Published in final edited form as:

Med Care. 2014 May ; 52(5): 415–421. doi:10.1097/MLR.000000000000114.

Did Budget Cuts in Medicaid Disproportionate Share Hospital Payment Affect Hospital Quality of Care?

Hui-Min Hsieh, Ph.D.,

Assistant Professor, Department of Public Health, Kaohsiung Medical University, 100 Shin-Chuan 1st Road, Kaohsiung, Taiwan 80708, Phone: 886-7-3121101 ex. 2141 then 48, Fax: 886-7-3110811, hsiehhm@kmu.edu.tw

Gloria J. Bazzoli, Ph.D.,

Bon Secours Professor of Health Administration, Department of Health Administration, Virginia Commonwealth University, P.O. Box 980203, Richmond, VA 23298-0203, gbazzoli@vcu.edu

Hsueh-Fen Chen, Ph.D.,

Assistant Professor, Department of Health Management and Policy, University of North Texas Health Science Center, 3500 Camp Bowie Blvd., Fort Worth, TX 76107, hsueh-fen.chen@unthsc.edu

Leslie S. Stratton, Ph.D., and

Professor of Economics, Department of Economics, Virginia Commonwealth University, Snead Hall, 301 W. Main Street, Box 844000, Richmond, VA, 23284, lsstratt@vcu.edu

Dolores G. Clement, Dr.PH.

Professor of Health Administration, Department of Health Administration, Virginia Commonwealth University, P.O. Box 980203, Richmond, VA 23298-0203, dclement@vcu.edu

Abstract

Background—Medicaid Disproportionate Share Hospital (DSH) payments are one of the major sources of financial support for hospitals providing care to low-income patients. However, Medicaid DSH payments will be redirected from hospitals to subsidize individual health insurance purchase through US national health reform.

Objectives—The purpose of this study is to examine the association between Medicaid DSH payment reductions and nursing-sensitive and birth-related quality of care among Medicaid/uninsured and privately insured patients.

Research Design and Method—Economic theory of hospital behavior was used as a conceptual framework, and longitudinal data for California hospitals for 1996–2003 were examined. Hospital fixed effects regression models were estimated. The unit of analysis is at the hospital-level, examining two aggregated measures based on the payer category of discharged patients (i.e., Medicaid/uninsured and privately insured).

Principal Findings—The overall study findings provide at best weak evidence of an association between net Medicaid DSH payments and hospital quality of care for either Medicaid/uninsured or the privately insured patients. The magnitudes of the effects are small and only a few have significant DSH effects.

Conclusions—Although this study does not find evidence suggesting that reducing Medicaid DSH payments had a strong negative impact on hospital quality of care for Medicaid/uninsured or privately insured patients, the results are not necessarily predictive of the impact national health care reform will have. Research is necessary to monitor hospital quality of care as this reform is implemented.

Keywords

Medicaid Disproportionate Share Hospital payment; Quality of Care; public good; private good

INTRODUCTION

The Medicaid Disproportionate Share Hospital (DSH) program is a major funding source that offsets hospitals' financial burdens for providing care to the low income population. However, in 1997, the Balanced Budget Act (BBA) limited Medicaid DSH payments by reducing state-specific federal allotments by \$10.4 billion over the period 1998–2003.^{1,2} These substantial Medicaid DSH reductions represented the major sources of federal BBA Medicaid savings, specifically accounting for 61 percent of total Medicaid gross savings over five years.² Little is known about whether these reductions in Medicaid DSH payments were associated with changes in hospital quality of care for low income populations. Understanding how DSH payment reductions affected quality of care is important because the Patient Protection and Affordable Care Act (ACA) in 2010 will implement sharp Medicaid DSH reductions so that these funds can be used instead to subsidize individual health insurance purchase and expand coverage nationally.^{3–5} Under ACA, hospitals will begin to lose Medicaid DSH payment funding in 2014. These DSH reductions could create financial pressures for safety-net hospitals that currently provide a large share of care to low-income populations even if health insurance coverage increases, because the residual uninsured will likely continue to rely on these facilities and newly insured individuals may seek care elsewhere.^{5–8}

