PROFIT STATUS AND THE RELATIONSHIP BETWEEN
MEDICAID REIMBURSEMENT AND QUALITY IN OHIO NURSING HOMES

by

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Abstract

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Nursing homes play a vital role in meeting Americans’ long-term health care needs. Nearly two-thirds of the facilities are organized for-profit. This study evaluates the relationship between Medicaid reimbursement and quality and whether the relationship differs based on profit status.

Using calendar year 2000 Medicaid cost report data (n = 536), quality was measured using case-mix adjusted nurse staffing ratios (NSRs), i.e., the ratio of the amount of nursing time provided divided by the amount of nursing time needed based on residents’ classification into one of 44 Resource Utilization Groups (RUGs). The differences between NFPs and FPs sectors on all nursing, RN, LPN, and nurse aide nurse staffing ratios were statistically significant with NFPs providing 26, 4, 4, and 18 more minutes, respectively, for residents with average nursing care requirements.

Profit status was found to have a negative relationship with quality when controlling for revenues. In stratified linear regression analysis using OLS, nurse aide, LPN, and RN NSRs were regressed on three Ohio Medicaid per diem rate components controlling for other financial resources. The rate per case mix unit, the rate
compensating facilities for nurse staffing, had a positive relationship with both sectors with no statistically significant differences based on strength. An incentive payment, paid to facilities as a reward for spending less for indirect care expenditures, had a negative relationship with quality for both sectors. A second incentive payment, paid to facilities as a reward for reducing capital spending, had no relationship with quality for either sector. The only relationship to result in a clinical significance between NFPs and FPs was the relationship between the indirect care incentive payment and case-mix adjusted RN nurse staffing with NFPs having a stronger negative relationship with this payment than FPs. The variation in direction between Medicaid reimbursement and quality highlights the importance of considering rate components rather than the average total rate. The fact that profit status did not moderate the relationship may reassure those who think that profit status affects quality.
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List of Abbreviations

CMS – Centers for Medicare and Medicaid Services
FP – Medicaid certified nursing facility organized for-profit
LPN – Licensed practical nurse
NA – Nurse aide
NFP – Medicaid certified nursing facility organized not-for-profit
NSR – Nurse staffing ratio
OAC – Ohio Administrative Code
ODJFS – Ohio Department of Job and Family Services
RN – Registered nurse
RUGs-III – Resource Utilization Groups, Version III


Executive Summary

This study examines the role of profit status in the relationship between Medicaid reimbursement and quality for 536 Ohio nursing homes during calendar year 2000. Previous research examining the reimbursement and quality association has provided mixed evidence and only one considered profit status as a potential moderator (Gertler, 1989). In that study, the findings revealed that firms organized not-for-profit (NFPs) reduced quality less than those organized for-profit (FPs). This was one of the early studies that found a negative relationship between Medicaid reimbursement and quality. More recent studies, using national level data, have found a positive relationship between Medicaid reimbursement and various measures of quality.

For-profit facilities dominate Ohio’s nursing home industry at a rate greater than the national average (75% in Ohio vs. 65% for the U.S. as a whole). Falling demand, Medicare’s adoption of prospective payment in place of cost-based reimbursement have resulted in declining revenues forcing providers to do with less. In order to remain in business, firms must meet their operating expenses. FPs have the added responsibility of paying their owners a return on his or her investment. This study proposes that the sectors will use Medicaid dollars differently in providing quality.

Using linear regression and ordinary least squares estimation, profit status was found to have a negative relationship with quality after controlling for financial resources. In a stratified analysis, nurse aide, LPN, and RN NSRs were each regressed on three Ohio Medicaid per diem rate components controlling for other financial resources. In seven of nine instances (three rates and three quality measures), the
associations between Medicaid reimbursement and quality did not vary depending on profit status. In the two exceptions, NFPs spent less of their Medicaid dollars on RN NSR compared to FPs. Private pay occupancy and Medicare occupancy also played significant roles in explaining variation in NSRs though the models explained only 7-18% of variation in the quality measures. This is comparable to the only other previously published study using case-mix adjusted nurse staffing ratios as the dependent variable. Cohen and Spector’s national study using National Medical Expenditure Survey data (Institutional Population Component) explained 6-25% of the variance in their dependent variables (Cohen et al., 1996).

In spite of the non-significant findings favoring moderation, the differences between the two sectors are disconcerting. A resident of average acuity receives 26 minutes less of total nursing time daily in a FP facility compared to a NFP facility. The difference in nurse aide time alone is 18 minutes per resident per day and 4 minutes each for RN and LPN time. And if this weren’t enough to cause family members concern about inadequate nurse staffing, research suggests that both sectors lack the necessary staffing to adequately meet the nursing care needs of the residents (Schnelle et al., 2001; Kramer et al., 2001; Schnelle et al., 2004).

The significant staffing differences between the two sectors should not be overlooked by policy-makers. Insofar as how current dollars are being used, there is no difference based on profit status. This is not to say that NFPs and FPs don’t receive different amounts of dollars – NFPs spend more and receive higher rates of reimbursement. FPs spend less and receive lower rates of reimbursement. But FPs also receive incentive payments for spending nothing at all, i.e., less than what NFPs spend on
indirect care (e.g., housekeeping, dietary, laundry, and administration) and capital.

In light of the small amount of variance explained by the model and the importance of case-mix adjusted nurse staffing adequate to meet residents’ needs, more research is needed to better understand the determinants of case-mix adjusted staffing. Medicaid payments that have a negative relationship with quality, like Ohio’s indirect care incentive payments, should be explored further by states that still reward facilities for spending less than their peers through the use of incentive payments.
1. Introduction

1.1 Research Problem

The nation’s nursing home sector plays a vital role in meeting the long-term care needs of millions of Americans. In 2004, 3 million Americans received care for a chronic and/or temporarily disabling condition in one of 16,500 nursing homes (Centers for Medicare and Medicaid Services, 2005b). Nursing homes provide post-acute care and custodial care for those too impaired, either physically and/or cognitively, ill to remain at home. Nearly two-thirds of the nation’s nursing homes are organized for-profit (Centers for Medicare and Medicaid Services, 2005b). After years of declining occupancy rates, slowdowns in out-of-pocket and Medicaid expenditures, and changes in Medicare pricing implemented in 1998, nursing home industry margins reached unprecedented lows in 1999 (van der Walde et al., 2003). As a result, five of the nine largest publicly traded nursing home corporations filed bankruptcy. The squeeze continues as states face increasing fiscal pressure to deal with Medicaid spending and low rates of economic growth (Holahan et al., 2003; Smith et al., 2003)

But poor quality of care continues to be a problem in the nation’s nursing homes. The Institute of Medicine, General Accounting Office, and Centers for Medicare and Medicaid Services have published numerous reports citing ongoing problems with staffing standards, care delivery, and survey and enforcement efforts to assure quality (U.S. General Accounting Office, 2003; Centers for Medicare and Medicaid Services, 2001; U.S. General Accounting Office, 2002; Institute of Medicine, 1986; U.S. General Accounting Office, 1998; U.S. General Accounting Office, 1999; Institute of Medicine,
Nursing homes rely on three primary sources of revenue to finance their operations: reimbursement from Medicaid, Medicare, and out-of-pocket spending. Medicaid represents 44% of the industry’s revenues. Those receiving Medicaid subsidies must contribute nearly all of their monthly income toward the cost of care at the rate set by state Medicaid programs. This means that state lawmakers regulate the price paid for 68% of the industry’s output, i.e., inpatient days though this ranges from 50-84% from state to state (Harrington et al., 2000a). For-profit (FP) nursing homes must earn owners a return on their investment in order to remain in business. Tax laws prohibit corporations organized not-for-profit (NFP) from spending any excess of revenues after expenses for any purpose other than financing ongoing operations. It is proposed that in these times of financial stress, FP operators will spend less of their available financial resources on quality compared to NFP operators.

The existing literature on the relationship between financial resources and quality includes only a handful of studies. They have used a variety of methods, datasets, quality measures, and models. All have focused on the relationship between Medicaid reimbursement and quality controlling for other financial resources using payer mix data, e.g., percentage of residents eligible for Medicare or paying privately. In operationalizing the Medicaid rate variable, national studies have used state-level averages that include reimbursement for capital and indirect expenditures, biasing coefficients on the Medicaid regressor toward zero. These rates also usually include adjustments for case-mix, confounding the relationship between the rate and input-based measures. Researchers using state-level data have also operationalized Medicaid rates
using the facility’s total rate or the amount of Medicaid payment in excess of costs. None of these studies have considered the relationship between specific rate components and quality. Finally, in all but one of these studies, profit status was examined as a covariate.

This study relies on state-level data, specific components of the Medicaid rate including one thought to affect quality and two others that may affect quality depending on profit status, and controls for the facility’s other financial resources. The study also adjusts for case mix using a validated approach that explains an estimated 55% of the variation in resource utilization (Fries et al., 1994). It also tests the role of profit status as a moderator of the relationship between Medicaid reimbursement and quality.

1.2 Research Aims

This study’s research question is, “Does the relationship between Ohio Medicaid reimbursement and quality differ depending on a facility’s profit status?” The study’s objective is not prediction but the development of valid estimates of the Medicaid reimbursement regression coefficients in models where quality is the dependent variable and testing whether profit status moderates the reimbursement and quality relationship.

The research question is significant for a number of reasons. First, understanding the relationship between Medicaid reimbursement and quality makes good policy sense. Sixty percent of the nation’s $115 billion spent in 2004 on nursing home care were public dollars. It is the first study to examine the role of profit status in the relationship between facility-level Medicaid reimbursement rates and quality since Paul Gertler’s work in New York during 1980, a period of industry expansion and excess demand (Gertler, 1989). Finally, in 2004, the nation’s nursing homes cared for 3 million Americans. On any
given day, most of the nation’s nursing homes care for frail older adults, at least three-fourths of whom suffer from some form of cognitive impairment. Since Medicare’s switch from a cost-based reimbursement to a prospective approach, the industry has been in financial crisis. Because the industry is dominated by for-profit providers, profit-seeking could be secondary to meeting residents’ needs warranting at least awareness and possible redress.

The study’s aims are:

1. Determine whether profit status is a significant factor in explaining variation in quality.

2. Determine the relationship between Ohio Medicaid reimbursement and quality for not-for-profits and for-profits.

3. Determine whether the relationship between Ohio Medicaid reimbursement and quality is different depending on a facility’s profit status.

1.3 Organization

Chapter 2 reviews the literature on reimbursement and quality, profit status and quality, spending and quality, and profit status and spending. While spending and reimbursement are not the same, they are closely linked for obvious reasons. Following the literature review, a conceptual framework for the hypotheses and analyses is presented along with a description of Ohio Medicaid’s nursing home reimbursement system. Chapter 3 includes the research design, hypotheses, analytic approach, sampling methodology, and data sources. Chapter 4 presents the analyses while Chapter 5 reflects on the study’s limitations and implications for policy and future research.
2. Background

2.1 Declining Revenues and Rising Costs

Public dollars paid 61% of the nation’s nursing home bill in 2003 (Centers for Medicare and Medicaid Services, 2005a). Nursing homes first became eligible for large-scale government support following passage of Titles 18 (aka Medicare) and 19 (aka Medicaid) to the Social Security Act in 1965. Then and now, Medicare revenues come from payroll taxes. Medicare covers short-term rehabilitative care in skilled nursing facilities. Medicaid revenues come from federal and state general revenues. Program coverage varies across the states but all 50 states cover long-term care in nursing homes.

The industry expanded rapidly during the first 20 years of Medicare and Medicaid. Between 1967 and 1983, the nation’s spending on nursing home care increased at an annual rate of 16.1%. While some of this growth was attributable to increased utilization, between 1973 and 1983, increases in costs per day were two-thirds of nursing home expenditure growth (Holahan et al., 1987). Beginning in the early 1980’s, state Medicaid programs dropped cost-based reimbursement in favor of prospectively-based systems and began to develop systems of care delivering health care to persons living at home on a long-term basis. Between 1984 and 1994, the rate of growth in U.S. nursing home spending slowed to an annual rate of 9.4%. About this time, the assisted living industry emerged to compete for the nursing home industry’s profitable private pay market. Increased administrative costs associated with resident assessment and care planning required by the provisions of the Nursing Home Reform Act of 1987 began to cut into the industry’s margins (Zhang et al., 2004). Between 1995
and 1998, Americans’ spending on nursing home care increased at an annual rate of 6.3%. The Balanced Budget Act of 1997 repealed the Boren Amendment which provided that state Medicaid rates for nursing homes had to be “reasonable and adequate to meet the costs which must be incurred by efficiently and economically operated facilities.” On October 1, 1998, Medicare implemented prospective payment for nursing home care. In 1999, Medicare spending on nursing home care dropped 16.2% from 1998. Congress restored some of the cuts effective April 1 and October 1, 2000 but in 2000, Medicare spending was 92% of 1998 spending levels unadjusted for inflation. In the four years between 1999 and 2003, U.S. spending on nursing home care has been only 5.1% per year. Declining Medicare payments, rising fixed costs due to declining occupancy, and increased liability costs are straining the industry’s capacity to generate the profit margins seen during the 1980’s and early 1990’s (van der Walde et al., 2003). Fiscal pressures on states since 2000 and the repeal of the Boren Amendment have also contributed to concerns about the industry’s ability to rely on future increases in Medicaid funding, not just among researchers but on Wall Street as well.

