Health Insurance

The Relationship of Medicaid Payment Rates, Bed Constraint Policies, and Risk-Adjusted Pressure Ulcers

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Objective. To examine the effect of Medicaid reimbursement rates on nursing home quality in the presence of certificate-of-need (CON) and construction moratorium laws.
Data Sources/Study Setting. A single cross-section of Medicaid certified nursing homes in 1999 ($N = 13{,}736$).
Study Design. A multivariate regression model was used to examine the effect of Medicaid payment rates and other explanatory variables on risk-adjusted pressure ulcer incidence. The model is alternatively considered for all U.S. nursing home markets, those most restrictive markets, and those high-Medicaid homes to isolate potentially resource-poor environments.
Data Extraction Methods. A merged data file was constructed with resident-level information from the Minimum Data Set, facility-level information from the On-Line, Survey, Certification, and Reporting (OSCAR) system and market- and state-level information from various published sources.
Principal Findings. In the analysis of all U.S. markets, there was a positive relationship between the Medicaid payment rate and nursing home quality. The results from this analysis imply that a 10 percent increase in Medicaid payment was associated with a 1.5 percent decrease in the incidence of risk-adjusted pressure ulcers. However, there was a limited association between Medicaid payment rates and quality in the most restrictive markets. Finally, there was a strong relationship between Medicaid payment and quality in high-Medicaid homes providing strong evidence that the level of Medicaid payment is especially important within resource poor facilities.
Conclusions. These findings provide support for the idea that increased Medicaid reimbursement may be an effective means toward improving nursing home quality, although CON and moratorium laws may mitigate this relationship.

Key Words. Medicaid, quality, nursing home, regulation, pressure ulcers

Substandard nursing home quality has been a persistent policy issue over the past three decades (e.g., U.S. Senate 1974; U.S. General Accounting Office 1987; Institute of Medicine 2001). The relationship between poor quality and Medicaid payment rates is of particular concern in a system in which two-thirds of all nursing home bed days are covered by Medicaid (Rhoades and Sommers 2001). State Medicaid programs spent $175 billion in fiscal year

1998 with more than $44 billion directed toward nursing home care services (Health Care Financing Agency 2000).

There is currently a great deal of interest in limiting state Medicaid expenditures for nursing home care. States are forecasting record budgetary shortfalls in the current fiscal year due to declining tax revenues related to the economic recession that began in 2001. Simultaneously, more individuals are unemployed and qualifying for Medicaid services. Thus, there is a widening gap between revenues and expenditures with recent data from the National Association of State Budget Officers estimating the net state budget shortfalls at approximately $40 billion (National Association of State Budget Officers 2001). Medicaid accounts for about 20 percent of states' spending and Medicaid spending growth has outpaced national health spending since the late 1980s. Not surprisingly, states have identified nursing home spending cuts as a potential means toward addressing widening state budget shortfalls. A Kaiser Family Foundation survey of state Medicaid directors found that 49 states plan to reduce the rate of growth in Medicaid spending while 19 states plan actual cuts in their Medicaid spending for long-term care in fiscal year 2003 (Smith, Gifford, and Ramesh 2003).

Historically, the two primary approaches to reducing state nursing home expenditures involve reducing Medicaid payment rates and limiting the number of Medicaid recipients in homes via certificate-of-need (CON) laws and construction moratoria. Essentially, the first mechanism constrains the price of care and the second constrains the quantity of available beds. In theory, both of these policy measures may have negative implications toward the provision of quality. Low Medicaid payment rates may not provide nursing homes with adequate resources to provide sufficient quality, and CON laws and moratoria may impede quality competition for Medicaid recipients. Both of these issues may be particularly important for homes that care for a high proportion of Medicaid residents.

In the context of these concerns, this study addresses three primary questions:

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1. How are Medicaid payment rates associated with risk-adjusted nursing home quality?
2. Does a restricted bed supply affect the relationship between Medicaid payment and risk-adjusted nursing home quality?
3. Are payment rates and bed constraint policies even more important for homes that care for a high proportion of Medicaid recipients?

CONCEPTUAL FRAMEWORK

The chronic care nursing home market has two primary payer types: Medicaid and private-pay. State Medicaid programs are responsible for approximately 50 percent of all nursing home expenditures and Medicaid recipients constitute 70 percent of all bed days (with the remainder of care financed primarily by out-of-pocket payments). The Medicaid rate is, on average, about 70 percent of the private-pay price. Despite the different rates charged Medicaid and private-pay residents, a home is required by law to provide the same level of quality to all residents within a home regardless of payer source.