Of great concern is that payment cutbacks will reduce the quality of patient care.^{8–15} Economic theory predicts that hospitals, when confronted with financial pressure as a result of payment reductions, reduce their quality of care because they have fewer resources to invest in the processes of care, new health care technology, and aging hospital infrastructure.^{16–19} Furthermore, many researchers have argued that the effect of cutbacks from a given payer may affect quality of care for patients with other payers because quality of care may be viewed as a public good.^{13,16,19,20} Specifically, as a public good, there are substantial commonalities (i.e., the same healthcare professionals and facilities) in a hospital that affect quality for all types of patients.^{16,20} On the other hand, if quality is a private good, hospitals may be able to distinguish profitable and unprofitable patients and provide different levels of quality given patients' payer status.

Several studies have investigated the effect of payment changes on hospital quality of care for Medicaid and uninsured patients specifically, but the evidence has been mixed.^{9,14,16,21,22} Only two studies focused on the effect of Medicaid DSH payment programs on quality. Duggan examined the extent to which increasing hospital DSH payments from California's Medi-Cal DSH program in 1990 affected infant mortality at the zip code level, and found that public subsidies did not improve infant mortality.²³ Baicker and Staiger studied the impact of Medicaid DSH spending on infant mortality and post-heart attack mortality in California at the county level between the periods of 1988–1990 and 1998–2000 and found little net impact on patient care.²⁴ However, neither of these studies examined how individual hospitals responded to changes in Medicaid DSH payments. In addition, previous studies were limited to the elderly or young children and did not examine potential effects among patients with other types of payers. Our study addresses these gaps among existing studies.

The purpose of this study is to examine how Medicaid DSH payment cuts affected hospital quality of care in California using data from 1996 to 2003, a period which spans pre and post implementation of the BBA in 1997. We evaluated this relationship at the individual hospital level, which is a more natural unit of analysis for reporting on and improving accountability. The State of California was selected for two reasons: first, California has a high uninsured rate and thus received relatively large amounts of Medicaid DSH payments; second, California was substantially affected by the BBA, with its state-specific federal Medicaid DSH allotment declining from \$1,085 million in 1998 to \$890 million in 2003 (as supplementary digital eFigure1 and 2).^{1,25} Given the data we examined, the overall change in total net Medicaid revenue per Medicaid/indigent discharge is –8.4% between 1998 and 2003. This combines a net Medicaid revenue per discharge increase of 6.4% with a decline in Medicaid DSH payments of –75.5%. We focused on quality of care for Medicaid and uninsured patients because these groups are likely affected by the Medicaid DSH payment reductions. Specifically, according to the federal requirement and California state regulation, Medicaid DSH subsidies are distributed to hospitals with high levels of Medicaid and uninsured inpatient utilization.²⁶ We also study quality of care for privately insured patients to examine whether the DSH reductions had any spillover effects given economic arguments about the potential public good nature of hospital quality of care.

METHODS

Data Sources

We used eight-years (1996–2003) of longitudinal unbalanced panel data for California hospitals to assess our research question. Several data sources were used for this study. The Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for California were used to construct hospital quality indicators. The Office of Statewide Health Planning and Development (OSHPD) in California provided state-audited hospital financial statements and hospital all payer case-mix index data. The American Hospital Association (AHA) Annual Survey provided data on hospital characteristics. The Area Resource File (ARF) provided demographic information among communities. HealthLeader-Interstudy data on HMO enrollment at the MSA level were also used. The Medi-Cal annual statistical

report was accessed to obtain statistical data on California Medi-Cal program services, expenditures, and eligibles. The Medi-Cal Managed Care Annual Statistical Report was also used to obtain information about the managed care programs rendering care to Medi-Cal beneficiaries. Finally, the Medicare CMS-2552-96 cost report provided data on the Medicare DSH payments that hospitals received.