Sixty-five percent of the nation’s nursing homes are organized for-profit. Twenty-eight percent of the facilities are organized not-for-profit and 7% are sponsored by government. In 42 states, at least half of the facilities are proprietary (Centers for Medicare and Medicaid Services, 2005b). Faced with declining revenues, options for the FP and NFP sectors include cutting costs and/or increasing revenues from other lines of

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2 A June 16, 2004 web exclusive on the Health Affairs website cites no changes in Medicaid payment rates between 1999 and 2002. They point out that these findings can be interpreted with some optimism. However, they did not control for changes in the facilities’ costs. High numbers of empty beds, rising acuity levels are eating away at Medicaid rate increases. Recent Trends in State Nursing Home Payment
business. For-profit operators have the added option of increasing cash flow by reducing their tax liability. Not-for-profit operators have the added option of trying to increase charitable contributions or borrowing from invested funds.

Unlike hospital care, nursing home care is mostly non-technical in nature. Yet defining what “quality” means in terms of the care delivered there has taken years of research study. Nursing homes vary in the quality of the care they deliver, whether measured in terms of structure, process, or outcomes of care. Most persons selecting a nursing home are making the decision for someone too impaired or acutely ill to make the decision. Oftentimes, there is a need for a quick decision. Under ideal free market conditions,

- the marketplace ensures consumer access to information necessary to evaluate the product before making a decision;
- consumers and providers negotiate contract terms and, if unsatisfactory, consumers are free to go elsewhere.

But the nursing home marketplace is not typical. Until October 2002, consumers did not have ease of access to standardized and audited information about nursing homes. Nursing home consumers, once admitted, are less likely to relocate if dissatisfied. Hansmann suggested that for-profit nursing homes might be likely to exploit these advantages (Hansmann, 1980). Studies by (Grabowski et al., 2003) and (Chou, 2002) confirm Hansmann’s “contract-failure” theory. This study seeks to examine whether this exploitation applies to payers as well. In other words, do FP and NFP demonstrate the

*Policies* by Grabowski, David C.; Feng, Zhanlian; Intrator, Orna; Mor, Vincent.
same relationship between quality and reimbursement even though reimbursement is not contingent of quality performance? For each percentage change in reimbursement, does quality change the same in FP as well as in NFP facilities?

2.2 Spending and Profit Status

There is a direct relationship between nursing home spending and reimbursement mechanisms (Cohen et al., 1990; Holahan, 1985; Holahan et al., 1987). Accordingly, differences in spending and profit status parallel differences in Medicaid rates and profit status. In theory, under the early flat-rate systems, lower spending meant higher profits. Under the retrospective cost-based systems, the lag time between the interim rate and final settlement by state Medicaid programs discouraged FP homes from spending more than NFPs who could more easily absorb the cash flow deficit. Many of the retrospective systems also shared the difference between the interim rate and actual costs with providers in an effort to curb spending growth (Holahan, 1985). Because flat-rate and prospective systems discourage cost growth better than retrospective systems, California has a flat-rate approach while the remaining 49 states reported using some kind of prospective approach to setting nursing homes rates in 2004 (Kaiser Family Foundation, 2005). In a prospective payment system (PPS), rates are based on the lower of the facility’s actual costs or some ceiling. Differences in spending based on profit status are expected since increased spending in the base year is non-recoverable by the provider under prospective systems.

Research has consistently shown that when a statistically significant difference is detected, FP homes spend less than NFP homes regardless of the type of reimbursement.
system. Early studies showing a positive association between NFP status and spending include (Lee et al., 1983; Bishop, 1980; Meiners, 1982) and (Tuckman et al., 1988). In examining the differences in spending before and after Maine’s shift from a cost-based system to a prospective system, Coburn et al found FP facilities lowered costs significantly more than NFPs (Coburn et al., 1993). Arling et al found that facilities responded to Virginia Medicaid rate ceilings differently depending on their profit status (Arling et al., 1987). Davis et al found FP status to have a negative association with costs, costs per day divided by facility average case mix, and a positive association with Medicaid margin (Davis et al., 1998). These relationships were attenuated following Kentucky’s adoption of a case-mix based component to their prospective payment system but remained significant.

2.3 **Spending and Quality**

Because of the direct relationship between spending and reimbursement and our interest in the relationship between reimbursement and quality, the literature on the relationship between spending and quality is also reviewed.

The relationship between spending and nursing home quality has been examined by several researchers. Analytic methods in these studies have been linear regression and group comparisons of facilities providing high and low levels of quality. Surprisingly, the evidence is mixed. Unless otherwise specified, the studies relied on linear regression.

Linn and colleagues found a positive relationship between higher monthly nursing home cost and functional improvement 6 months after admission (Linn et al., 1977). Spector and Takada found no relationship between routine operating costs in 80 Rhode
Island nursing homes and risk-adjusted quality measures of mortality, functional decline, and functional improvement (Spector et al., 1991). Munroe’s California study of nursing homes didn’t find a significant relationship between average operating costs and the number of health related deficiencies (Munroe, 1990). Anderson et al found statistically significant differences in spending per day among Texas nursing homes grouped according to mean differences in functional improvement from baseline. Those showing higher rates of case-mix adjusted improvement also had higher mean spending levels per day (Anderson et al., 1998). Rantz, using a similar comparison approach between the best and worst of Missouri nursing homes on 23 quality measures, found no statistically significant relationship with spending (Rantz et al., 2004). Finally, Mukamel and Spector, using risk-adjusted outcome rates (observed over expected rates) and weighted least squares regression, estimated a nursing home cost function that allowed for nonmonotonic relationships between costs and quality (Mukamel et al., 2000). Quality measures were risk-adjusted deterioration in functional status during the first six months following admission, deterioration of pressure ulcer stage during the same time period, and mortality within 6 months of the last nursing home live record, regardless of the place of death. Their analysis of New York data revealed an inverted-U shape relationship between costs (y-axis) and quality (x-axis).

2.4 Medicaid Reimbursement and Quality

Economists have been interested in the relationship between Medicaid reimbursement and quality. Economists’ early research focused on the relationship between Medicaid reimbursement and quality under market conditions of excess demand, i.e., the numbers of individuals requiring Medicaid subsidies were far greater in number
than beds available (Scanlon, 1980; Gertler, 1985; Nyman, 1985; Nyman, 1988b; Gertler, 1989; Nyman, 1989b). Their work and others by Nyman validated Scanlon’s “excess demand theory” (Scanlon, 1980; Nyman, 1989a; Nyman, 1988c; Nyman, 1989c). “Excess demand theory” posited that under conditions of excess demand for nursing home care, an increase in the Medicaid rate would lower the marginal cost of quality to facilities that preferred private pay applicants over those applicants receiving Medicaid subsidies. As the Medicaid rate increased, the gap between the return on dollars necessary to raise quality in order to attract those paying privately narrowed since no improvements in quality were necessary to fill beds in a state of excess demand by those applicants requiring Medicaid subsidies. Nyman found that excess demand moderated the relationship between Medicaid reimbursement and quality. Facilities located in markets characterized by high levels of excess demand were found to spend less than their peers located in markets characterized by low levels of excess demand (Nyman, 1988a).

In two published studies using national-level data from 1995-96, Grabowski found positive relationships between Medicaid reimbursements and various measures of quality and little support for moderation based on market tightness (Grabowski, 2001a; Grabowski, 2001b).

Only one of the studies considering the relationship between Medicaid reimbursement and quality examined the relationship of profit status as a potential moderator. In his study using 1980 data from New York state, Gertler found a negative relationship between Medicaid reimbursement and nursing home quality. Furthermore, for a 10% increase in the Medicaid rate, his model predicted a 3% decline in quality
(price-adjusted inputs) in FP homes and only a 2% decline in quality in NFP homes (Gertler, 1989). All other studies on the relationship between Medicaid reimbursement and quality treated profit status as a covariate. In these studies, not-for-profit status had a positive association with quality as measured by the reductions in the incidence of pressure sores (Grabowski, 2001b; Grabowski et al., 2004), in the use of physical restraints (Grabowski et al., 2004), and RN staffing (Grabowski, 2001b). Not-for-profit status had negative associations with quality as measured by the prevalence of pain (Grabowski et al., 2004) or no relationship with quality as measured by number of survey deficiencies (Nyman, 1988b; Nyman, 1989b).

2.5 Profit Status and Quality

The current period of financial strain characterizing the nursing home industry makes the role of profit status worth examination. In a recent summary of survey data examining consumers’ perceptions about the role of profit status in health care, nearly 60% felt that the profit motive in health care was “not a good thing” and viewed NFPs as more trustworthy, humane, and thought NFP hospitals would be less likely to discharge a sick patient for lack of insurance (Schlesinger et al., 2004).

Numerous studies have identified profit status as a significant factor in explaining variations in nursing home quality. When these studies use multiple measures of quality, they often find a significant relationship on one measure and insignificant relationships on others. This lack of correlation between different measures of quality reflects the multi-dimensional nature of quality but makes understanding the determinants of quality extremely difficult. Nevertheless, most of the research studies in which a significant
relationship has been found suggests that FP status is negatively associated with quality (Carter et al., 2003; Aaronson et al., 1994; Spector et al., 1998; Intrator et al., 1999; Harrington et al., 2000c; Brannon et al., 2002; Grabowski et al., 2004; Dobalian, 2004; Hillmer et al., 2005; Boockvar et al., 2005).

Most likely due to financial strain, operators from both sectors are exiting the industry (Centers for Medicare and Medicaid Services, 2005b). Failure to ensure the continued participation of NFPs may be detrimental to the nursing home industry overall, quality in local markets, and further erode the public’s trust in the this important sector charged with caring for those who are least able to fend for themselves (Hirth, 1999; Grabowski et al., 2003; Schlesinger et al., 2004).

2.6 Gaps in Current Knowledge

2.6.1 Medicaid Rate Components and Quality

With the exception of two studies (Nyman, 1985; Gertler, 1989), the other six studies on the relationship between Medicaid reimbursement and quality depicted the Medicaid rate as the total per diem. Instead of the total rate, Nyman (1985) used the difference between the facility’s Medicaid rate and the average operating costs while Gerter (1989) used a “cost-plus” rate set by New York authorities based on the owners’ equity, debt structure, facility size and value of assets. Investigators using national level data used statewide average rates rather than each facility’s actual rate (Cohen et al., 1996; Grabowski, 2001a; Grabowski, 2001b; Grabowski et al., 2004). Most states’ Medicaid nursing home per diem payments are sub-divided into multiple components, e.g., rates for patient-related expenses, non-patient related care, and capital (Swan et al.,
In Ohio, NFP nursing homes may receive up to eight rate components while FP homes may receive up to nine. Some states also pay a separate rate for ancillaries like therapies or medications in the total per diem while others require facilities or ancillary service providers to bill separately (Swan et al., 2001). Systematic interaction of facility-level characteristics with specific rate components and/or quality as well as differences across states in what is covered by the per diem confound parameter estimates on the relationship between Medicaid rates and quality based on national data. Reimbursement policy is usually designed specific to each rate component leading to possibly conflicting incentives across components and biasing coefficients in relationship to quality toward zero. Accordingly, state-level research and studies using Medicaid rate components provide better estimates of the relationship between Medicaid reimbursement and quality.

### 2.6.2 Prospective Rates and Quality

While all four of the early studies examining the relationship between Medicaid reimbursement and quality were based on state-level data (Wisconsin and New York), three of the four studies’ rates were based on retrospective rate-setting methodologies (Nyman, 1985; Nyman, 1988b; Gertler, 1989). Today, none of the nation’s 50 state Medicaid programs use retrospective reimbursement. As previously discussed, the reimbursement system has a direct effect on facility spending and rates such that the question merits reexamination. Also, most of the nation’s nursing home markets are no longer in a state of “excess demand,” another condition characterizing the four earlier state-level studies.
2.6.3 The Facility’s Own Capacity to Finance Care

Previous research on the relationship between Medicaid reimbursement and nursing home quality has sought to control for other revenue streams affecting quality. The two major approaches have been using payer mix variables (e.g., percent of inpatient days paid for at the Medicare rate) as covariates in a linear regression model or a two-stage approach in which the first stage consists of stratifying based on the facility’s preference to serve a mix of Medicaid and private pay residents, all Medicaid residents, or all private pay residents (Grabowski, 2001a; Grabowski, 2001b). The possibility that facilities, especially NFPs, would use their own equity has been ignored. Because NFPs must return any excess earnings to operations or make up any losses through reductions in operations or non-operating revenue streams, this omission may have biased previous estimates about the relationship between Medicaid and quality. FP facilities, in the face of declining occupancy rates, may seek to increase quality using their own equity. Because this study relies on Medicaid cost reports, information on the facility’s non-operating and net-operating revenues are available.

2.6.4 Profit Status as a Specification Variable

The industry is under tremendous financial stress right now. If profit status is entered in a model as a covariate when, in fact, it is a moderator, biased estimates result. Important inferences for policy-makers and consumers are also missed. Theory suggests examining the potential role of profit status as a moderator.