Building on this uniform quality assumption, economists have generally considered two alternative models of the nursing home market: a free entry model and an excess demand model. The key distinction between these two models is the presence of a binding bed constraint policy such as a CON law or a construction moratorium. In the absence of such a binding policy, the market for nursing home care is thought to be in equilibrium where there is a sufficient supply of beds to meet the demand for nursing home care. Under this paradigm, the demand of Medicaid eligible individuals is assumed to be a function of quality because revenues will increase when an additional Medicaid resident is attracted to a facility by an increase in quality. Put alternatively, homes have an incentive to provide quality until the marginal cost of caring for an additional resident equals the marginal revenue associated with the predetermined Medicaid payment rate. Thus, our first hypothesis is that:

H1: Medicaid payment rates are positively associated with risk-adjusted nursing home quality in a model with free entry.

The excess demand model builds on the assumption that CON and moratorium policies impose a binding bed constraint within the market for nursing home care whereby certain individuals are unable to gain access to

care (Scanlon 1980). In practice, a CON law constrains the growth of beds by employing a need-based evaluation of all applications for any new bed construction. A home must show a clinically legitimate rationale for additional beds to a state CON board. A construction moratorium is even more stringent in that it effectively prevents any expansion within the nursing home sector.

The stated goal of these policies is to limit rising health care costs by preventing "unnecessary" construction of nursing home beds. The underlying logic is that fewer total nursing home beds leads to fewer Medicaid residents in nursing homes, which will ultimately result in lower state Medicaid expenditures. If a CON law or construction moratorium is in fact binding, a home is thought to first accept those higher-paying private-pay residents and then fill the remaining beds with Medicaid residents. Thus, private-pay demand is still satisfied under a binding bed constraint, but there exists an "excess demand" for nursing home beds among Medicaid-eligible individuals.

Nyman (1985) and Gertler (1989) first hypothesized that Medicaid reimbursement may have a counterintuitive effect on quality in the presence of CON and moratoria. The broad implications of this observation are reviewed here and the reader is referred elsewhere for a mathematical treatment of this issue (see Norton 2000). In markets with a binding bed constraint in place, nursing homes do not view a Medicaid payment as a reward for quality, because Medicaid recipients are available (due to the binding bed constraint) regardless of the level of quality. This lack of quality competition for Medicaid recipients entails that the reward to a home for attracting an additional private-pay resident is reduced to the difference between the private-pay price and the Medicaid per diem rate. In theory, a home could always attract an additional Medicaid recipient with only minimal quality due to the presence of the binding bed constraint. Thus, as the Medicaid payment rate is increased and the difference between the private-pay price and the Medicaid rate is decreased, nursing homes will have less incentive to compete for residents on the basis of quality. Because common quality is provided across payer types, a higher Medicaid payment rate is therefore associated with a lower return to raising quality to attract private-pay residents. As a result, our second hypothesis is that:

H2: Medicaid payment rates have a counterintuitive effect of decreasing risk-adjusted quality in markets with a binding bed constraint.

The two models introduced above typically assume that nursing homes care jointly for both Medicaid and private-pay residents (e.g., Norton 2000).

However, the payer mix distribution across facilities is quite skewed with more than 1 in 5 facilities consisting of at least 90 percent Medicaid or 90 percent private-pay residents (Grabowski 2001b). A number of studies have argued that quality is lower in facilities with a higher proportion of Medicaid residents (e.g., Birnbaum et al. 1981; Schlenker and Shaughnessy 1984). Because high-Medicaid homes cannot rely on private-pay revenue, they are thought to be particularly dependent on the Medicaid payment rate. Thus, our third hypothesis is that,

> **H**3: In the absence of a binding bed constraint, Medicaid payment rates are positively associated with risk-adjusted quality in nursing homes with high proportions of Medicaid residents.

However, if a binding bed constraint is imposed on the marketplace, then the optimal level of quality is trivial within a high-Medicaid home because firms will provide the minimum acceptable level of quality, regardless of the payment level. Unlike the integrated facility where the demand of private-pay residents still depends on the provision of quality, there is no quality competition within a high-Medicaid facility under a bed constraint, and as a result, no incentive to provide quality above the minimum threshold. In theory, a home can always find another potential Medicaid eligible individual in the community. Thus, our final hypothesis is that

> **H**4: Medicaid payment rates have no effect on risk-adjusted quality in high-Medicaid facilities operating in the presence of a binding bed constraint.

There have been a number of papers that have tested the effect of a change in the Medicaid reimbursement rate on nursing home quality in the presence of CON and moratorium policies. Early state-level studies found results in support of a negative relationship between reimbursement and quality (e.g., Nyman 1985; Gertler 1989), but more recent national studies have not confirmed this negative relationship and have often found a small positive relationship (Cohen and Spector 1996; Grabowski 2001a, 2001b). By replicating earlier methods and quality measures, Grabowski (2001b) attributes differences across the two generations of studies to a changing nursing home market. That is, there has been a significant decline in utilization over the past two decades within the nursing home market (Bishop 1999). Occupancy rates, an indirect measure of excess demand, have been declining over the past two decades. The national occupancy rate was 92.9 percent in

1977, 91.8 percent in 1985, and 87.4 percent in 1995 (Strahan 1997). Thus, CON and moratoria may be less relevant within today's marketplace.