Sample Criteria

The California SID dataset was used for constructing risk-adjusted hospital-level quality measures. It contained 30,395,971 inpatient discharges from 1996 to 2003. We excluded discharges for those who: were younger than 18 or older than 64 ($n=16,030,336$); were enrolled in Medicare ($n=1,605,701$); stayed in the hospital longer than 30 days ($n=124,986$); were residents of a state other than California ($n=311,915$); were discharged alive in less than 1 day (these patients either were miscoded or had conditions not requiring a hospital stay) ($n=356,807$); or had specific exclusions (i.e., gender variable is missing or with erroneous data) ($n=670,498$). The final sample included 11,295,728 inpatient discharges. Overall, privately insured individuals represent about 55% of these inpatient discharges, with the remainder being Medicaid/uninsured.

The hospitals included in the study were short-term, non-federal general acute care hospitals. We eliminated 25 Kaiser hospitals in each study year because they do not report data to OSPHD. Additionally, we excluded hospitals that experienced ownership changes (i.e., hospital closure or ownership conversion) during the study years because these changes could affect hospital care to low-income individuals and thus the amount of Medicaid DSH payments they received, which resulted in about 8% of hospitals being excluded. Finally, there were 2,279 hospital-year observations, representing 318 hospitals that had at least two annual observations for each payer type. The distribution of hospital-year observations between 1996 and 2003 is listed in the supplementary eTable1. California hospitals that provided a high volume of care to low-income and uninsured patients are eligible to receive Medicaid DSH payments and were defined as DSH hospitals. Between 1996 and 2003, 129 hospitals received Medicaid DSH payments in two or more of our study years.

Variable Definitions

Quality of Care Measures—We used patient safety indicators (PSIs) and inpatient quality indicators (IQIs) software available at the Agency for Healthcare Research and Quality (AHRQ -www.qualityindicators.ahrq.gov) to construct hospital-level, risk-adjusted patient quality indicators for privately insured and Medicaid/uninsured patients separately. For each hospital, risk-adjusted PSIs and IQIs controlled for patient age, gender, modified DRG and 30 comorbidities.^{27,28} Given concern that payment reductions may affect staffing levels at hospitals because hospitals cut back on labor inputs in response to financial pressure,^{29–32} nine nursing-sensitive patient safety and inpatient quality indicators were created. The California legislature passed Assembly Bill 394 (AB394) mandating minimum licensed nurse-to-patient ratios in October 1999, but this law was not implemented until January 2004^{33–35} and should not influence our findings. These nine indicators were death in low mortality DRGs (PSI02), pressure ulcer (PSI03), selected infections due to medical care (PSI07), postoperative hemorrhage or hematoma rate (PSI09), postoperative pulmonary

embolism or deep vein thrombosis rate (PSI12), acute myocardial infarction mortality (IQI15), congestive heart failure mortality (IQI16), acute stroke mortality (IQI17), and pneumonia mortality (IQI20).^{36–38} Additionally, given the fact that childbirth is the leading reason privately insured and low-income women are hospitalized,³⁹ two birth-related PSIs were examined: obstetric trauma - vaginal birth with use of an instrument (PSI18) and obstetric trauma - vaginal birth without use of an instrument (PSI19).