2.7 Conceptual Framework

The question to be addressed in this study is whether or not the relationship
between various Medicaid rate components and quality (using an input-measure to be discussed in Chapter 3) depends on profit status. The conceptual framework for this study makes certain assumptions about differences between FP and NFP nursing homes. These are:

1. FP nursing homes will provide a level of quality necessary to ensure compliance with federal and state requirements in order to protect the owners’ equity and to ensure a positive return on investment;

2. NFP nursing homes will provide a level of quality necessary to ensure compliance with federal and state requirements as well as fulfillment of the organization’s mission, including but not limited to preserving the organization’s capacity to deliver service in the future;

In other words, it is assumed that for FP operators, quality is a means to satisfy the owners’ requirements whereas for NFP operators, quality is a means to satisfy a civic, religious, or philanthropic mission as well as a health-related one.

Financial resources affect quality defined broadly. Following Nyman (1989b), financial resources are perceived as exogenous to the facility since the facility cannot affect financial resources in the present period. Profit status appears in the model as a moderator of the relationship between financial resources and quality. It is assumed that FP facilities set aside some of the financial resources for quality to pay owners a return on their investment, attenuating the relationship between financial resources and quality. It is assumed that NFP facilities use all of their financial resources for quality on quality.

The model also posits that federal and state requirements affect quality along with consumers’ demand for nursing home quality. Regulations and enforcement are thought to affect quality through minimum requirements as well as the threat of negative sanctions. Consumers’ demand for nursing home quality may play a small but potentially
increasing role in affecting nursing home quality. In recent studies using input-based quality measures, however, market measures like excess demand for care were insignificant (Cohen et al., 1996; Grabowski, 2001b) suggesting a change in the demand for nursing home care of whatever quality.

Figure 1 displays the framework to be used for the study. Ovals depicted in a faded font are not empirically included in the study models to be discussed in Chapter 3. Consumer demand is a difficult construct to measure. Private pay occupancy is one possible means but will serve as a measure for financial resources, i.e., a proxy for private pay revenues. Data on exogenous demand variables like the number of Ohio’s home-and-community based waiver slots by county or assisted living beds by county in 2000 were not available.
2.8  **Ohio Medicaid Reimbursement for Nursing Homes**

This section describes Ohio’s Medicaid nursing home reimbursement system in effect at the time of the study. In order to avoid confusion between the “old” system and “new system,” this section is written in the present tense and pertains only to the system in effect from July 1, 1993 through June 30, 2005.\(^3\).

2.8.1  **Prospective Rate-Setting Approach**

Medicaid rates for Ohio nursing home providers are determined prospectively. They are based on providers’ costs. Rates are updated at the start of each state fiscal year, July 1, based on the facilities’ costs reported on the cost report for the prior calendar year (e.g., state fiscal year (SFY) 2001 rates, payable starting July 1, 2000 are based on costs for calendar year 1999). Once the rates are established, no adjustments are made so if a facility spends more than its rate, it operates at a loss. If it spends less than its rate, it will make a profit. However, when it comes time to report its costs incurred during the period in which it made a “profit,” its rate could go down, depending in which cost center the “savings” occurred.

2.8.2  **Case-Mix Adjustment Methodology**

Since 1990, all federally Medicaid certified nursing facilities have been required to assess resident needs at least quarterly and to develop a care plan based on a common protocol and clinical practice guidelines. Many state Medicaid programs, including Ohio’s, require nursing homes to use a standardized assessment tool called the Minimum Data Set or MDS to “case-mix adjust” Medicaid rates for nursing care. Using data from

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\(^3\) In June, 2005, the Ohio legislature passed Amended Substitute House Bill 66 which created a new nursing
the MDS, a system known as Resource Utilization Groups, Version 3 or RUGs-III, classifies residents into one of 44 groups. Each of these groups corresponds to different amounts of registered nurse (RN), licensed practical nurse (LPN), and nurse aide (NA) time. RUG assignments are based on each resident’s ability to perform activities of daily living, cognitive status, special nursing care needs, behavior problems, and physician orders for rehabilitation documented on the MDS. The estimates of nursing time needed within each classification group are based on time-and-motion studies conducted by the Centers for Medicare and Medicaid Services in 1995 (from 98 Medicare-certified units in 7 states serving 1,896 residents) and 1997 (from 74 units caring for 2,037 residents spread over 5 states) (Feuerberg et al., 2000). Attempts were made to limit participating facilities to those providing high quality. Facilities with low staffing counts or major quality citations were excluded.

In Ohio, the reimbursement of nursing care relies on weights for each type of nursing resource (RN, LPN, NA) based on statewide median hourly wages. The resource weights are adjusted every three years. In the study year, the RN resource weight was 2.20, the LPN resource weight was 1.76 and the NA resource weight was 1.00. Each RUG-III group’s resource-specific minutes is multiplied times the resource weight to derive total weighted nursing minutes for the group. The weighted minutes for the 44th group, the group requiring the least amount of weighted nursing time, becomes the index case equal to 1.0000 case mix units. The case mix unit score for each of the remaining 43 groups is derived by dividing their weighted total nursing minutes by the weighted total nursing minutes of the index case. A facility’s average case mix score is based on the home reimbursement system under Medicaid effective July 1, 2005.
sum total of the facility’s residents’ case mix scores divided by the number of residents. For purposes of rate setting, Ohio Medicaid uses both an annual and a quarterly facility average case mix score.

The RUGS-III classification approach has been validated and explains 55% of the variance in total nursing and therapy per diem costs according to a study carried out in seven states involving 7,658 residents over a 1-week period (Fries et al., 1994). Ohio has relied on RUGs for adjusting rates for direct care (nursing, medical direction, psychology, social services, and activities) since 1990. In 1998, Medicare adopted the RUGs system for calculating reimbursement rates for Medicare covered skilled nursing facility stays.

### 2.8.3 Medicaid Allowable Expenditures

The Ohio Medicaid nursing home reimbursement system compensates nursing homes for allowable expenditures. Federal law prohibits federal match to be used for the reimbursement of certain expenses incurred by Medicaid-certified facilities. State Medicaid programs also disallow these expenses to avoid having to pay 100% of the provider’s reported cost. Non-allowed expenditures include bad debt, charitable contributions, political campaign contributions, income taxes, promotional advertising, and expenses offset by other payers. These are the same types of expenditures disallowed for Medicare-certified providers as well.

State Medicaid programs may establish more restrictive limits on allowable expenditures in their role administering the program. In Ohio, the legislature adopted
imputed occupancy requirements for the purpose of rate-setting as well as limits on compensation of administrators, owners, owners’ family members, payments to related organizations, out-of-facility meals, and reimbursement for purchased nursing personnel (temporary nursing agencies).

Reimbursable expenses are divided into four cost centers. The four cost centers and examples of reimbursable expenses within each category are listed in Figure 2.

**Figure 2  Ohio Medicaid Nursing Home Cost Centers**

<table>
<thead>
<tr>
<th>Other Protected (OP)</th>
<th>Direct Care (DC)</th>
<th>Indirect Care (IC)</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Utilities</td>
<td>Nursing</td>
<td>Dietary</td>
<td>Depreciation</td>
</tr>
<tr>
<td>Minor Med Equip</td>
<td>Medical Director</td>
<td>Housekeeping</td>
<td>Interest</td>
</tr>
<tr>
<td>Taxes and Govt Fees</td>
<td>Social Services</td>
<td>Laundry</td>
<td>Amortization</td>
</tr>
<tr>
<td>OP Share Home Ofc</td>
<td>Activities</td>
<td>Accounting</td>
<td>Rent/Leasing Expense</td>
</tr>
<tr>
<td>OP Consultants</td>
<td>Respiratory Therapy</td>
<td>Legal</td>
<td>Equip Leasing/Dep</td>
</tr>
<tr>
<td></td>
<td>Psychology</td>
<td>Personnel</td>
<td>Non-ext Renovations</td>
</tr>
<tr>
<td></td>
<td>DC Share Home Ofc</td>
<td>Administrative Staff</td>
<td>Captic Share Home Ofc</td>
</tr>
<tr>
<td></td>
<td>DC Consultants</td>
<td>Insurance Supplies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Payroll Expenses</td>
<td>Supplies</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Legal</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Plant Maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incontinence Supplies</td>
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<tr>
<td></td>
<td></td>
<td>Personal Care Supplies</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>IC Share Home Ofc</td>
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<tr>
<td></td>
<td></td>
<td>IC Consultants</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Payroll Expenses</td>
<td></td>
</tr>
</tbody>
</table>

2.8.4  Reporting Costs – The Medicaid Cost Report

Nursing homes are required to record their revenues and expenses using a chart of accounts set forth in the Ohio Administrative Code (OAC §5101:3-3-201). They have the option of maintaining accounts on a cash or accrual basis. Annually, upon change of ownership, closure, but least annually, nursing homes are also required to report their

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4 Ohio Medicaid does not use therapy minutes to reimburse for therapy but Medicare does.
costs electronically in a format specified by the Ohio Administrative Code by no later than March 31 of each year (OAC §5101:3-3-20). The cost report contains a separate schedule for each cost center as well as several attachments. The attachments are used to report information about the facility owners, changes throughout the cost reporting period in the facility’s licensed and certified bed count, inpatient days by payer source, changes in capital asset valuation, changes in owner equity, and information needed by the state Medicaid agency to discern allowable and disallowable expenditures. The cost report also requires providers to submit a balance sheet, changes to the revenue trial balance during the reporting period, and a wage and hours survey. These data are used by the Ohio Department of Jobs and Family Services (ODJFS), Ohio’s single state Medicaid agency, to set prospective rates. The rates are effective on July 1 of the year following the cost report year through June 30 of the next year. This is also known as the state’s fiscal year or SFY. For example, SFY01 represents the state’s fiscal year and nursing home rate year 2001 beginning July 1, 2000 and ending June 30, 2001. Rates would have been based on costs incurred during calendar year (CY aka base year) 1999.

Following submission to ODJFS, data are reviewed for internal consistency and possible errors. Following review, disallowances are determined followed by rate-setting. Rates are reported to the nursing homes by no later than the first day of the new rate year.

2.8.5 Rate Setting for Covered Expenses
Ohio Medicaid pays providers for covered expenses using prospectively determined rates based on costs reported by the nursing homes. Rates for covered
expenses can be divided up by the four cost centers and comprise 6 separate rates displayed in Error! Reference source not found.. This section will describe the method by which each of these rates is set.

**Figure 3** Ohio Medicaid Nursing Home Rates for Covered Expenses

<table>
<thead>
<tr>
<th>Protected</th>
<th>Direct Care</th>
<th>Indirect Care</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Protected Per Diem</td>
<td>• Rate per Case Mix Unit</td>
<td>• Indirect Care Per Diem</td>
<td>• Cost of Ownership Per Diem</td>
</tr>
<tr>
<td>• Franchise Permit Fee Per Diem</td>
<td></td>
<td></td>
<td>• Non-extensive Renovations Per Diem</td>
</tr>
</tbody>
</table>

### 2.8.5.1 **Protected Per Diem**

Rate-setting for protected costs other than franchise fee-related costs are based on the facility’s actual costs per inpatient day reported on the ODJFS cost report (OAC §5101:3-3-49). In other words, to set the protected per diem for the rate year starting July 1, the protected costs from the base year are divided by the number of inpatient days during the cost report year and then adjusted for inflation.

### 2.8.5.2 **Franchise Permit Fee Per Diem**

The franchise permit fee (FPF) per diem add-on is a mechanism used by many states to increase federal matching funds for Medicaid without a corresponding increase in the state’s match. Ohio’s providers pay a franchise fee that is deposited into a special fund set up by the state’s treasurer. The nursing home operator receives a portion of the fee back depending on the operator’s ratio of certified to licensed beds and ratio of Medicaid inpatient days to total inpatient days (OAC §5101:3-3-491). The state uses part of FPF revenues to finance the expansion of home-and-community based services and does not reimburse nursing homes this part of the fee.
2.8.5.3  **Rate per Case Mix Unit**

The rate per case mix unit (CMU) is based on the lesser of the facility’s actual costs per case mix unit or the facility’s peer group ceiling (OAC §5101:3-3-44). The former is based on the division of the facility’s total direct care costs in the cost reporting year divided by the number of inpatient days to derive a direct care cost per inpatient day. This amount is divided by the facility’s average case mix unit score during the cost reporting period to derive the facility’s costs per case mix unit per day during the base year.

The state is divided into four geographically distinct direct care peer groups based on the county in which each facility is located. Each facility is in one of four peer groups for purposes of setting the case mix unit ceiling. The median cost per case mix unit per day for all of the facilities in a peer group (weighted by each facility’s number of Medicaid inpatient days) multiplied times 1.2378, adjusted for inflation, becomes the peer group’s rate per case mix unit ceiling for the rate year. The facility’s direct care per diem during the rate year is updated quarterly (but not the rate per CMU). Each quarter, the facility’s direct care per diem will equal the facility’s rate per case mix unit multiplied times the facility’s (6-month lagged) quarterly average case mix score.

2.8.5.4  **Indirect Care Per Diem**

The indirect care per diem is set using an imputed occupancy requirement. Base year indirect costs are divided by the greater of the facility’s actual inpatient days or the facility’s imputed occupancy to derive indirect care costs per day for the base year. In the first half of the study year (SFY 2000), imputed occupancy for indirect care rate-setting equaled 0.85 multiplied times the number of bed days available in 1998. In the
second half of the study year (SFY 2001), imputed occupancy equaled 0.75 multiplied times the number of bed days available in 1999. Next, indirect care costs per day in the base year are adjusted for inflation. The facility is paid the lesser of inflated indirect care costs per day in the base year or the peer group ceiling (OAC §5101:3-3-50).