However, a common limitation across previous studies of Medicaid payment and nursing home quality is the lack of resident-level data needed for adequate risk adjustment of quality measures. Earlier studies generally employ facility-level measures of quality (e.g., the aggregate pressure ulcer rate) and use facility-level case-mix measures (e.g., an aggregate activities of daily living score) as controls. With this type of facility-level analysis, one cannot unambiguously determine whether the effect of reimbursement is an artifact of quality differences or simply due to differences in the underlying case mix of the residents. Any relationship between reimbursement rates and quality (positive or negative) may be masked or distorted in the absence of risk-adjusted resident-level quality measures. This study improves on previous facility-level analyses by incorporating resident-level quality and risk-adjustment information from the Minimum Data Set (MDS). The MDS includes resident-level information for all individuals in Medicaid-certified facilities within the United States.

METHODS

Data

Nursing home data were obtained from two different sources. The information on nursing home quality was obtained from MDS assessments. The MDS includes resident-level information for all individuals in Medicaid certified facilities within the United States. The instrument contains over 350 discrete data elements including sociodemographic information, numerous clinical items ranging from degree of functional dependence to cognitive functioning, and a checklist for staff to indicate the presence of the most common geriatric diagnoses (Centers for Medicare and Medicaid Services 2002; Morris et al. 1994). Assessments are performed on admission, upon significant change, and at least quarterly, so that there are multiple assessments of the same individual over time. For the purposes of this study, we analyzed MDS assessments from the third quarter of 1999. We aggregated the resident-level information to the facility level in creating a facility-level risk-adjusted quality indicator. The specifics of the risk-adjusted pressure ulcer incidence measure will be discussed in further detail below.

The MDS is a resident-level instrument that does not contain facility-level information. Thus, ownership status and other institutional information

on nursing homes are obtained from the On-Line Survey, Certification, and Reporting (OSCAR) system. The OSCAR system contains information from state surveys of all federally certified Medicaid (nursing facilities) and Medicare (skilled nursing care) homes in the United States. Certified homes represent almost 96 percent of all facilities nationwide (Strahan 1997). Collected and maintained by the Centers for Medicare and Medicaid Systems (CMS), the OSCAR data are used to determine whether homes are in compliance with federal regulatory requirements. Every facility is required to have an initial survey to verify compliance. Thereafter, states are required to survey each facility no less often than every 15 months, and the average is about 12 months (Harrington et al. 1999). For the purposes of this study, we identified 17,510 unique OSCAR surveys during the 1998 to 2000 period. We were then able to match the facility-level MDS high-risk pressure ulcer indicator (collected in the third quarter of 1999) to its corresponding OSCAR survey for 13,736 facilities.

Three other data sources are used to supplement the MDS and OSCAR nursing home data. First, the nursing home data are merged with aggregate county-level data from the Bureau of Health Professions' Area Resource File (ARF). Second, state-level Medicaid reimbursement methods and rates are obtained from the most recent edition of the *State Data Book on Long Term Care Program and Market Characteristics*, published by Harrington and colleagues (1999). Finally, the CMS area wage indexes are linked with the nursing home data.

Variables

This section outlines the variables used within the empirical model (see Table 1 for descriptive statistics). This study uses the proportion of risk-adjusted pressure ulcers as a measure of nursing home quality. Pressure sores (or decubitis ulcers), commonly associated with immobility in the elderly, are areas of the skin and underlying tissues that erode as a result of pressure or friction and/or lack of blood supply. Pressure ulcers can be a significant factor in the quality of life of nursing home residents. They may take months to heal, and are associated with much suffering and increased risk of death (Berlowitz et al. 2000). However, even though guidelines for the prevention and treatment of pressure ulcers are well established and circulated by organizations such as the Agency for Healthcare Research and Quality (AHRQ), their prevalence varies widely. Those nursing homes with the lowest prevalence of pressure ulcers have rates as low as 3 percent (Allman 1989),

Table 1: Descriptive Statistics (13,736 Nursing Homes)