Medicaid DSH Payments—In California, a hospital is eligible for a Medicaid DSH payment when it meets one of two criteria: (1) the hospital's number of Medi-Cal inpatient days are at least one standard deviation above the statewide mean; (2) the hospital's revenues from low-income patient utilization (including Medi-Cal and uncompensated care) account for 25% or more of its total revenues.^{25,26}

The State of California collects money from hospitals in the form of Intergovernmental Transfers (IGTs) that are then matched with federal Medicaid matching funds. Thus, it is necessary to calculate net Medicaid DSH as the amount of Medicaid DSH payments that a hospital received less the amount of funds collected by the state through IGTs.⁴⁰ We obtained DSH and IGT data from hospital annual audited financial report data published by the OSHPD in California. Our constructed Medicaid DSH measure equals net Medicaid DSH divided by the hospital's average charge per admission. This measure can be considered as the number of low-income patients the hospital can treat given its net Medicaid DSH payments and its average charge per patient in a year. It also controls for inflation because both DSH and charges in a year are affected by inflation. Following the terminology adopted by Gaskin (1997),⁴¹ we named this variable as net Medicaid DSH admissions.

Other Governmental Subsidies—To isolate the impact of the decline in Medicaid DSH payments on hospital patient safety quality, we controlled for two other subsidies that hospitals receive to cover the unreimbursed costs of care for Medicaid and uninsured patients. One is governmental subsidies for Medicare DSH payments, and the other is state and local governmental financial support. The latter includes state and county tax appropriations, restricted donations and subsidies for indigent care and subsidies for district hospitals. These values are rescaled in the same manner as the Medicaid DSH payment variable.²⁵

Market Characteristics—Controls are necessary for several market factors that may affect hospitals' quality of care. These factors include Medicaid eligibility, Medicaid managed care, the prevalence of public and teaching hospital beds, Herfindahl-Hirschman Index (HHI), private HMO managed care penetration, median household income and unemployment rate at the county level. Medicaid eligibility is the ratio of the number of average monthly Medi-Cal eligible individuals to the total population, and Medicaid managed care is the ratio of the number of Medicaid managed care enrollees to the total population in the county. A Herfindahl-Hirschman Index (HHI) is used to measure the degree of hospital competition within a given market. It is calculated as the sum of squared of market shares for each hospital in a county based on the number of admissions to that hospital. The HHI takes high values (with a maximum of 1), if there are few hospital

competitors in a market and takes low values (approaching zero) if many competitors are present. If hospitals are in the same multi-hospital system within a county, their hospital admissions were combined and treated as if the system were one organization. The percentage of public hospital beds was measured as the number of county and district hospital beds divided by total hospitals beds, and the percentage of teaching hospital beds was measured as the number of teaching hospital beds divided by total hospital beds within a county.

Hospital Characteristics—Several hospital characteristics were controlled in the model, including: hospital ownership, system affiliation, teaching status, hospital size, the ratio of registered nurses to hospital staff beds and the number of high-tech services as identified by Bazzoli et al.⁴² Hospital all payer case-mix was included because hospitals treating patients with more severe illnesses may experience greater numbers of adverse patient events due to that more complex patient population.^{43,44} Additionally, year dummy variables were included to identify the study years, with the year of 1996 in the referent category.

Empirical Approach

Hospital-level quality of care measures are examined based on the payer category of discharged patients (i.e., Medicaid/uninsured and privately insured). The empirical specification for the analysis is represented by the following reduced form equation:

$$QI_{ipt}^k = \gamma_0 + \gamma_1 DSH_{it} + \gamma_2 DSH_{it} \times PAYER_{ipt} + \gamma_3 Z_{it} + \gamma_4 M_{it} + \gamma_5 H_{it} + \gamma_6 Y_r + \lambda_i + \varepsilon_{ipt}$$

where i = an individual hospital; k = selected quality indicators; p = payer; t = year. DSH_{it} is net Medicaid DSH payment. $PAYER_{ipt}$ represents a dummy variable for Medicaid/uninsured for a hospital i , with privately insured as the reference group. $DSH_{it}PAYER_{ipt}$ is the interaction term between the Medicaid DSH payment variable and the dummy variable for Medicaid/uninsured. Z_{it} is other governmental financial subsidies for indigent care; M_{it} is a vector of market characteristics; H_{it} is a vector of hospital characteristics; Y_r represents a vector of year dummy variables. λ_i is a hospital-specific fixed effect; and ε_{ipt} is a random error term. Specifically, we calculated two sets of aggregated risk-adjusted quality of care indicators (i.e., Medicaid/uninsured and privately insured) for each hospital in each year. Rather than analyzing two models for each quality indicator, we used a payer dummy variable for Medicaid/uninsured for a hospital, with privately insured as the reference group in each model to differentiate the quality impact on different payer discharges, while simultaneously controlling hospital and market characteristics. The inclusion of both year and payer dummies makes this a two-way fixed effects model that identifies how nonsystematic changes in DSH generosity within a hospital over time affect the quality of care at that hospital.