For indirect care rate-setting, the 4 geographic peer groups used to set rate per case mix unit ceilings are subdivided into two groups according to the number of beds in the facility for a total of 8 indirect care peer groups. Facilities with 99 or fewer beds comprise one subset while facilities with 100 or more beds comprise the second subset. Ceilings for each of these 8 peer groups are based on the median inflated indirect care cost per day (weighted for Medicaid inpatient days) multiplied times 1.125.

2.8.5.5 Cost of Ownership and Non-extensive Renovation Per Diems

The costs of ownership (CO) and non-extensive renovations (NER) costs per day comprise capital costs. However, rates are set for each item individually using nearly identical processes for each (OAC §5101:3-3-512 and 513). Both of these rates rely on an imputed occupancy requirement. Base year costs are divided by the greater of the facility’s actual inpatient days or the facility’s imputed occupancy to derive (1) cost of ownership and (2) non-extensive renovation costs per day. In the first half of the study year (SFY 2000), imputed occupancy for capital costs (both CO and NER) equaled 0.95 (the greater of actual inpatient days or 0.95 multiplied times the number of bed days available in 1998). In the second half of the study year (SFY 2001), imputed occupancy equaled 0.85. These two rates are not adjusted for inflation.

Facilities are paid the lower of the sum of 88.65% of the cost of ownership per
diem plus 85% of the cost of non-extensive renovations or 88.65% of the statewide capital limitation for the rate year. The statewide capital limitation applicable to all nursing homes replaced a facility-specific mechanism for compensating operators for capital costs in effect from 1979 to 1993. The statewide capital limitation started at a $16.00 per resident per day in SFY 1994 (the first year of the reimbursement system described here) and is adjusted annually for inflation. This starting point was negotiated with the industry (Manard, 1999).

2.8.6 Rate Setting for Incentive Payments

The Ohio Medicaid reimbursement system contains incentives for providers to slow the rates of increase in two areas of cost: indirect care and cost of ownership. This section describes the mechanisms for determining the amount of each of these incentives awarded to a facility during a rate period.

2.8.6.1 Indirect Care Incentive

As mentioned in the section describing the rate-setting process for reimbursement of indirect care-related expenses, the state calculates a ceiling for each indirect care peer group based on 112.5% of the median indirect care cost per day, adjusted for inflation and weighted for Medicaid inpatient days. In order to determine the maximum incentive payment for each peer group, ODJFS also calculates a statewide median indirect care cost per day with the same multiplier (112.5%) and adjustments. The difference between the peer group ceiling for indirect care-related reimbursement and the statewide ceiling becomes the maximum incentive payment for each peer group. The difference between the facility’s own inflated indirect care costs per diem and the peer group maximum incentive payment is the facility’s indirect care incentive payment per diem for the rate
year (OAC §5101:3-3-50).

2.8.6.2 Cost of Ownership Incentive

Under two systems of Medicaid nursing home reimbursement in effect from 1979 to 1993, the state set rates for capital based on the facility’s age and cost of construction, adjusted annually for inflation. Capital reimbursement rates paid in SFY 1993 provided the basis for calculating facility cost of ownership incentive ceilings for rates paid starting with SFY 1994. For example, a facility built between 1976 and 1978 for more than $5,150 per bed but less than $6,799 per bed had a cost of ownership incentive ceiling of $7.73 in SFY 2000. The facility’s cost of ownership incentive payment is the lesser of the difference between 88.65% of the facility’s base year (CY 1998) cost of ownership per day (see section above) and the facility’s ownership incentive ceiling or the statewide limit (OAC §5101:3-3-512). In SFY 2000, the statewide limit on cost of ownership incentive payments was $3.69 per day. These limits are also adjusted for inflation annually.

2.8.6.3 Return on Equity

The return on equity payment is available to proprietary facilities only and is based on the facility’s average equity per month during the base year divided by the greater of the facility’s actual inpatient days or 0.95 multiplied times bed days available (OAC §5101:3-3-514). In SFY 2000 and 2001, the return on equity payment could not exceed $1.00 per day.

2.9 Hypotheses

Aim 1, addressing the nature of the relationship between profit status and quality
has one hypothesis.

1.1  *For-profit status will be negatively associated with quality.*

Hypothesis 1.1 tests the relationship between profit status and quality controlling for financial resources related to quality. A negative relationship between for-profit status and quality was posited based on the findings of previous research (Carter et al., 2003; Aaronson et al., 1994; Aaronson et al., 1995; Porell et al., 1998; Intrator et al., 1999; Grabowski, 2001b).

Aim 2, focused on the relationship between Ohio Medicaid reimbursement and quality for NFP and FP facilities, has three hypotheses.

2.1  *The facility’s Medicaid rate per case mix unit will be positively associated with quality for both NFP and FP facilities.*

As will be described in Chapter 3, the quality measure is a measure of the extent to which the facility meets the residents’ needs for nursing care, a ratio of the facility’s average amount of nursing time provided to amount of nursing time needed. The Medicaid rate per CMU is the major Medicaid rate component financing nursing care. Presumably, both NFPs and FPs will have a positive relationship between this Medicaid rate and both components of the ratio -- the amount of nursing time provided and the amount of nursing time needed since the reimbursement system is prospective (based on prior year costs) and case-mix adjusted. Therefore, a positive association is hypothesized.
Ohio Medicaid’s reimbursement program paid facilities two types of incentive payments during calendar year 2000. Both incentive payments were paid over and above facility expenses. In other words, they were positive net revenue. Assuming that NFPs reinvest net revenues back into the operation and would emphasize nursing care over other expenditures, it is hypothesized that these incentive payments will have a positive relationship with quality for NFPs. Assuming that FPs would use these net revenues as profits rather than apply them to improving quality, it is hypothesized that at a minimum, these payments would have no relationship with quality for the FPs. However, if a facility reduces costs in indirect care spending in order to earn the incentive payment, it seems to follow that the facility would spend less than the allowable ceiling for the rate per case mix unit. Accordingly, it is hypothesized that FPs will have a negative relationship between the incentive payments and quality.

The third aim specifically proposes to examine moderation of the relationship between Medicaid reimbursement and quality based on profit status. It has one hypothesis.

3.1 Profit status will moderate the relationship between Medicaid reimbursement and quality.

- The relationship between rate per CMU and quality will be stronger for
This hypothesis posits statistically and clinically significant differences in Medicaid’s association with quality based on profit status. This hypothesis is based on the assumption that, even after controlling for variations in the facility’s other financial resources, profit status will significantly alter the relationship between Medicaid reimbursement and quality. Specifically, it is proposed that the relationship between the rate per CMU and quality will be stronger for NFPs than for FPs and that the relationship between incentive payments and quality will be of opposing signs based on profit status.

3. Study Approach

3.1 Study Design

The type of design selected for this study was a retrospective cohort. Because of the constantly changing financial picture at the facility and state-level as well as the interaction of these forces, a cohort design was chosen in order to minimize the effects of changes that might affect facilities differently. The year 2000 allowed a period of stability following Medicare’s adoption of prospective payment in October 1998.

3.2 Plan of Analysis

The plan of analysis for each hypothesis is discussed in this section. All data analyses were conducted using SAS Version 8 for the personal computer.
1.1 For-profit status is negatively associated with quality.

Analysis of this hypothesis will be based on linear regression and ordinary least squares estimation. Profit status and measures controlling for the facility’s financial resources will be regressed on quality. Quality will be the facility average amount of total (NA + LPN + RN) nursing time provided divided by amount of total nursing time needed. Profit status is reported by the facility on the calendar year cost report. Potential confounders are the facility’s financial resources and a variable intended to control for possible measurement error in the dependent variable.

If the estimated coefficient on profit status (1 = FP; 0 = NFP) is negative and statistically significant at alpha = 0.05 level, data will not support rejection of the hypothesis. If the estimated coefficient on profit status is positive or, regardless of the sign, if the association is not statistically significant at alpha = 0.05, the hypothesis will be rejected.

2.1 Medicaid rate per case mix unit will be positively associated with quality for both NFP and FP facilities.

2.2 Medicaid indirect care incentive payments will be positively associated with quality for NFP facilities and negatively associated with quality for FP facilities.

2.3 Medicaid cost of ownership incentive payments will be positively associated with quality for NFP facilities and negatively associated with quality for FP facilities.

Analysis of these hypotheses will be based on linear regression using ordinary least squares estimation and stratified analysis. Quality will be measured using three different case-mix adjusted nurse staffing ratios. The first measure will be nurse aide time provided to nurse aide time needed. The second measure will be licensed practical
nurse (LPN) time provided to LPN time needed. The third measure of quality will be registered nurse (RN) time provided to RN time needed. The models will be adjusted for other financial resources to pay for quality. An omnibus test using multivariate analysis of variance will be conducted to limit the possibility of Type I family-wise error.

3.1 Profit status will moderate the relationship between Medicaid reimbursement and quality. The relationship between rate per case mix unit and quality will be stronger for NFPs than for FPs and the relationship between incentive payments and quality will be positive for NFPs and negative for FPs.

Analysis of the statistical significance of strata differences will rely on calculating the 95% confidence intervals of the difference between the two sets of Medicaid rate coefficients. If the interval does not include zero (and is therefore statistically significant at the level of \( p < 0.05 \)) then the difference will be examined for clinical significance.

Clinically significant moderation implies a difference in the two strata’s rate coefficients large enough to affect a meaningful difference in nurse staffing ratios. “Meaningful” was operationalized by estimating the amount of nursing time needed to carry out one nursing activity on a resident with average nursing need, e.g., documenting a clinical observation, repositioning the resident, or engaging in some sort of range of motion exercise. For licensed nursing personnel, this was arbitrarily set to 3 minutes for a resident requiring average nursing time and 5 minutes for nurse aides.

While the rate coefficients will be estimated using rates weighted by the facility’s

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5 The difference in point estimates \( \pm (1.96 \times \text{the square root of the sum of the two coefficients’ standard errors squared}) \).

6 The means for nursing time needed across the pooled sample was 142.8 minutes per day for NAs, 39.5 minutes per day for LPNs, and 57.1 minutes per day for RNs.
Medicaid occupancy rate, moderation will be evaluated at various levels of Medicaid occupancy using the coefficients multiplied times unweighted rates while holding Medicaid occupancy constant for both strata, e.g., 50%, 65%, and 100%. Holding Medicaid occupancy and the unweighted rate constant for both strata, an absolute difference of at least 0.035 points in the NA NSR, 0.077 points in the LPN NSR, or 0.053 points in the RN NSR will represent a clinically significant difference. Otherwise, clinically significant differences will not be assumed.

3.3 Data Sources

Data for this study comes from three sources:

- Medicaid nursing home cost reports for calendar years 1998-2000
- Resource Utilization Group (RUGs) data for every nursing home resident submitted quarterly by Ohio nursing homes in 2000
- Medicaid rate data for rate years 2000-2002

Multiple years of data were required to generate and/or validate study variables. For example, calendar year (CY) 1998 cost report data were the basis for state fiscal or rate year (FY) 2000 data. CY 2000 spanned two separate fiscal years (2000 and 2001). To ensure that the cost report data were actually those data used to generate the FY 2000 and 2001 rates and that the cost reports were not subsequently amended, rates were simulated using the cost report data provided by the Ohio Department of Job and Family Services (ODJFS). If the simulated rates did not match the rates actually paid (also provided by ODJFS), the facility was eliminated from the sample. Rate data for FY 2002
were used to ensure the reliability of CY 2000 data.

Information necessary to convert the RUGs assignments to nursing time needed (the denominator of the quality measure) also came from ODJFS.

3.4 Sample Selection Criteria

In calendar year 2000, 957 nursing homes submitted 12-month cost reports to ODJFS. In order to avoid attributing variation in quality to facilities who had recently undergone a sale and were subject to a transitional (higher) Medicaid rate, to facilities who were anticipating a sale (perhaps due to providing lower quality care), and to ensure the data’s reliability, the sample included only stable facilities. Stable facilities were defined as those having at least a 6-month cost report for 1998, a 12-month cost report for 1999, a 12-month cost report in 2000, and in business under the same operator for the first 6 months of 2001. This reduced the sample size to 753 facilities.

Exclusion criteria included hospitals (4%) and government-sponsored non-hospital-based facilities (4%) because they generally have a different payer mix and scale compared to freestanding facilities (Sulvetta et al., 1986; Pizer et al., 2002).

Again, rates were simulated based on the CY 1998, 1999, and 2000 cost reports. If the rates actually paid based on those cost reports (FY 2000, 2001, and 2002) did not match the data provided in the cost reports, these facilities were excluded from the sample. This meant excluding an additional 18% of the otherwise stable homes. Almost all of these exclusions (169 of 173 nursing homes) were for-profit. This left a sample of 536 nursing homes. Slightly higher than the statewide NFP/FP mix in CY 2000 (23/75 where 2% of the operations were government sponsored), 27% of the sample (145) were
organized NFP and 73% were organized FP. A comparison of included and excluded facilities revealed no statistically significant differences among NFP facilities on any of the quality or financial measures. Among FP facilities, excluded facilities had fewer financial resources (lower net operating revenue per day and lower Medicaid incentive payments) compared to the sample facilities. Quality as measured by the case-mix adjusted nurse aide nurse staffing ratio was also lower among the FP excluded facilities.