Variable	*Mean*	*Standard Deviation*
Quality Measure		
Risk-adjusted pressure ulcer rate	0.11	0.08
State-Level Characteristics		
The average Medicaid rate	94.34	22.25
Retrospective reimbursement system	0.01	0.12
Prospective reimbursement system	0.76	0.43
Flat-rate reimbursement system	0.16	0.37
Combines prospective and retrospective systems	0.06	0.24
Allows rate adjustment upward during or after a rate period	0.42	0.49
Employs case-mix reimbursement	0.55	0.50
Total state agency spending on regulation	220.23	104.37
Market (County)-Based Characteristics		
Lagged empty beds per 1,000 noninstitutionalized elderly (65+)	11.61	12.04
HCFA area wage index	9.46	1.65
Herfindahl index	0.20	0.23
Median per capita county income	25,476	6,947
Number of individuals over age 65, per square mile	146.74	448.41
Facility Characteristics		
High-Medicaid home (>80% Medicaid, <8% Medicare, <8% private)	0.13	0.34
For-profit facility	0.69	0.46
Not-for-profit facility	0.25	0.43
Government owned and operated facility	0.06	0.23
Chain facility	0.58	0.49
Hospital-based	0.06	0.23
Number of beds	113.84	66.02

whereas those nursing homes with the highest prevalence have rates as high as 21 percent (Brandeis et al. 1994). Pressure ulcers can be prevented through good nutrition, frequent repositioning of immobilized body parts, and keeping skin clean and dry. A good prevention program for residents at risk costs more than routine nursing care for residents not at risk. However, the long-term cost of caring for a resident with an established pressure ulcer is several-fold greater than the cost of preventing ulcers in that resident. Although it is hard to calculate the proportion of total resident care cost attributable to the actual treatment of pressure sores, estimates have ranged from $4,000 to $40,000 per pressure ulcer, depending on stage (Hibbs 1988; Frantz 1989).

Using the MDS, a risk-adjusted facility-level indicator of quarterly pressure ulcer incidence (new or unresolved from the previous quarter) was created. The denominator for the incidence indicator included all residents

who had resided in a facility for at least ninety days. We selected the assessment closest to the midpoint of the third quarter in 1999 (excluding admission and readmission assessments). We limited the denominator to residents at "high risk" for a pressure ulcer. High-risk individuals were defined as those with either bed mobility or transferring problems (i.e., requiring extensive assistance or total dependence), those with secondary diseases related to malnutrition (ICD-9 codes = 260,262,263), those who are comatose, or those who have an end-stage disease. By identifying individuals based on these factors, we account for those risk factors associated with pressure ulcer development. Because these risk factors are largely independent of facility treatment practices, we also minimize the potential for over adjustment. Other factors potentially associated with pressure ulcer development (e.g., restraint use, having a history of unresolved pressure ulcers) were not used to characterize high-risk residents because they are reflective of facility treatment practices. Individuals were excluded from the denominator if they had a Stage 4 pressure ulcer (the most severe kind) on their baseline assessment from the previous quarter.

In total, 38.5 percent of residents (or 521,498 residents overall) were included within the denominator of this study. Within this population, 57,299 pressure ulcers (Stages 1 through 4) were observed for an overall high-risk pressure ulcer incidence rate of 10.99 percent and a facility-level average incidence rate of 11.09 percent.

The key independent variable of interest in the analyses was the Medicaid payment rate. Rather than including a facility-level payment rate, which may be endogenous to a facility's quality level, the analysis uses the average rate for the state. If the state deals in aggregates (policing for bad homes aside), no individual home can affect the state's payment rate. Thus, to the individual home, the average state Medicaid rate is exogenous. There is considerable cross-state variation in the level of Medicaid payment. The mean Medicaid rate was $94.34 with Arkansas having the lowest payment rate at $61.98 and Alaska having the highest payment rate at $253.48. Importantly, the exclusion of those three states with the lowest and highest Medicaid payment rates did not qualitatively change the results presented below.

A series of state-level dummy variables were also included to represent other aspects of Medicaid payment systems. States broadly employ one of four reimbursement methodologies—prospective, combination, flat rate, or a retrospective system of reimbursement. Additionally, states may employ a case-mix payment system or allow an upward adjustment in their prospective rates based upon cost information that becomes available during the rate period.

In addition to the generosity and method of Medicaid payment, states may also differ in the degree of regulation present in their state system. In an effort to capture these differences, we obtained data from a 2000 survey conducted by Walshe and Harrington (2002) of state survey agencies responsible for the licensing and certification of facilities for participation in Medicaid and Medicare on behalf of CMS. We are grateful to Charlene Harrington for sharing these data with us. From these data, we created a measure of total state agency spending on regulation per nursing home bed within each state. For the nursing homes included in our analyses, the mean spending per bed was $220.23 with Alaska ($858.85), Delaware ($624.37), and California ($481.37) spending the most and Maryland ($97.29), West Virginia ($102.19), and Tennessee ($107.31) spending the least. Potential limitations of this measure are that some variation across states may be explained by differences in geography, economies of scale in larger states, and varying levels of regulatory efficiency. Nevertheless, the variation also likely represents differences across states in agency behavior, performance, and attitudes toward regulation (Walshe and Harrington 2002).