This empirical model allows us to examine the impact of the reduction in Medicaid DSH payments on hospital quality for both Medicaid/uninsured and privately insured patients. Specifically, the estimated coefficient of DSH (i.e., γ_1) represents the DSH effect on quality of care for the privately insured patients and the sum of this coefficient and the coefficient to $DSH \times PAYER$ (i.e., $\gamma_1 + \gamma_2$) represents the total effect for Medicaid/uninsured patients. In

addition, a heteroskedasticity-robust standard error adjustment was used and also clustered by hospitals to take account of unequal error variances across hospitals.

RESULTS

Table 1 reports the number of hospitals and hospital-years, the average of quality performance for a given indicator for privately insured individuals and Medicaid/uninsured individuals at the hospital level between 1996 and 2003, and the p-value from a paired t-test between two groups of patients. IQIs and PSIs measure negative quality events. Therefore, higher numbers imply poorer quality of care. For example, the average value of PSI 02 is .00024 for the privately insured and is .00031 for Medicaid/ uninsured. These numbers imply that Medicaid/ uninsured patients had on average .7 additional PSI 02 adverse events per 1,000 discharges when compared to privately insured patients.

Table 2 presents descriptive statistics on hospital and market characteristics for DSH hospitals and non-DSH hospitals between 1996 and 2003. Compared to non-DSH hospitals, DSH hospitals tended to receive more other governmental financial support ($p < .01$), have larger bed size ($p < .01$), be more involved in teaching ($p < .01$), be more likely to be located in counties with a high ratio of Medicaid eligible to total population ($p < .01$), have a higher ratio of Medicaid managed care enrollees to total population ($p < .01$), be in a more competitive market ($p < .01$), have a greater percentage of public and teaching hospitals in a county ($p < .05$ and $p < .01$, respectively), and be in a county with a lower median household income ($p < .01$) and with a higher unemployment rate ($p < .05$).

Table 3 provides the coefficients for each quality measure for private insured (γ_1) and Medicaid/ uninsured ($\gamma_1 + \gamma_2$) groups, extracted from the multivariate fixed effects model (please see the supplementary eTable2). Although the coefficients for most of the quality measures are insignificant, we observe significant findings ($p < .1$) on PSI02 and PQI16 for the privately insured and on PSI16 for the Medicaid/ uninsured ($p < .1$), indicating that greater DSH payments reduced the probability of low mortality DRGs and congestive heart failure (CHF) deaths for privately insured patients and the rate of CHF deaths for Medicaid and uninsured patients.

To put the magnitude of these responses into perspective, it is worthwhile to examine the elasticity of hospital responses, namely the percentage change in quality of care associated with a percentage change in the net Medicaid DSH variable. We used IQI16 for Medicaid/ uninsured as an example and calculated an elasticity using the mean value of IQI16 for Medicaid/uninsured patients in Table 1, the mean value of net Medicaid DSH admissions in Table 2, and the marginal effect estimates based on the results in Table 3. Our study findings imply that a one-unit change in the net Medicaid DSH variable equaled .16% reduction in net Medicaid DSH (i.e., 1 divided by 607.96) and this was associated with a .0087% (i.e., 1 divided by .02254 and then multiplied by .000196 and divided by 100) increase in hospital rate of CHF deaths for Medicaid/uninsured. This implies that the elasticity of hospital quality of care for this IQI to a net Medicaid DSH change was $-.054$. Overall, these results suggest an inelastic and small hospital response to declining Medicaid DSH payments.