3.5 **Operationalization of Variables**

This section presents the operationalization of variables used to evaluate hypothesis 1.1 (the relationship of profit status to quality) and hypotheses 2.1 through 2.3 and hypothesis 3.1 (the relationship of Medicaid reimbursement to quality and moderation, respectively). The model used to test hypothesis 1.1 was intended to signal whether profit status had a relationship with quality controlling for financial resources. Operationalization of financial resources at this stage was simplified because we wanted to be sure that profit status had a relationship with quality before proceeding to a more sophisticated model. Tests of hypotheses 2.1 through 2.3 and 3.1 relied on a model with more indicators of the “financial resources” construct. Table 2 at the conclusion of this chapter summarizes the constructs and how each was captured for each model.

3.5.1 **Quality Measure**

The dependent variable is a facility-level ratio, made up of the average amount of nursing minutes provided by the amount of nursing minutes needed during a calendar year. The numerator of each nurse staffing ratio (NSR) is the average nursing time

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7 Based on the distribution-free Kolmogorov-Smirnoff empirical distribution test at the p < 0.05 level
provided to residents in each facility per day according to data filed in Medicaid cost reports. The denominator of each NSR is the average nursing time needed by the facility’s residents based on the residents’ distribution into one of the 44 RUGs groups.

Information for the numerator came from a wage and hours survey that is part of the Ohio Medicaid nursing home cost report form as well as the schedule detailing direct care cost expenditures broken down by line item. Data from this schedule was used to check the data contained in the wage and hours survey for internal consistency as well as to develop estimates of nursing time provided by subcontractors and nursing agency personnel, excluded from the wage and hours survey. The wage and hours survey was checked for reliability as part of a national study on minimum nurse staffing requirements and found to be more reliable than federal nursing home survey data, normally used by health services researchers to capture nurse staffing (White, 2000).

Information for the denominator came from information provided by ODJFS on the distribution of RUGs-III groups by nursing homes for the four quarters during CY 2000. Data used to classify residents into the RUGs-III groups is collected by nursing home staff using standardized assessment tools. Information about each resident’s ability to perform activities of daily living, diagnoses, cognitive functioning, rehabilitation requirements, medications, specialized nursing needs, and behaviors is used to classify each resident into one of the 44 RUGs. The data collection process used to classify residents into the RUGs groups has been determined to be reliable (Hawes et al., 1995; Straker et al., 2001; Bailer et al., 2001).

Cohen et al used case-mix adjusted nurse staffing ratios (total, RN, and LPN) in
their 1996 published study based on National Medical Expenditure Survey data but their
denominator was based on weighted minutes of nursing time needed according to
residents’ limitations in activities of daily living (ADL) only. The RUGs system, in
contrast, is a cluster-based classification system based on a greater number of resident-
level domains besides ADL functioning.

Time spent by the Director of Nursing was included in calculations of the all
nursing and RN NSR.

3.5.1.1 Quality Measure for Hypothesis 1.1
Quality, for purposes of testing hypothesis 1.1, is based on total nursing time
provided by total nursing time needed.

3.5.1.2 Quality Measure for Hypotheses 2.1 – 2.3 and 3.1
Quality, for purposes of hypotheses 2.1 through 2.3 and 3.1 is based on nursing
time provided by nursing time needed for each of three distinct categories of nursing
professionals, i.e., nurses’ aides (NAs), LPNs, and RNs.

3.5.1.3 A Comment about Nurse Staffing and its Relationship with Other
Quality Measures
While quality is a multi-dimensional construct, nurse staffing, adjusted for
resident acuity, has been shown in previous research to be a significant factor in
explaining variation in process and outcome quality measures (Kramer et al., 2001; Linn
et al., 1977; Morris et al., 2002; Zimmerman et al., 2002; Zhang et al., 2004; Schnelle,
2004). Nurse staffing has also been used as a dependent variable in studies of nursing
home quality with residents’ needs as an independent covariate (Cohen et al., 1990;
Davis, 1993; Aaronson et al., 1994; Aaronson et al., 1995; Grabowski, 2001a; Grabowski, 2001b). The measure of nurse staffing used in this study adjusts for the residents’ needs as part of the construct, similar to (Cohen et al., 1996), capturing the extent to which the facility is responding to the residents’ needs for nursing time.

As part of a federally-funded study to validate nursing home quality indicators, CMS researchers linked nursing care processes with nursing home quality indicators (Morris et al., 2002). A pilot study resulted in scales consisting of trained observations about nursing facility care practices, medical record reviews, administrative questionnaires, and resident-level assessment. Data elements were characterized as either preventive (of some adverse outcome) or responsive (to an adverse outcome once it occurred). In the second phase, data from 219 nursing homes in 6 states were stratified by each facility’s performance on 20 quality indicators. Over 90% of the items found statistically significant in affecting variation in the quality indicators related to nurse staffing and/or nursing care practice. On the other hand, time spent by ancillary service providers or physicians in contact with residents explained very little of the variance in quality performance.
Table 1 contains a list of the nursing care related activities (and validation study codes) found to be statistically significant with columns 2-4 suggesting which nursing discipline might be involved and the type of involvement required. The remaining columns provide a crosswalk between the nursing care process and the quality indicators.
### Table 1  
**Listing of Nursing Care Processes Linked to Quality Indicators by Nursing Discipline**

<table>
<thead>
<tr>
<th>CARE PROCESS</th>
<th>Discipline</th>
<th>Quality Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Residents with Tx Plans for Wt Loss [val81]</td>
<td>NA LPN RN</td>
<td>Incidence of PUs Bowel/Bladder Incontinence Infection Pain Improvement in Walking, ADL Functioning</td>
</tr>
<tr>
<td>Bladder Continence Improvement Scale [val18]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Change was evaluated w/in 72 hrs [rallx8]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Clear evidence in the record (other than MDS &amp; Care Plan that the area was noted as a problem in the chart [rallx4])</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>CNA involved in care planning [val57]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>CQI Protocol - Behavioral Function [as39e]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>CQI Protocol - Bladder Incontinence [as39g]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>CQI Protocol - Communication Changes [as39f]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Daily verbal reports from CNA on behavioral function [as27b]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Documentation in the MR of a comprehensive assessment [rallx1]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Evidence of Change in Record [rallx7]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Evidence that the resident's status changed [kallx7]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Focus on Catheter [val74]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Focus on Incontinence [val36]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Inquiries of resident families or staff reasons for cognitive changes [as18a]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Inquiries of resident family or staff for change in behavior [as18c]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Match of Chart and Care Plan [val48]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Physician notified of change [kallx9]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Referral or consult ordered in response to change [kallx11]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Restorative programs in place:</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>CARE PROCESS</td>
<td>Discipline</td>
<td>Quality Indicators</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>LPN</td>
</tr>
<tr>
<td>active Range of Motion [as21c]</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Restorative programs in place: ambulation/gait training [as21d]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Restorative programs in place: passive Range of Motion [as21b]</td>
<td>O, C</td>
<td>O, C, A, D</td>
</tr>
<tr>
<td>Restorative/ Rehab aide routinely contributed to care plan [as9d]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Standard assessment tools to routinely assess bladder continence [as28db3]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Standard assessment tools to routinely assess communication change [as28fb3]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Standard assessment tools to routinely assess depression, moods, and behavior [as28bb3]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Standard assessment tools to routinely assess for delirium [as28cb3]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Standard assessment tools to routinely assess pain [as28hb3]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Therapies are ordered in response to change [kallx10]</td>
<td>O, C, A, D</td>
<td></td>
</tr>
<tr>
<td>Treatment plan in place to address the issue [rallx12]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Uses CQI to conduct an overall review and evaluation to improve care [as43d]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Weekly verbal reports from CNAs on communication changes [as27d2]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>When suspicious area of skin, more frequent skin eval is scheduled [as30a]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
<tr>
<td>Care Plan Mtgs scheduled into CNAs workday [as11a]</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Case Mix Index Adjusted RN+LPN FTE per bed [val52]</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>CNA attends care plan mtg [as10]</td>
<td>O, C</td>
<td>S</td>
</tr>
<tr>
<td>Continuing Ed for CNAs in Behavior Function [as26ga]</td>
<td>CE</td>
<td>T</td>
</tr>
<tr>
<td>Continuing Ed for CNAs in Delirium, Depression, Mood, Anxiety [as26aa]</td>
<td>CE</td>
<td>T</td>
</tr>
<tr>
<td>Continuing Ed for Licensed Nurses in Behavioral Symptoms</td>
<td>CE</td>
<td>T</td>
</tr>
<tr>
<td>CARE PROCESS</td>
<td>Discipline</td>
<td>Quality Indicators</td>
</tr>
<tr>
<td>--------------</td>
<td>------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>NA</td>
<td>LPN</td>
</tr>
<tr>
<td>[as26gb]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hours worked by CNAs [as5ca]</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>NP on staff [val19]</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>Ratio of CNAs to Licensed Nurses [cnarat2]</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>When suspicious area of skin, schedule in-depth skin assessment [as30b]</td>
<td>O, C</td>
<td>O, C, D</td>
</tr>
</tbody>
</table>

A = Assessment  
C = Communication  
CE = Continuing Education  
D = Documentation  
O = Observation  
S = Supervision  
T = Training

While higher spending is not always significant in predicting higher quality, ensuring adequate numbers of skilled staff to ensure the delivery of care consistent with professional standards and residents’ needs requires some minimum level of financial resources depending on the residents’ care demands. In the nursing home sector, where most of the dollars come from taxpayers, decisions about resource levels necessary to meet minimally acceptable standards for “quality” are first made by elected officials and then by providers. Based on data from a 2001 study submitted to Congress, there is a sizable gap between the levels of staffing employed in the nation’s nursing homes and the levels of staffing consistent with professional standards of care.8

8 In the 2001 study submitted to Congress, researchers found that 91% of the nation’s nursing homes had nurse aide staffing levels below the thresholds determined necessary to meet five daily care processes for residents using simulation: (1) consistently changing wet linens for incontinent residents who could not successfully toilet if given assistance; (2) providing timely toileting for incontinent residents who could successfully toilet; (3) providing feeding assistance to either physically dependent residents or those with
3.5.2 Financial Resources for Quality

Financial resources available to pay for quality include the facilities’ revenues from residents for services in the present year, non-operating revenues, and net-operating revenues from the prior year. This section discusses the operationalization of each of these revenue streams by hypothesis.

3.5.2.1 Medicaid Revenue Measure

3.5.2.1.1 Medicaid Revenue Measure for Hypothesis 1.1

In the model used to test hypothesis 1.1, the percentage of the facility’s inpatient days paid for at the Medicaid rate was used as a simple proxy for Medicaid revenues.

3.5.2.1.2 Medicaid Revenue Measure for Hypotheses 2.1-2.3 and 3.1

In the model used to test the remaining hypotheses, three components of the facility’s total Medicaid revenue stream were selected for consideration of their effect on quality: the rate per case mix unit (CMU), the indirect care incentive payment (ICI) and the cost of ownership incentive payment (COI). Other rate components were not included in this model on the assumption that they were paid as compensation for non-nursing related costs already incurred or because they applied to FP facilities only and would therefore not be subject to moderation (return on equity). Given the smallness of low food intake; (4) providing exercise to all residents; and (5) providing assistance that enhances the ability of residents to dress and groom independently (Schnelle et al., 2001). In the same report to Congress, a different group of researchers (Kramer et al., 2001) found that 97% of the nation’s nursing homes failed to meet one of six thresholds identified for nurse aide, licensed nursing, and RN staffing for short-stay and long-stay chronic care populations. Using a complex decision-tree methodology and resident data from 8,900 facilities in 10 states, staffing below the thresholds was associated with statistically significant differences in outcomes including hospitalization for preventable conditions within 30 days of nursing home admission, development of incident pressure sores, weight loss, and functional decline within 90 days of admission. Residents of facilities in the lowest deciles of staffing were 2 to 10 times more likely to experience poor outcomes.
the return on equity payment paid during CY 2000 (mean = $0.64, std. dev. = $0.43), it was assumed that this would not be an omission likely to affect the other parameters.

The study’s rate variables were weighted by the facility’s Medicaid occupancy during the study year 2000 on the assumption that the facility’s behavior would be affected by Medicaid reimbursement in direct proportion to which the facility’s payer mix consisted of inpatient days paid at the Medicaid rate.

3.5.2.1.3  A Look at the Effect of Mid-Year Rate Adjustments on Quality - Models 2A and 2B

Because two rate years span one calendar year, and it was unclear whether or not this made a difference in quality, two approaches to operationalizing the rate variables were adopted for analysis. In Model 2A, a 50/50 approach was adopted to construction. For example, 50% of each variable’s SFY00 rate and 50% of each variable’s SFY01 rate were summed, divided by 2, and then weighted by the facility’s percentage of Medicaid inpatient days in CY 2000. In Model 2B, the SFY00 rate acted as one regressor and the difference between the SFY00 and SFY01 rates became a second regressor. No differences other than these characterize Models 2A and 2B.