A series of facility- and market-level variables were included as controls in the regression analysis. Binary indicators were included for several facility-level factors including not-for-profit ownership, government ownership, chain ownership, and whether the facility was hospital-based. The total number of beds within the facility was also included in the model. The county was used to approximate the market for nursing home care within this study. The market-level variables included in this analysis were the median income of people living in the nursing home's county; the Health Care Financing Agency (HCFA)-area hospital wage index; the population of individuals over age 65 per square mile in the county; and a Herfindahl index of market concentration. A Herfindahl index is a measure that is negatively related to the competitiveness of a market. This index is constructed by summing the squared market shares (i.e., the proportion of residents in each home) for all facilities in the county. The index ranges from 0 to 1, with higher values signifying a higher concentration of residents.

The identification of excess demand conditions across nursing home markets is a critical issue toward testing the relationship between Medicaid payment and quality in the presence of CON and moratoria. The ideal measure of excess demand would be the number of Medicaid eligible individuals in a given market who cannot find an available bed due to a CON or moratorium law. However, this type of information is not typically available with facility-oriented data such as that employed in this and other

economic analyses. The measure of market tightness used within the analysis is the number of open beds in the market divided by the number of noninstitutionalized elderly individuals over the age of 65 living in the county. A lagged measure of market tightness from the preceding year is employed because a contemporaneous measure may be endogenous to quality in those counties with fewer nursing facilities. The most restrictive markets are identified as those markets in the top quartile of the lagged measure (those markets with less than 4.61 open beds per 1,000 elderly age 65 and older). Thus, 4,389 homes (out of 17,380 homes nationally) were identified as being located in the most restrictive markets. Of these homes in restrictive markets, we had matched MDS quality information for 3,690 facilities. As a robustness check, a lagged measure of the number of empty beds per nursing home in the county generated similar results to the results presented below.

Finally, a measure of high-Medicaid homes was constructed to examine the Medicaid payment and nursing home quality relationship in a high-Medicaid environment. In order to be categorized as a "high-Medicaid" home, the facility had to have at least 80 percent of its residents reporting Medicaid as the primary payer type, and not greater than 8 percent of either Medicare or private-pay. Thus, 2,355 homes (or 13.45 percent) out of 17,510 homes nationwide were identified as high-Medicaid homes using these criteria. Of these high-Medicaid homes, we had matching MDS quality information for 1,830 facilities.

Empirical Analyses

Theoretical work has argued that nursing homes jointly choose quality, the private-pay price and the payer mix (Norton 2000). In the reduced form, each of these dependent variables can be expressed as a function of exogenous variables such as the Medicaid payment rate. This study will employ this reduced form approach in examining the association between the Medicaid payment rate and nursing home quality. Norton (2000) observed that, in theory, an increase in the Medicaid payment rate will raise the private-pay price. If we assume the private-pay price is greater than the Medicaid payment, then an increase in the Medicaid payment rate will still decrease the overall differential between the private-pay price and the Medicaid rate, because the private-pay price will increase on a less than proportional basis (Scanlon 1980). Thus, one does not need to observe private pay prices to make meaningful inferences regarding the relationship between Medicaid payment rates and quality. Moreover, our analysis of high-Medicaid homes will

effectively negate this issue by conditioning on facilities for which the private-pay price is not relevant. For all of the models, efficient estimates of the parameters are given by the weighted least squares (WLS) estimator. Because we are ultimately interested in residents within facilities rather than the facilities themselves, these importance weights take into account the number of residents within each facility.

In order to test our various hypotheses, four sets of analyses are presented below. The first model includes all facilities nationwide within the analysis. Given declining occupancy rates across many nursing home markets, this national model is assumed to test the relationship between Medicaid payment and quality in the absence of a bed constraint. The second model conditions on the most restrictive markets using the lagged tightness measure discussed above to test our second hypothesis regarding the association between Medicaid payment and nursing home quality in the presence of a binding bed constraint. The third set of analyses restricts the model to only the high-Medicaid homes using the payer mix threshold variable discussed above. This model provides a test of our third hypothesis regarding the relationship between the Medicaid payment rate and quality within high-Medicaid homes. The final set of analyses isolates the model to high-Medicaid homes that are located in the most restrictive markets to test the Medicaid rate and quality relationship in high-Medicaid homes under a bed constraint. Importantly, in interpreting the coefficients below, pressure ulcers are a negative indicator of quality (that is, a higher pressure ulcer rate entails lower quality).

A final methodological point concerns the "grouped" nature of the key explanatory variable. Because the Medicaid payment rate is reported at the state-level, it may introduce heteroskedasticity and bias the estimates of the parameter standard errors. When the true specification of the residual variance–covariance matrix follows a grouped structure, Moulton (1990) has shown that estimates of the standard errors will be biased downward. A straightforward and unrestrictive approach to addressing this issue in the WLS model is to adjust the standard errors using the Huber-White robust estimator.