For a sensitivity analysis, we assumed that a hospital determines the level of quality of care to provide in time period t based on the pool of resources available to it in the prior period $t - 1$ rather than the current period t . The results we obtained using lagged Medicaid DSH effects were similar to those obtained using current Medicaid DSH effects in that few of the effects were found to be significant and those that were suggested only a small effect on the quality indicators (as listed in the supplementary eTable3).

DISCUSSION

With the number of uninsured expected to drop, the ACA initiates a series of payment reductions, such as those planned for reducing Medicaid DSH payments by a total of \$18.1 billion between 2014 and 2020.⁶ This DSH payment reduction could create a substantial financial shortfall for safety-net hospitals. The present study applied economic theory of hospital behavior as a framework to examine whether hospitals change their quality of care for both privately insured and low-income patients when their Medicaid DSH payments declined. Nine nursing-sensitive and two birth-related hospital quality indicators were examined using data from California hospitals from 1996 to 2003. Despite the strong theoretical predictions, our overall study findings provide little evidence that hospital quality of care declined for either Medicaid/uninsured or privately insured patients in California. Although we found a few quality measures that had a significant relationship with DSH payment cut, the magnitude of those effects was very small.

There are several potential explanations for these findings. First, even though Medicaid DSH subsidies declined, hospitals may have been able to maintain sufficient business revenues so that they did not need to reduce resources devoted to quality of care.^{45,46} Second, hospitals may need to keep their core clinical care at sufficiently high quality to maintain their reputation and to attract paying patients. Thus, they may take actions to sustain quality of care despite DSH reductions.⁴⁷ Third, even though California implemented regulations requiring minimum levels of licensed nurse staffing after our study period (e.g., beginning in 2004),^{33–35} hospitals may have anticipated this new regulation. Therefore, rather than cutting back on labor inputs in response to DSH payment reductions, hospitals may have maintained or increased their nurse staffing and as a result, quality of care was not affected. Fourth, hospitals may take actions that affect other dimensions of their activities when faced with financial pressure to ensure they have sufficient internal resources to support quality of care. Specifically, they may instead decide to reduce the volume of care for Medicaid/ uninsured patients although such action may in turn affect the future subsidies they can obtain for caring this group of patients.²⁵

As with any study, this research has limitations that must be acknowledged. First, this study only examined hospitals in California. The results may not be generalizable to other states. Second, the data used to construct quality measures (i.e., PSIs and IQIs) were based on hospital administrative data. We were not able to observe post-hospitalization mortality because it is not available in HCUP-SID datasets. Additionally, we used SID data from 1996 to 2003 to construct PSIs and IQIs. From prior research,⁴⁸ it is clear that PSIs may be substantially affected when the present on admission (POA) indicators are used. However, these data lacked of this information because POA data were collected since 2007. Even so,

our results still indicate Medicaid DSH payments have little effect on quality of care. Third, our analysis excluded hospitals that closed during the study period; if DSH payment reductions were a primary factor in these closures, we may be underestimating the effects of DSH reductions on quality of care. Fourth, while we used eight years of data, the specification we estimated only focused short term effect for the impact that changes in DSH in one year have upon quality in that year.

Despite its shortcomings, the study results do provide important implications. This study examined the association between changes in Medicaid DSH payments resulting from the 1997 BBA policy and hospital quality of care. Through this study, we can gain knowledge of the effects of health policies and have better ability to anticipate the potential effects of future policies on health outcomes. With respect to the 2010 U.S. health care reform law, the ACA includes provisions that would redirect Medicaid and Medicare DSH payments to provide subsidies for individual health insurance purchase. Our findings suggest that this change, which will result in declining hospital DSH payments, should have little effect on the quality of care for hospitalized patients. However, our findings do not account for the array of additional changes that hospitals will confront as the new health reform law is implemented and thus more study of potential quality of care changes is needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was supported by NIH Grant R01 HL082707: *Safety Net Hospitals and Minority Access to Care*, awarded by the National Heart, Lung and Blood Institute of the National Institutes of Health.