3.5.2.2  Medicare Revenue Measure

Lacking information on which facilities opted for rates based 100% on the federal prospective payment system (PPS) and which facilities selected a phase-in period combining 75% fee-for-service and 25% Medicare PPS, a consistent measure of actual Medicare revenues per diem could not be determined based on available data. Therefore, Medicare revenues were operationalized as the percentage of inpatient days paid for at
the Medicare rate in the two models used to evaluate all of the hypotheses.

3.5.2.3 **Private Pay Revenue Measure**

3.5.2.3.1 **Private Pay Measure for Hypothesis 1.1**

Facilities set their own private pay rates and include different services in the rate in order to compete on price. Unfortunately, there is no reliable dataset that captures just the room and board rates for private payers. Use of the private pay proportion of inpatient days as the proxy is possible but is collinear with either of the other two payer mix variables when the other two are also in the model. Accordingly, in the model used to test the effect of profit status on quality, the percentage of inpatient days represented by private payers was excluded.

3.5.2.3.2 **Private Pay Measure for Hypotheses 2.1-2.3 and 3.1**

In order to account for private pay revenues in the second model, a dummy variable was created based on an artificial threshold of 40%, the 90th percentile of the pooled distribution.

3.5.2.4 **Measure for Facility’s Internal Capacity to Finance Quality**

3.5.2.4.1 **Facility’s Internal Capacity Measure for Hypothesis 1.1**

An additional source of financing for quality, other than revenues that accrue to the facility during the study year, is the facility’s own internal resources to finance quality. It was assumed that those facilities choosing to utilize internal resources would make decisions about the amount to spend based on the value of selected variables at year-end of the prior year. However, facilities differ in their definition of “year-end.” While Medicaid cost reporting is on a 12-month calendar year cycle, facilities may
determine their own 12-month period for financial reporting which usually corresponds
to the 12-month period for which the facility is required to use in filing forms with the
Internal Revenue Service (IRS). The IRS requires S corporations, C corporations,
partnerships, and personal service corporations (all FP entities) to use the calendar year as
their fiscal year with some exceptions. The IRS imposes no requirements on nonprofit
foundations or charities with respect to fiscal year but does require about one-quarter of
them to file Form 990 within five and one-half months of the end of each fiscal year with
the IRS. This form reports the NFP entities’ revenues, expenses, and changes from the
prior year. Most businesses choose the calendar year because it is simple and natural to
use. Consequently, for purposes of operationalizing the facility’s own internal capacity
to finance quality, “year-end” was assumed to be December 31, 1999.

For the first hypothesis, the ratio of fixed costs to total costs in the prior year was
used to represent the facility’s internal capacity to finance quality in the present period.
Fixed costs “compete” with variable costs for limited funds. If the fixed costs ratio is
above average, the nursing home may be “over-capitalized” and less able to finance
quality.

3.5.2.4.2 Facility’s Internal Capacity Measure for Hypotheses 2.1-2.3 and 3.1

For hypotheses 2.1 through 3.1, net operating revenues and non-operating
revenues per day in the prior year were used to represent the facility’s internal capacity to
finance quality.

3.5.2.5 Adjustment for NFP Sector’s Use of Non-Staff Nursing Personnel

Nursing time provided, the numerator of the quality ratio, relies on both time
spent by facility employees as well as estimated time spent by purchased nursing personnel (under personal services contract and temporary nursing personnel from agencies). For personnel under personal services contract, the conversion from dollars to time was based on division by the median wage within the direct care peer group for non-owner employers within the same class and a multiplier of 1.7 because the individual must pay for their own benefits. For personnel from agencies, the conversion from dollars to time was based on the same method except the multiplier used was 2.0. Hypothesis 1.1 was applied to pooled data and NFPs use more purchased nursing personnel compared to FPs. In order to avoid attributing variation in quality to profit status that might actually be related to differences between the sectors’ reliance on non-staff nursing personnel (part of the numerator of the dependent variable), a regressor representing the percentage of the facility’s nursing time represented by purchased nursing personnel was included in the model.

3.6 Handling of Outliers

Data outliers were identified based on univariate and multivariable analyses using graphical displays and influence statistics, including hat matrices (the $i^{th}$ diagonal of the projection matrix for the predictor space), studentized residuals, the covariance ratio (the change in the determinant of the covariance matrix of the estimates by deleting the $i^{th}$ observation), the DFFITS statistic (scaled measures of change in the predicted value for the $i^{th}$ observation), and DFBETAS (scaled measures of change in each parameter estimate by deleting the $i^{th}$ observation) (SAS Institute, 1999). All cutoffs were based on thresholds recommended by Belsley et al (Belsley et al., 1980). Once identified as a potential outlier, the observation’s available data preceding and following the study year
were reviewed in an effort to evaluate possible measurement error. While subjective, decisions to omit observations were framed in the context of the study objectives.

The study’s objectives are not prediction but the development of valid estimates of the Medicaid reimbursement regression coefficients in models where quality is the dependent variable and an evaluation of moderation depending on profit status. The nursing home industry is complex and a number of random forces are at play. Accordingly, since none of the outliers appeared to be measurement errors, none were eliminated since they were assumed to be accurate representations of a diverse industry.

3.7 Summary

Table 2 chapter summarizes the constructs and how each was applied to the Models 1 and 2.
<table>
<thead>
<tr>
<th>CONSTRUCT</th>
<th>GENERAL DESCRIPTION</th>
<th>MODEL 1 (Hypothesis 1.1) VARIABLES</th>
<th>MODEL 2 (Hypothesis 2.1-2.3, 3.1) VARIABLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Resources</td>
<td>Medicaid Revenues</td>
<td>Percent of inpatient days paid at Medicaid rate</td>
<td>Rate per Case Mix Unit weighted for percent of inpatient days paid at Medicaid rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Indirect Care Incentive weighted for percent of inpatient days paid at Medicaid rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cost of Ownership Incentive weighted for percent of inpatient days paid at Medicaid rate</td>
</tr>
<tr>
<td>Medicare Revenues</td>
<td></td>
<td>Percent of inpatient days paid at Medicare rate</td>
<td></td>
</tr>
<tr>
<td>Private Pay Revenues</td>
<td></td>
<td>Not included</td>
<td>Inpatient days paid at private pay rate ≥ 40% = 1</td>
</tr>
<tr>
<td>Facility’s internal capacity to finance quality</td>
<td>Prior year’s fixed cost ratio</td>
<td>Prior year’s non-operating revenues per day</td>
<td>Prior year’s net-operating revenues per day</td>
</tr>
<tr>
<td>Profit Status</td>
<td>Profit Status</td>
<td>Profit status entered as main variable of interest</td>
<td>Stratified analysis</td>
</tr>
<tr>
<td>Quality</td>
<td>Quality</td>
<td>Total NSR (Dependent Variable)</td>
<td>NA NSR, LPN NSR, RN NSR (Dependent Variables)</td>
</tr>
<tr>
<td>Use of Non-Staff Nursing Personnel</td>
<td>Ratio of purchased nursing hours to total nursing hours</td>
<td>Not included</td>
<td></td>
</tr>
</tbody>
</table>
4. Results

This chapter begins with an analysis of the means and distributions of the model variables by profit status, followed by a discussion of each model’s compliance with classic linear regression assumptions. The results of the models are also presented in this chapter.

4.1 Variable Means and Distributions

Table 3 lists descriptive information for each the variables included in Model 1. For illustrative purposes, the means and standard deviations for Model 1 variables are presented in total (the variables used in Model 1) and by profit status. While none of the variables in Model 1 had a statistically normal distribution, three assumed the shape of a normal distribution. The percentage of Medicare occupancy and prior year fixed cost ratio were skewed. Tests of statistical significance between the two sectors revealed significant differences at p < .05 for all of the measures. Independent t-tests were used in evaluating the quality measure, percentage of Medicaid occupancy, and percentage of dollars paid to non-staff nursing personnel. The Kolmogorov-Smirnov D statistic, a distribution-free non-parametric test of differences between distributions of groups were used for the skewed distributions.

The dependent variable in Model 1 suggests that the sample facilities were meeting only 97% of their residents’ daily needs for nursing care across all skill levels. NFP facilities met 105% and FP facilities that met only 94% of their residents’ daily needs for nursing care across all skill levels.
Table 3  Descriptive Statistics for Model 1 Variables

<table>
<thead>
<tr>
<th>Outcome Variable</th>
<th>All (n = 536)</th>
<th>NFP (n = 145)</th>
<th>FP (n = 391)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
<td>Mean</td>
</tr>
<tr>
<td>All Nursing NSR**</td>
<td>0.97</td>
<td>0.18</td>
<td>1.05</td>
</tr>
<tr>
<td>Financial Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Medicaid occupancy**</td>
<td>70.6</td>
<td>16.0</td>
<td>65.3</td>
</tr>
<tr>
<td>% Medicare occupancy**</td>
<td>6.6</td>
<td>4.9</td>
<td>5.2</td>
</tr>
<tr>
<td>Fixed costs ratio*</td>
<td>0.12</td>
<td>0.05</td>
<td>0.11</td>
</tr>
<tr>
<td>Percent of Non-Staff Nursing Personnel (Estimated portion of Nursing Hours Provided)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of CY00 nursing expenditures paid to non-staff nursing personnel**</td>
<td>4.0</td>
<td>5.4</td>
<td>6.5</td>
</tr>
</tbody>
</table>

** Significant at the p < .05 level; * Significant at the p < .01 level; Differences between the two sectors were tested using independent t-tests or the K-S test (those in italics).

The next table, Table 4, lists the means and standard deviations for the three dependent variables and regressors specified for Model 2A. With the exception of the LPN nurse staffing ratio and cost of ownership incentive payments, the differences in the medians and empirical distributions between the two sectors were statistically significant at the p < 0.05 level (independent t-test and the Kolmogorov-Smirnov D statistic for those variables in italics).
### Table 4 Descriptive Statistics for Model 2A Variables

<table>
<thead>
<tr>
<th></th>
<th>NFP (N = 145)</th>
<th>FP (N = 391)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
</tr>
<tr>
<td><strong>Outcome Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY 2000 Nurse Aide NSR**</td>
<td>1.10</td>
<td>0.22</td>
</tr>
<tr>
<td>CY 2000 LPN NSR*</td>
<td>1.36</td>
<td>0.49</td>
</tr>
<tr>
<td>CY 2000 RN NSR**</td>
<td>0.69</td>
<td>0.27</td>
</tr>
<tr>
<td><strong>Financial Resources</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Rate per Case Mix Unit</td>
<td>23.87</td>
<td>7.05</td>
</tr>
<tr>
<td>Medicaid Indirect Care Incentive**</td>
<td>0.90</td>
<td>1.29</td>
</tr>
<tr>
<td>Medicaid Cost of Ownership Incentive</td>
<td>0.71</td>
<td>0.79</td>
</tr>
<tr>
<td>CY 2000 % Medicare Days**</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>CY 2000 PP Threshold ** (if private pay inpatient days ≥ 40% of all inpatient days, then 1; else 0)</td>
<td>0.25</td>
<td>0.05</td>
</tr>
<tr>
<td>CY 1999 Non-operating Revenues per Day**</td>
<td>14.06</td>
<td>66.51</td>
</tr>
<tr>
<td>CY 1999 Net Operating Revenues Per Day**</td>
<td>-37.05</td>
<td>151.18</td>
</tr>
</tbody>
</table>

* 50/50 blend of SFY00 and SFY01 rates and weighted for percent of Medicaid occupancy in CY 2000
** Significant at the p < .05 level; * Significant at the p < .01 level; Differences between the two sectors were tested using independent t-tests or the K-S D test (those in italics).

NFPs provided 110% (s.d. = 22%) of their residents’ needs for daily nurse aide time. Nurses aides provide most of the care in nursing homes, including assistance with bed mobility, transferring, repositioning residents, changing linens, changing clothes, toileting, feeding, bathing, hydration, exercise, and stimulation. On average, FPs meet
only 97% (s.d. = 19%) of their residents’ daily needs for nurse aide time. For the average
nursing home resident who requires about 143 minutes per day in both sectors (s.d. = 9.0-
9.6 minutes depending on the sector), this difference represents a difference of 18
minutes of nurse aide time per day between NFP and FP facilities.

Both sectors provide more LPN nursing time than needed. NFP facilities, on
average met 136% (s.d. = 49%) of the residents’ needs while FPs met 126% (s.d. = 43%)
of the residents’ daily requirements for LPN nursing care. LPNs are licensed to carry
out nursing tasks at the direction or under the supervision of a RN. LPNs cannot carry
out nursing assessments, develop nursing care plans, or conduct some nursing treatments.
In nursing homes, LPNs are primarily responsible for passing out medications and
supervision of the nurse aides. They act as shift supervisors but an RN must be on-site at
all times. According to a recent random sample of 689 Ohio nursing home residents,
residents receive an average of 13.4 medications per day (Permedion, 2004). The high
proportion of nursing home residents’ LPN needs being met reflects the use of LPNs to
substitute for RNs.

As illustrated in Table 4, only 69% (s.d. = 27%) and 62% (s.d. = 26%) of Ohio
nursing home residents’ daily needs for RN care are being met by NFP and FP facilities,
respectively. RNs provide a level of skill critical to avoid unnecessary hospitalizations of
residents with high numbers of comorbid conditions and cognitive impairment (Kramer
et al., 2001). RNs are the only group of nurses in nursing homes with the education and
training required to conduct nursing assessments, care planning, and patient education.

