reductions. The results of this study contribute to a growing body of literature aimed at uncovering the effects of the Medicaid expansion, which would enable lawmakers to establish an optimal distribution of DSH funds, not only across expansion and nonexpansion states, but within states that have expanded as well. Moving forward, it is also important to keep the effects of the Medicaid expansion on hospital provision of uncompensated care at the forefront as federal policy makers contemplate changes to the ACA in light of the results of the 2016 presidential election.

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NOTES

1. Medicare DSH program eligibility was chosen over Medicaid DSH program eligibility as the grouping variable because there exists a single formula for determining eligibility for Medicare DSH payments across all states, which is based on a hospital's disproportionate patient percentage (DPP). The "DPP is equal to the sum of the percentage of Medicare inpatient days (including Medicare Advantage inpatient days) attributable to patients entitled to both Medicare Part A and Supplemental

Security Income (SSI) (including patient days not covered under Part A and patient days in which Part A benefits are exhausted) and the percentage of total inpatient days attributable to patients eligible for Medicaid but not entitled to Medicare Part A" (U.S. Department of Health and Human Services 2016).

2. A difference-in-differences-in-differences analysis was run comparing hospitals at the high end of the Medicare DSH allotment distribution (in the top 25 percent) with non-DSH hospitals in expansion states, which was not statistically significant.

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SUPPORTING INFORMATION

Additional supporting information may be found online in the supporting information tab for this article:

Appendix SA1: Sensitivity Analysis: Models Consisting of Different Samples of Hospital Data.