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Table 1

Descriptive results of hospital quality indicators, 1996–2003

Variables	No. of hospital, 1996–2003	No. of hospital-years, 1996–2003	Privately insured		Medicaid & uninsured		p-value*
			Mean (± SD)	Mean (± SD)	Mean (± SD)	Mean (± SD)	
Nursing sensitive patient safety and hospital inpatient quality							
PSI 02 : Death in low mortality DRGs	316	2,257	.00024 (±.00333)	.00031 (±.00347)			.179
PSI 03 : Pressure ulcer rate	313	2,235	.00525 (±.01394)	.00873 (±.01672)			.000
PSI 07 : Selected infections due to medical care	318	2,277	.00084 (±.00218)	.00097 (±.00211)			.018
PSI 09 : Postoperative hemorrhage or hematoma rate	308	2,207	.00182 (±.00445)	.00189 (±.00669)			.555
PSI 12 : Postoperative pulmonary embolism or deep vein thrombosis rate	308	2,207	.00312 (±.01288)	.00323 (±.00731)			.471
IQI 15 : Acute myocardial infarction mortality rate	264	1,558	.06080 (±.10353)	.07406 (±.11124)			.093
IQI 16 : Congestive heart failure mortality rate	294	1,951	.02475 (±.05768)	.02254 (±.04975)			.315
IQI 17 : Acute stroke mortality rate	283	1,772	.11681 (±.12739)	.13565 (±.13271)			.622
IQI 20 : Pneumonia mortality rate	308	2,136	.03752 (±.06049)	.03946 (±.06040)			.112
Women birth related patient safety quality							
PSI 18 : Obstetric trauma rate- vaginal with instrument	261	1,775	.15771 (±.10964)	.13647 (±.10205)			.001
PSI 19 : Obstetric trauma rate- vaginal without instrument	265	1,849	.03353 (±.02798)	.02665 (±.02180)			.000

* Paired t-test was used for comparing hospital quality between privately insured and Medicaid & uninsured in a hospital.

DRG= Diagnosis Related Group; IQI=inpatient quality indicator; PSI=patient safety indicator.

Table 2
Descriptive statistics for explanatory variables by disproportionate share hospital types, 1996–2003

Variables	DSH Hospitals		Non-DSH Hospitals		P-value
	Mean	S.D.	Mean	S.D.	
Governmental Financial Supports					
Net Medicaid DSH admissions	607.96	1269.73	-	-	-
Other Governmental Supports admissions	865.61	1462.36	225.61	346.32	.000
State and Local Governmental Subsidy admissions	436.03	1427.92	12.21	54.31	.000
Medicare DSH subsidy admissions	429.58	494.46	213.4	342.28	.000
Market Characteristics (at county level)					
Ratio of Medicaid eligible to total population	17.83	5.58	15.85	5.74	.000
Ratio of Medicaid managed care enrollees to total population	7.47	5.25	5.92	5.11	.000
Ratio of private HMO enrollees to total population at MSA Level	42.71	18.67	41.14	20.31	.131
Herfindahl-Hirschman Index	0.24	0.23	0.32	0.27	.000
Percentage of public hospitals in county (%)	20.9	22.84	18.14	20.42	.022
Percentage of teaching hospitals in county (%)	32.01	20.2	26.81	22.21	.000
Median household income (in 1000s)	36.49	7.38	38.1	7.8	.000
Unemployment rate (%)	7.14	3.67	6.63	3.34	.000
Hospital Characteristics					
FTE RNs to staffed bed	1.23	0.58	1.4	0.63	.000
Hospital staffed bed size	213.44	162.71	188.68	152.26	.000
Proportion system affiliated (%)	0.57	0.5	0.67	0.47	.000
Proportion teaching hospital (%)	0.31	0.46	0.12	0.32	.000
Proportion hospitals that provide high-tech services (%)	0.28	0.45	0.28	0.45	.807
Hospital all payer casemix index	0.94	0.22	1.06	0.28	.000
Proportion not-for-profit hospital (%)	0.37	0.48	0.62	0.48	.000
Proportion for-profit hospital (%)	0.3	0.46	0.23	0.42	.001
Proportion public hospital (%)	0.33	0.47	0.14	0.35	.000
N (Study Hospital Observations, 1996–2003)					
	674		1,605		