The rate variables are weighted by the facility’s percent of CY 2000 Medicaid
occupancy. Only the indirect care incentive payment is significantly different statistically. However, unweighted, differences emerge, at least for the rate per case mix unit. The means and standard deviations for the unweighted rate per case mix unit were $36.74 (s.d. = $5.44) for NFPs and $31.40 (s.d. = $5.07) for FPs and significantly different at \( p < 0.01 \). In spite of this difference, because the mean facility occupancy rate for NFPs is 65.2% and 73.2% for FPs, the large gap favoring NFPs based on rate is diminished by the gap favoring FPs based on Medicaid occupancy. Unweighted means and standard deviations for the indirect care incentive were $1.33 ($1.80) for NFPs and $3.28 ($1.76) for FPs. It is important to note that only 52% of the NFPs and 11% of the FPs received an ICI greater than 0. Unweighted means and standard deviations for the cost of ownership incentive were $1.09 (s.d. = $1.15) for NFPs and $1.09 (s.d. = $1.11) for FPs. About one-third of each sector received a COI greater than zero (36% of NFPs and 32% of FPs).

Non-operating revenue is a large source of income for NFPs with 59% of NFPs earning $0.50 or more per day in CY 1999 versus 16% of FPs. But NFPs were also more likely to experience a loss in non-operating revenue in CY 1999 (24%) compared to FPs (16%). Over one-third of the FPs (36%) earned zero in non-operating revenue in CY 1999 with 23% earning greater than $0.00 but less than $0.50. All of the NFPs had some gain or loss in non-operating revenue with 17% earning more than $0.00 but less than $0.50. While a loss in non-operating revenue should not force a facility to reduce operating expenditures, it doesn’t allow them to increase operating expenditures.

On the other hand, a net loss in operating revenues from the prior year could force a facility to lower nurse staffing in the current year. Half of the NFPs (50%) and 43% of
the FPs experienced a net loss in operating revenues in CY 1999. The majority of those that did earn money though earned at least $1.00 per day (42% of NFPs and 55% of FPs). While presumably the NFPs would reinvest those earnings back into nursing care, the FPs would be expected to pocket those earnings.

Table 5 contains descriptive statistics for Model 2B, listing only those Medicaid rate variables that differ from the Medicaid rate variables used in Model 2A. Again, all of the Medicaid rate variables are weighted for the percentage of Medicaid occupancy in the facility. None of the differences were statistically significant using independent t-tests for the rate per case mix unit variables and the Kolmogorov-Smirnov D statistic for the others. Unweighted, the differences between the sectors for both of the rate per case mix unit variables would have been significant at p < .01 and for the second half increment of the cost of ownership incentive at p < .05. Other variables included in Model 2B are the same as those in Model 2A.
Table 5  Descriptive Statistics for Model 2B Variables

<table>
<thead>
<tr>
<th></th>
<th>NFP (N = 145)</th>
<th></th>
<th>FP (N = 391)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
<td>Mean</td>
<td>Std Dev</td>
</tr>
<tr>
<td>SFY00 Medicaid Rate per Case Mix Unit</td>
<td>23.46</td>
<td>7.04</td>
<td>22.56</td>
<td>6.12</td>
</tr>
<tr>
<td>SFY01-SFY00 Medicaid Rate per Case Mix Unit</td>
<td>0.81</td>
<td>1.41</td>
<td>0.51</td>
<td>2.19</td>
</tr>
<tr>
<td>SFY00 Medicaid Indirect Care Incentive</td>
<td>1.07</td>
<td>1.49</td>
<td>2.69</td>
<td>1.48</td>
</tr>
<tr>
<td>SFY01-SFY00 Medicaid Indirect Care Incentive</td>
<td>-0.33</td>
<td>0.95</td>
<td>-0.53</td>
<td>1.24</td>
</tr>
<tr>
<td>SFY00 Medicaid Cost of Ownership Incentive</td>
<td>0.72</td>
<td>0.80</td>
<td>0.80</td>
<td>0.84</td>
</tr>
<tr>
<td>SFY01-SFY00 Medicaid Cost of Ownership Incentive</td>
<td>-0.02</td>
<td>0.18</td>
<td>-0.01</td>
<td>0.30</td>
</tr>
</tbody>
</table>

NOTE: All of the above rates are weighted for the facility’s percent Medicaid occupancy in CY 2000. ** Significant at the p < .05 level; * Significant at the p < .01 level; Differences between the two sectors were tested using independent t-tests or the K-S D test (those in italics).

4.2  OLS Estimation Requirements

Prior to the final decision to use linear regression and an ordinary least squares (OLS) approach to estimating the relationship between Medicaid reimbursement and quality, a number of tests were performed to test the models’ compliance with the necessary conditions for their use. The five statistical assumptions are:

- existence of a linear relationship between the dependent variable and a set of independent variables plus a disturbance term;
- the mean of the distribution from which the disturbance term is drawn is zero;
• the disturbance terms all have the same variance and are not correlated with one another;

• the observations on the independent variables can be considered fixed in repeated samples; and

• no exact linear relationships between the independent variables (Kennedy, 1998).

Because there were essentially three models (Aim 1’s Model 1 and Models 2A and 2B) and 3 dependent variables for Models 2A and 2B, 13 different models were subject to evaluation.

4.3.1 Tests Used to Evaluate Compliance with Assumptions Required for OLS Estimation

The models’ linear forms were tested using data plots and two tests proposed by McGuirk. In the first test, the model is run using OLS and the resulting predicted y-values are squared and added to the original model. If the squared value of the predicted y is not a statistically significant predictor of the new predicted y, then a linear relationship between the regressors and the dependent variable cannot be rejected. In the second test, the first-stage predicted y is cubed and both the squared and cubic predicted y’s are added to the original model to test the significance of these two variables. If neither variable is statistically significant, again, linear relationships cannot be rejected (McGuirk et al., 1993).

The second assumption of zero expected disturbance can only be tested theoretically since the OLS estimation procedures automatically creates residuals whose
mean is zero. There was no practical way to test whether there were systematically positive or negative errors in measurement of the dependent variable. Violations of this assumption would be of concern in this study if the bias characterized one sector and not the other.

The third assumption was evaluated using visual inspections of plots graphing the residuals against each regressor, a test proposed by Glejser and a modified Glejser test. In a Glejser test, the squared residuals are regressed on the original regressors. If any of the original regressors is statistically significant, this suggests heteroskedasticity (Glejser, 1969). In a modified Glejser test, the absolute value of the residuals are regressed on the original regressors. Again, statistical significance of a regressor is indicative of heteroskedasticity. Autocorrelation was not evaluated for lack of data related to a conceivable source, chain affiliation.

The fourth assumption requires that: (a) there are no errors in measurement of the regressors; (b) a lagged value of the dependent variable is not part of the model; and (c) the dependent variables are not a function of the simultaneous interaction of relationships other than the linear relationship accounted for in the model. Requirement (a) was tested by thorough analysis of outliers. Requirement (b) could not be tested due to inadequate data to construct lagged values of the dependent variable. Requirement (c) was not evaluated for lack of adequate instrumental variables.

Multicollinearity among the regressors was tested using condition indices and variance inflation factors. The largest variance inflation factors and condition indices were compared with the thresholds proposed by Belsley et al (Belsley et al., 1980).
4.3.2 Results of Tests Regarding Assumptions

There was empirical support for the first, third, and fifth assumptions. The second and fourth assumptions were not tested but rather assumed. OLS is not robust against violations of the fourth assumption. If the assumption of independence of the errors is not true, even if all of the other conditions are met, the resulting coefficients and hypothesis tests are unreliable.

4.4 An Overview of Results based on OLS Estimation

In this section, the results of all three models are presented first followed by a detailed discussion of the results by hypothesis.

4.4.1 Model 1

Table 6 contains the parameter estimates derived using Model 1. The coefficient standard errors and probability values for rejecting the null based on t-statistics (beta = 0) are also shown.
Table 6  Parameter Estimates for Model 1

<table>
<thead>
<tr>
<th>Dependent Variable All Nursing NSR</th>
<th>Mean of Dependent Variable</th>
<th>Root Mean Square Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profit Status (1 = FP; 0 = NFP)</td>
<td>-0.10</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>Financial Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY00 % Medicaid Days</td>
<td>-0.03</td>
<td>(.5618)</td>
</tr>
<tr>
<td>CY00 % Medicare Days</td>
<td>-0.41</td>
<td>(.0253)</td>
</tr>
<tr>
<td>CY99 Fixed Cost Ratio</td>
<td>-.20</td>
<td>(.1496)</td>
</tr>
<tr>
<td>Measurement Adjustment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estimated % Agency Personnel</td>
<td>.12</td>
<td>(.3981)</td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>1.06</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>.093</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>536</td>
<td></td>
</tr>
<tr>
<td>F (Prob &gt; F)</td>
<td>11.99 (&lt;.0001)</td>
<td></td>
</tr>
</tbody>
</table>

As predicted, profit status had a negative relationship with quality as defined by the case-mix adjusted all nurse staffing ratio. In fact, a resident with average daily nursing care needs (about 240 minutes per day) could expect to receive 10% less nursing time (or 24 minutes per day) in a FP facility compared to a NFP facility. Depending on the nursing skill mix of the facility, this may mean less frequent toileting, a missed bath, inadequate feeding assistance, a higher probability of a medication error, or inadequate attention to a change in the individual’s health status.

The percent of the facility’s inpatient days paid for at the Medicare rate was
inversely associated with the all nurse staffing ratio. In fact, the intercept was greater than the dependent variable mean and Medicare occupancy rates was a significant factor affecting a decline in the all NSR. This is surprising given that Medicare beneficiaries generally require more nursing care compared to Medicaid-subsidized nursing home residents. The time spent by Medicare beneficiaries in therapy may also have increased since the last time and motion study in 1997. Another explanation is that facilities were still in the process of adjusting their nurse staffing in response to Medicare’s shift to prospective payment enacted in 1998 but phased-in for the majority of facilities over a four-year period. For those facilities participating in the phase-in, during their Medicare cost report year beginning on or after October 1, 1999, they would receive a Medicare per diem for skilled care with 50% based on the federal prospective rate and 50% based on the facility’s historical costs.

Other crude indicators of financial resources (percent of Medicaid occupancy and fixed cost ratio) had no statistically significant effect on quality. The adjustment for possible measurement error was also insignificant.

The model explained 10% of the variance in the dependent variable. Models proposed by Cohen et al, using a similar measure of quality using nationally pooled data (FP and NFPs together), explained 6% of the variance in total nurse staffing ratios (Cohen et al., 1996).

4.4.2 Model 2A

The linear regression results for Model 2A using OLS estimation methods are displayed in Table 7. Statistically significant coefficients are in bold. Their standard
errors and probability values for rejecting the null based on t-statistics (beta = 0) are also shown.

The models explained 11-18% of the variance in the quality measures compared to 11-25% of the variance in LPN and RN nurse staffing ratios using national data by Cohen and Spector (Cohen et al., 1996). Medicaid rate variables were statistically significant in only about half of the instances (4/9 for NFPs; 5/9 for FP) but either the rate per CMU or ICI was significant in explaining variation in all quality measures for both strata. Prior year non-operating and net-operating revenues were not significant at all and the lack of significance is not surprising given the small mean and large variance of these two variables. A transformation to a categorical variable based on percentiles might have found some significance.

Medicare occupancy had a negative but insignificant effect on quality for NA and RN nurse staffing ratios in NFPs and could be reflecting the events occurring during the study year – shifts in staffing configurations attributable to Medicare PPS. For example, if the facility had a higher nurse staffing ratio for NAs and RNs in 1999 and its PPS share of reimbursement went from 75 to 50% in 2000, the facility may have had to reduce NA and RN staffing. Some may have substituted LPNs to compensate for the reductions in RN staffing.9 In the case of FPs, the opposite may have occurred although again, these coefficients are not significantly different from zero. It is impossible to say, with any certainty, whether the negative sign is the results of changes in the numerator or the

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9 Facilities had the option to elect immediate transition to Medicare PPS with their first cost reporting period after October 1, 1998 or to phase-in implementation over a four-year period keeping their facility-specific cost-based rate from fiscal year 1998 adjusted for inflation. For those not opting to transition to 100% of the federal rate in fiscal year 1999, the schedule was 25/75 (federal PPS/facility-specific), 50/50,
denominator of the NSRs. The answer would require a panel-based longitudinal analysis of pre- and post-Medicare PPS implementation.