FINDINGS

This section presents the results from empirical models that relate the level of Medicaid reimbursement to the risk-adjusted pressure ulcer rate. The key variable of interest in these models is the Medicaid payment rate. In an initial specification of the model, we can examine this relationship across all homes

nationwide (see Table 2, column 1). Within this model, there is a positive and statistically significant association between Medicaid payment and nursing home quality. Because the risk-adjusted pressure ulcer incidence rate is relatively low (see the bottom row of Table 2), the *absolute* magnitude of this effect is relatively small. An increase in the Medicaid rate of $1 was associated with a decrease in the pressure ulcer incidence rate of 0.0171 percentage points. However, an elasticity (ε) provides a *relative* measure of the association between the Medicaid payment rate and quality. At the mean levels of the Medicaid rate ($\overline{MR}$) and quality ($\overline{Q}$) measures, we can use the coefficient estimate ($\partial Q/\partial MR$) to obtain the association between a percentage change in the Medicaid rate on the percentage change in quality [$\varepsilon = (\partial Q/\partial MR)(\overline{MR}/\bar{Q})$]. Thus, the Medicaid rate elasticity of quality implied by the estimate from the model was -0.15. Put alternatively, a 10 percent increase in the Medicaid rate was associated with a 1.5 percent decrease in the risk-adjusted pressure ulcer rate. Thus, this finding supports the first hypothesis that an increase in Medicaid payment will be associated with higher nursing home quality in markets with free entry.

The second column of Table 2 provides a test of the second hypothesis that an increase in Medicaid payment will be associated with lower quality in the presence of CON and moratoria. When the model is isolated to the most restrictive markets, the positive relationship between Medicaid payment and quality largely falls away. However, the coefficient is still negative (implying a positive association between Medicaid payment and quality), but the magnitude of the coefficient (-0.000031) is approximately one-fifth as large as the coefficient from the national model (-0.000171). Additionally, the result is no longer statistically significant. A Chow test from a pooled model indicated that the Medicaid payment coefficient is statistically different across the overall and most restrictive models. Thus, although these results do not directly support the negative finding advanced in the second hypothesis, we do find an attenuated association between Medicaid payment and nursing home quality in the most restrictive markets providing some evidence of a deleterious effect of CON and moratoria on nursing home quality.

We next isolated the model to those high-Medicaid homes to examine the role of Medicaid payment in a resource-poor environment. Across all nursing home markets (see column 3, Table 2), an increase in Medicaid payment had a statistically significant positive association with nursing home quality. The elasticity implied by the estimate from the model was -0.20. Put alternatively, a 10 percent increase in the Medicaid rate was associated with a 2.0 percent decrease in the risk-adjusted pressure ulcer rate within those

Table 2: Weighted Least Squares Regression Results: Determinants of Risk-adjusted Pressure Ulcers (Huber-White Standard Errors in Parentheses)

	All Homes		*High-Medicaid Homes*	
Independent Variables	*All Markets*	*Most Restrictive Markets*	*All Markets*	*Most Restrictive Markets*
Medicaid rate	−0.000171‡	−0.000031	−0.00024†	−0.00016
	(0.000040)	(0.000064)	(0.00012)	(0.00018)
Retrospective payment	−0.0428‡	−0.0547‡	−0.046‡	—[a]
	(0.0045)	(0.0096)	(0.015)	
Flat rate system	0.0106‡	0.0140‡	−0.0038	0.002
	(0.0025)	(0.0050)	(0.0069)	(0.014)
Combination system	0.0060†	0.0170‡	−0.0035	−0.0004
	(0.0029)	(0.0048)	(0.0084)	(0.0120)
Allows upward adjustment	−0.0086‡	−0.0073‡	−0.0070	−0.0109
	(0.0015)	(0.0026)	(0.0042)	(0.0070)
Case-mix adjustment	0.0073‡	0.0123‡	0.0020	0.0067
	(0.0018)	(0.0032)	(0.0051)	(0.0084)
Licensing and certification spending per bed ($100s)	−0.00511‡	−0.0036†	−0.0045†	−0.0014
	(0.00076)	(0.0016)	(0.0022)	(0.0041)
Wage index	0.00241‡	0.0038‡	0.0010	0.0028
	(0.00070)	(0.0010)	(0.0018)	(0.0025)
Herfindahl index	−0.015‡	−0.0098	−0.0230‡	−0.024†
	(0.0035)	(0.0056)	(0.0085)	(0.012)
Median per capita income ($1,000s)	0.00030‡	0.00031	0.00037	0.00009
	(0.00013)	(0.00017)	(0.00029)	(0.00035)
Elderly (1,000s) per square mile	−0.0011	−0.0040†	−0.0041	−0.0035
	(0.0013)	(0.0015)	(0.0026)	(0.0032)
Not-for-profit	−0.0138‡	−0.0054	−0.0118†	−0.0145
	(0.0016)	(0.0031)	(0.0051)	(0.0087)
Government owned	−0.0228‡	−0.0107†	−0.0351‡	−0.0206†
	(0.0031)	(0.0046)	(0.0071)	(0.0095)
Chain owned	−0.0030	0.0037	−0.0053	−0.0048
	(0.0015)	(0.0028)	(0.0042)	(0.0075)
Hospital-based	0.0181‡	0.0108†	0.0010	0.0096
	(0.0036)	(0.0045)	(0.0088)	(0.0100)
Beds (100s)	0.0024‡	−0.0001	0.0034	0.0009
	(0.00091)	(0.0013)	(0.0019)	(0.0026)
Constant	0.1123‡	0.071‡	0.143‡	0.112‡
	(0.0060)	(0.011)	(0.016)	(0.028)
N	13,736	3,690	1,830	572
R-Squared	0.03	0.03	0.05	0.04
Dependent Variable Mean	0.11	0.11	0.11	0.10