Notes: DSH hospitals are defined as those hospitals that received Medicaid DSH payments. Net Medicaid DSH admissions equals Medicaid DSH payments less IGTs divided by hospital average charges per admission. Similarly, other governmental support admissions equal the sum of other financial supports received by the hospital divided by the hospital average charges per admission. FTE=full-time

equivalent. RN=registered nurse. S.D.=standard deviation. P-value presented here is to compare DSH and non-DSH hospitals for explanatory variables. Independent t-test was used to compare DSH and non-DSH hospitals when explanatory variable is continuous variable and Chi-square test was used for categorical variables.

Table 3

Summary of fixed effect models for Medicaid DSH effects on hospital quality for privately insured and Medicaid & uninsured

Medicaid DSH total effects	Privately Insured (γ_1)			Medicaid & Uninsured (γ_1, γ_2)		
	Coefficient	S.E.	P-value	Coefficient	S.E.	P-value
Nursing sensitive patient safety and hospital inpatient quality						
PSI 02 : Death in low mortality DRGs	-.000012	.000001	.093	.000008	.000052	.882
PSI 03 : Pressure ulcer rate	.000008	.000030	.802	-.000029	.000051	.575
PSI 07 : Selected infections due to medical care	.000004	.000006	.453	.000001	.000003	.846
PSI 09 : Postoperative hemorrhage or hematoma rate	-.000013	.000010	.190	-.000016	.000011	.144
PSI-12 : Postoperative pulmonary embolism or deep vein thrombosis rate	-.000072	.000048	.131	.000018	.000016	.255
IQI 15 : Acute myocardial infarction mortality rate	.000460	.000534	.390	.000025	.000282	.930
IQI 16 : Congestive heart failure mortality rate	-.001148	.000652	.079	-.000196	.000103	.059
IQI 17 : Acute stroke mortality rate	-.001147	.001085	.291	.000056	.000354	.875
IQI 20 : Pneumonia mortality rate	-.000741	.000831	.373	-.000347	.000145	.117
Women birth related patient safety quality						
PSI 18 : Obstetric trauma rate- vaginal with instrument	.000948	.001140	.406	.000505	.000374	.179
PSI 19 : Obstetric trauma rate- vaginal without instrument	-.000096	.000081	.233	.000002	.000057	.968

Notes: IQI=inpatient quality indicator; PSI=patient safety indicator; DRG=diagnosis related group; DSH hospitals are defined as those hospitals that received Medicaid DSH payments. S.E.=robust standard errors. Control variables were used in the fixed effect models including net Medicaid DSH admissions, interaction term of net Medicaid DSH admissions and Medicaid/uninsured group, other governmental supports admissions, market characteristics at county level (i.e., ratio of Medicaid eligibles to total population, ratio of Medicaid managed care enrollees to total population, HMO penetration at MSA level, Herfindahl-Hirschman Index, presence of public hospitals in county, presence of teaching hospitals in county, median household income, unemployment rate), hospital characteristics (i.e., FTE RNs to hospital staffed bed, hospital bed size, system affiliated, teaching hospital, hospital provide high-tech services, hospital all payer casemix index and ownership types) and year dummy variables. The coefficients and standard errors were multiplied by 100.