[a]The retrospective method was dropped from this specification of the model due to an insufficient number of cases within this category.

†Statistically significant with $p<0.05$.

‡Statistically significant with $p<0.01$.

homes with a high proportion of Medicaid residents. This elasticity is larger than the result reported above for all nursing homes nationwide implying that the level of Medicaid payment is particularly important within facilities that care for a disproportionately high number of Medicaid residents. Thus, this result provides support for our third hypothesis that Medicaid payment would be associated with higher quality within high-Medicaid homes.

When we limited the analysis to high-Medicaid homes in the most restrictive markets (see column 4, Table 2), we once again observed an attenuation of the association between Medicaid payment and nursing home quality. The magnitude of the coefficient (-0.00016) is approximately two-thirds as large as the coefficient (-0.00024) from the high-Medicaid homes model. The result is not statistically significant (at the 5 percent level), although there may be insufficient precision ($N = 572$) to detect an effect. A Chow test did not indicate a statistically significant difference across the Medicaid payment coefficients from the two models. Nevertheless, these results do support the final hypothesis that a change in Medicaid payment would not be associated with nursing home quality in high-Medicaid homes under a bed constraint.

In terms of other measures included within the model, the coefficient on total state agency spending on regulation per nursing home bed implies that a 10 percent increase in regulatory spending was associated with a 1 percent decrease in the incidence of pressure ulcers within the overall model. This result is attenuated in the other specifications, but the overall finding does provide some support for the idea that greater state regulation of nursing home services is associated with better quality, ceteris paribus. As a final point, it is important to note the low r-squared estimates across the different model specifications. Clearly, the observable determinants of nursing home quality included within the model only explain a small proportion of the overall variance and the issue of omitted variable bias may be of some concern within this study.

In sum, we found general support for our four hypotheses. Higher Medicaid payment was shown to be associated with better nursing home quality across all nursing home markets. This result was modified in the most restrictive nursing home markets, which provided some evidence that CON and moratoria may have a negative effect toward the provision of nursing home quality. However, we must note that—unlike some previous analyses—we were not able to show a negative relationship between Medicaid payment and nursing home quality in the most restrictive markets. The positive relationship between Medicaid payment and quality was particularly strong in

those homes that care for predominantly Medicaid residents. However, this result is once again modified in the most restrictive markets.

DISCUSSION

This paper offered an alternative approach to examining Medicaid reimbursement and nursing home quality in the presence of CON and moratorium policies. Rather than relying on facility-level risk adjustment strategies, which may mask or distort the empirical relationship between Medicaid payment and quality, this study employed a resident-level risk-adjusted quality measure. By merging this resident-level measure with facility, market, and payment information, this study provides new evidence of the relationship between Medicaid payment and nursing home quality. Although further research with other resident-level risk-adjusted measures of quality will be necessary, this study provides strong support for the argument that decreased state-level payment due to state budget shortfalls will be associated with lower nursing home quality. Our estimates presented above suggest that a 10 percent decrease in the Medicaid payment rate for nursing home care will be associated with a 1.5 percent overall increase in the risk-adjusted pressure ulcer rate and a 2.0 percent increase in homes that care for predominantly Medicaid residents.

We can use these results to think concretely about the implications of a reduction in the state Medicaid payment rates on the number of pressure ulcer cases among Medicaid recipients. Based on our sample of 13,736 nursing homes, the average Medicaid payment rate was $94.34 (in 1998 dollars) and there were 347,212 Medicaid recipients who were at a high risk for a pressure ulcer. Thus, over the course of the year, state Medicaid programs spent an average of $11.96 billion (i.e., $94.34 × 347, 212 × 365) dollars on nursing home care for these residents. A 10 percent reduction in the Medicaid payment rate for nursing home care would have saved approximately $1.196 billion dollars toward the care of these residents. Over the 90-day window, we observed 57,299 new pressure ulcer cases among the 521,498 nursing home residents. If we assume pressure ulcers are equally distributed across Medicaid and private-pay residents within facilities, then there were 38,150 new Medicaid pressure ulcer cases among the 347,212 Medicaid recipients in the denominator of our study. In order to adjust the 90-day pressure ulcer incidence rate to an annual incidence rate, we can multiply the 90-day amount times four for a total of 152,600.

Thus, if every state reduced their Medicaid payment rate by 10 percent, our elasticity estimate of -0.145 would imply an additional 2,213 pressure ulcer cases annually among high-risk Medicaid recipients. Put alternatively, for every $540,332 (or $621,216 in 2004 dollars) cut from state Medicaid budgets, there will be one additional pressure ulcer among those Medicaid recipients who are at a higher risk for pressure ulcers. Although this is a relatively large estimate, it is important to keep in mind that pressure ulcers are only one dimension of nursing home quality. With a reduction in the Medicaid payment rate, we may also expect greater physical restraints, daily pain, anti-psychotic drug use, catheters, feeding tubes, weight loss, hospitalizations, and other indicators of poor quality. And of course, a lower Medicaid payment rate will be associated with a decrease in access to care for Medicaid eligible individuals. All of the quality and access problems suggest potentially significant downstream costs to the Medicare program in terms of increased acute care utilization, costs that may far exceed "savings" realized from reduced Medicaid rates. The interdependence of Medicare and Medicaid thus emerges as an important issue for state and federal policymakers to consider.

At the state level, policymakers are left with the question of whether the quality of care results implied by this study are large enough for state Medicaid programs to forestall decreases to the Medicaid payment rate. In the current budget climate, tradeoffs are inevitable and it is beyond the scope of this paper to examine the implications of cuts to the nursing home payment rate relative to other aspects of the Medicaid program. Clearly, there is also the potential for negative Medicaid outcomes if nonnursing home Medicaid spending is lowered. Although this paper cannot weigh the relative costs associated with decreased Medicaid spending across various services, the findings from this current study are especially important given previous empirical work that implied that a decrease in the Medicaid payment rate would actually improve quality in the context of CON and moratoria (e.g., Nyman 1985; Gertler 1989). Based on this current study, the excess demand model of the nursing home market would appear to be less applicable for much of the United States. Several economic, demographic, and political factors have altered the nursing home market over the past two decades, but the most important development has likely been the market-based growth of potential substitutes to nursing home care such as assisted living and home health care. These substitutes have competed away individuals who otherwise would have required nursing home care. As a result, there has been a spillover to the nursing home market whereby facilities must now compete for Medicaid-eligible individuals on the basis of quality.

Somewhat ironically, the results from the empirical analyses imply that a decrease in the Medicaid payment rate in a market with a binding bed constraint would not be associated with a decline in quality. In the context of the current state budget shortfalls, this result may appear to be a silver lining. However, the reason that a decrease in the Medicaid payment rate is not associated with lower quality in these markets is that homes have limited incentives to compete for the Medicaid segment of the market on the basis of quality. Obviously, this type of incentive structure does not serve the best long-term interests of Medicaid recipients within these markets. This study provides strong evidence that a repeal of CON and moratorium policies would encourage greater quality competition for the care of Medicaid residents in the most restrictive markets.

Our study was limited in several ways. Although pressure ulcers are an important indicator of nursing home quality, this measure cannot fully encompass the multidimensional construct of nursing home quality of care. Moreover, this measure focuses on the technical aspects of care, but does not capture the quality of life within the facility, an important dimension of nursing home quality. Because the analyses contained within this paper are cross-sectional, we cannot unambiguously rule out bias introduced by a third unobserved factor correlated with both Medicaid rates and nursing home quality. Given the issue of endogeneity discussed in the methods section, the private-pay price may be one such omitted factor. However, recent evidence from facility-level data from the early 1990s showed that the relationship between Medicaid payment and quality did not qualitatively change when the state-level private-pay price was introduced into the model (Grabowski 2004).

The recent state budget shortfalls will almost certainly provide state policymakers with the impetus to revisit spending across various Medicaid programs. States may look toward nursing home care, which comprises a significant portion of state Medicaid expenditures, as a potential area to cut spending. For example, the Georgia Department of Community Health has reduced payment for nursing home care by $27.7 million dollars effective February 1, 2003. This paper has presented evidence that decreasing Medicaid spending and limiting bed slots will have deleterious implications for nursing home quality, especially in those homes that care for predominantly Medicaid recipients. Policymakers will need to use this type of information in determining how best to serve its Medicaid population in this era of diminished resources.

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