Table 7  Parameter Estimates for Model 2A (50/50 Blend of FY00/01 Medicaid Rates Weighted for Medicaid Occupancy)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>NFP</th>
<th>FP</th>
<th>NFP</th>
<th>FP</th>
<th>NFP</th>
<th>FP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of Dependent Variable</td>
<td>1.10</td>
<td>0.97</td>
<td>1.36</td>
<td>1.26</td>
<td>0.69</td>
<td>0.62</td>
</tr>
<tr>
<td>Root Mean Square Error</td>
<td>0.20</td>
<td>0.18</td>
<td>0.47</td>
<td>0.40</td>
<td>0.24</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Medicaid Rates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Rate per CMU</td>
<td>0.01 (.0018)</td>
<td>0.01 (.0001)</td>
<td>0.02 (.0038)</td>
<td>0.02 (.0001)</td>
<td>0.00 (.2756)</td>
<td>0.02 (.0001)</td>
</tr>
<tr>
<td>Medicaid Indirect Care Incentive</td>
<td>-0.04 (.0108)</td>
<td>-0.01 (.2101)</td>
<td>0.04 (.2880)</td>
<td>-0.03 (.0479)</td>
<td>-0.07 (.0002)</td>
<td>-0.03 (.0050)</td>
</tr>
<tr>
<td>Medicaid Cost of Ownership Incentive</td>
<td>0.01 (.6469)</td>
<td>0.01 (.2693)</td>
<td>0.00 (.9669)</td>
<td>0.03 (.3154)</td>
<td>-0.01 (.8090)</td>
<td>-0.01 (.5526)</td>
</tr>
<tr>
<td><strong>Other Financial Resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY99 Net Op Rev/Inpatient Day</td>
<td>0.00 (.4507)</td>
<td>0.00 (.0882)</td>
<td>0.00 (.2679)</td>
<td>0.00 (.8212)</td>
<td>0.00 (.5546)</td>
<td>0.00 (.0036)</td>
</tr>
<tr>
<td>CY99 Nonop Rev/Inpatient Day</td>
<td>0.00 (.1078)</td>
<td>-0.01 (.4377)</td>
<td>0.00 (.6551)</td>
<td>0.03 (.2477)</td>
<td>0.00 (.0732)</td>
<td>0.00 (.8261)</td>
</tr>
<tr>
<td>CY00 % Medicare Days</td>
<td>-0.73 (.1686)</td>
<td>0.27 (.2369)</td>
<td>1.39 (.2494)</td>
<td>-0.62 (.2086)</td>
<td>-0.71 (.2585)</td>
<td>0.30 (.3115)</td>
</tr>
<tr>
<td>CY00 PP Days GE 40% (1= Yes)</td>
<td>0.11 (.0413)</td>
<td>0.06 (.1926)</td>
<td>-0.08 (.5294)</td>
<td>0.06 (.5175)</td>
<td>0.15 (.0240)</td>
<td>0.17 (.0051)</td>
</tr>
<tr>
<td><strong>Intercept</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.87 (.80001)</td>
<td>0.74 (.0001)</td>
<td>0.71 (.0074)</td>
<td>0.78 (.0001)</td>
<td>0.64 (.0001)</td>
<td>0.33 (.0001)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.16</td>
<td>0.07</td>
<td>0.11</td>
<td>0.13</td>
<td>0.18</td>
<td>0.13</td>
</tr>
<tr>
<td>N</td>
<td>145</td>
<td>391</td>
<td>145</td>
<td>391</td>
<td>145</td>
<td>391</td>
</tr>
<tr>
<td>F (Pr &gt; F)</td>
<td>4.87 (.0001)</td>
<td>5.51 (.0001)</td>
<td>3.53 (.0016)</td>
<td>9.41 (.0001)</td>
<td>5.63 (.0001)</td>
<td>9.09 (.0001)</td>
</tr>
</tbody>
</table>

A private pay occupancy rate of at least 40% exerted the strongest effect on NA and RN nurse staffing ratios in NFPs and on the RN NSR in FP facilities. High private pay occupancy had a negative but insignificant effect on the LPN NSR in FP facilities.
perhaps reflecting these facilities’ higher reliance on RNs.

4.4.3 Model 2B

The linear regression results for Model 2B using OLS estimation methods are displayed in Table 8. Statistically significant coefficients are in bold. Their standard errors and probability values for rejecting the null based on t-statistics (beta = 0) are also shown. The effects of mid-year rate increases on the relationship between Medicaid reimbursement and quality were consistent with the relationships between Medicaid reimbursement during the first half of the calendar year and quality with one exception. For FPs, the cost of ownership incentive payment increase in mid-year 2000 was positively and significantly associated with increases in NA NSR. Given the mean value of this payment (-0.01), from a practical point of view, the effect on the NA NSR was extremely small.

In summary, compared to Model 2A, Model 2B explained about the same variance across all measures of quality for the NFPs but slightly more for FP LPN and NA nurse staffing ratios (3 and 4 points, respectively). The standard errors for FY00 Medicaid rate coefficients were not appreciably reduced from those based on a 50/50 blended of FY00 and FY01.
Table 8  Parameter Estimates for Model 2B (FY00 Rates and FY01 First Difference Rates)

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nurse Aide NSR</th>
<th>LPN NSR</th>
<th>RN NSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFP</td>
<td>FP</td>
<td>NFP</td>
</tr>
<tr>
<td>Mean of Dependent Variable</td>
<td>1.10</td>
<td>0.97</td>
<td>1.36</td>
</tr>
<tr>
<td>Root Mean Square Error</td>
<td>0.20</td>
<td>0.18</td>
<td>0.47</td>
</tr>
<tr>
<td>Medicaid Rates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FY00 Medicaid Rate per CMU</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
</tr>
<tr>
<td>(0.011)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0034)</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>FY01 1st Dif Medicaid Rate per CMU</td>
<td>0.03</td>
<td>0.02</td>
<td>0.04</td>
</tr>
<tr>
<td>(0.0149)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.2352)</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>FY00 Medicaid ICI</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>(0.0156)</td>
<td>(&lt;.2846)</td>
<td>(&lt;.3281)</td>
<td>(&lt;.0375)</td>
</tr>
<tr>
<td>FY01 1st Dif Medicaid ICI</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>(0.8888)</td>
<td>(&lt;.0786)</td>
<td>(&lt;.8099)</td>
<td>(&lt;.4094)</td>
</tr>
<tr>
<td>FY00 Medicaid COI</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>0.024</td>
<td>0.012</td>
<td>0.054</td>
<td>0.027</td>
</tr>
<tr>
<td>(0.6422)</td>
<td>(&lt;.2672)</td>
<td>(&lt;.9540)</td>
<td>(&lt;.3002)</td>
</tr>
<tr>
<td>FY011st Dif Medicaid COI</td>
<td>0.00</td>
<td>0.07</td>
<td>-0.10</td>
</tr>
<tr>
<td>(0.9775)</td>
<td>(&lt;.0280)</td>
<td>(&lt;.6332)</td>
<td>(&lt;.2999)</td>
</tr>
<tr>
<td>Other Financial Resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY99 Net Op Rev/Inpatient Day</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>(0.4218)</td>
<td>(0.0594)</td>
<td>(0.2764)</td>
<td>(0.9740)</td>
</tr>
<tr>
<td>CY99 Nonop Rev/Inpatient Day</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>(0.0748)</td>
<td>(0.7504)</td>
<td>(0.7060)</td>
<td>(0.2668)</td>
</tr>
<tr>
<td>CY00 % Medicare Days</td>
<td>-0.49</td>
<td>0.41</td>
<td>1.72</td>
</tr>
<tr>
<td>(0.3702)</td>
<td>(0.6600)</td>
<td>(1.752)</td>
<td>(0.5129)</td>
</tr>
<tr>
<td>CY00 PP Days GE 40% (1= Yes)</td>
<td>0.13</td>
<td>0.07</td>
<td>-0.07</td>
</tr>
<tr>
<td>0.096</td>
<td>0.044</td>
<td>0.130</td>
<td>0.097</td>
</tr>
<tr>
<td>(0.0242)</td>
<td>(0.1334)</td>
<td>(0.6128)</td>
<td>(0.4942)</td>
</tr>
<tr>
<td>Intercept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>0.82</td>
<td>0.71</td>
<td>0.65</td>
</tr>
<tr>
<td>0.117</td>
<td>0.059</td>
<td>0.271</td>
<td>0.129</td>
</tr>
<tr>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0181)</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>Adjusted R^2</td>
<td>0.17</td>
<td>0.11</td>
<td>0.10</td>
</tr>
<tr>
<td>N</td>
<td>145</td>
<td>391</td>
<td>145</td>
</tr>
<tr>
<td>F (Pr &gt; F)</td>
<td>3.91</td>
<td>6.00</td>
<td>2.52</td>
</tr>
<tr>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0082)</td>
<td>(&lt;.0001)</td>
</tr>
</tbody>
</table>
4.4.4 Results by Hypothesis

4.4.4.1 Hypothesis 1.1

Hypothesis 1.1 predicted that profit status would be negatively associated with quality. The model predicted that a resident with average daily nursing care needs could expect to receive 10% less nursing time (or 24 minutes per day) in a FP facility compared to a NFP facility.

This hypothesis was confirmed based on the results of Model 1 displayed in Table 9. This finding is consistent with a number of studies finding a negative relationship with quality and provides support for further examination into the exact role profit status plays in the relationship between Medicaid reimbursement rates and quality.

Table 9 Results for Hypothesis 1.1

<table>
<thead>
<tr>
<th>Profit Status</th>
<th>Dependent Variable All Nursing NSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profit Status (1 = FP; 0 = NFP)</td>
<td>-0.10 (&lt;=.0001)</td>
</tr>
</tbody>
</table>

4.4.4.2 Hypothesis 2.1

Hypothesis 2.1 proposed that the Medicaid rate per CMU would be positively associated with quality for both NFPs and FPs. This hypothesis was confirmed based on the coefficients for Medicaid rate per CMU illustrated below in Table 10.
Table 10  Results for Hypothesis 2.1

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nurse Aide NSR</th>
<th>LPN NSR</th>
<th>RN NSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFP FP NFP FP</td>
<td>NFP FP</td>
<td></td>
</tr>
<tr>
<td><strong>Medicaid Rates – Model 2A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Rate per CMU</td>
<td>0.01 0.01</td>
<td>0.02 0.02</td>
<td>0.00 0.02</td>
</tr>
<tr>
<td></td>
<td>(.0018)</td>
<td>(.0038)</td>
<td>(.2756)</td>
</tr>
<tr>
<td></td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td><strong>Medicaid Rates – Model 2A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FY00 Medicaid Rate per CMU</td>
<td>0.01 0.01</td>
<td>0.02 0.02</td>
<td>0.03 0.00</td>
</tr>
<tr>
<td></td>
<td>(.0011)</td>
<td>(.0034)</td>
<td>(.2855)</td>
</tr>
<tr>
<td></td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
</tr>
<tr>
<td>FY01 1st Dif Medicaid Rate per CMU</td>
<td>0.03 0.02</td>
<td>0.04 0.05</td>
<td>0.01 0.01</td>
</tr>
<tr>
<td></td>
<td>(.0149)</td>
<td>(.2352)</td>
<td>(.5102)</td>
</tr>
<tr>
<td></td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
<td>(&lt;.0001)</td>
</tr>
</tbody>
</table>

For a resident with the statewide daily average number of nurse aide minutes required (about 143 minutes per day), this means that for every increase of $1.00 in the weighted rate per case mix unit ($1.00 for a facility with 100% Medicaid occupancy or $2.00 for a facility with 50% Medicaid occupancy), both NFPs and FPs increase their nurse aide minutes provided per day by 1.4 minutes. For a resident with the statewide daily average number of LPN minutes required (about 39 minutes per day for NFP residents and 40 minutes per day for FP residents), a $1.00 increase in the weighted rate per case mix unit will result in an additional 0.7 LPN minutes per day. For a resident of a FP facility with the statewide FP daily average number of 58 RN minutes required per day, this means that a $1.00 increase in the weighted rate per case mix unit will increase RN nurse staffing about 2 minutes per day. Because the NFP coefficient was non-significant, the model predicts no change in RN nurse staffing as the result of an increase in the weighted rate per case mix unit.

4.4.4.2  **Hypothesis 2.2**

This hypothesis predicted that Medicaid indirect care incentive payments would
be positively associated with quality for NFP facilities and negatively associated with quality for FP facilities. However, as indicated in Table 11, where these coefficients were statistically significant, they had a negative sign for both NFP and FP facilities.

For a NFP resident with the statewide NFP daily average number of nurse aide minutes required (about 144 minutes per day), this means that for every increase of $1.00 in the weighted ICI, the facility will reduce the number of NA minutes provided per day by 5.0. For a FP resident with the statewide FP daily average number of LPN minutes required (about 40 minutes per day), a $1.00 increase in the weighted ICI will result in a drop of 1 LPN minute per day. For a resident with the statewide daily average number of RN minutes required per day (56 for NFPs and 58 for FPs), this means that a $1.00 increase in the weighted ICI will decrease RN nurse staffing about 3.8 minutes per day in NFPs and 1.7 minutes per day in FPs.

### Table 11 Results of Hypothesis 2.2

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nurse Aide NSR</th>
<th>LPN NSR</th>
<th>RN NSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFP</td>
<td>FP</td>
<td>NFP</td>
</tr>
<tr>
<td>Medicaid Rates – Model 2A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Indirect Care Incentive</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>FY00 Medicaid ICI</td>
<td>-0.04</td>
<td>-0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>FY01 1st Dif Medicaid ICI</td>
<td>0.00</td>
<td>-0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

### 4.4.4.3 Hypothesis 2.3

This hypothesis predicted that Medicaid cost of ownership incentive payments would have a similar relationship with quality as between indirect care incentive
payments, i.e., a positive association for NFPs and a negative association for FPs.

Results are displayed for Models 2A and 2B in Table 12. None of the coefficients indicates a statistically or clinically significant relationship with any of the quality measures.

Table 12  Results of Hypothesis 2.3

<table>
<thead>
<tr>
<th>Dependent Variables</th>
<th>Nurse Aide NSR</th>
<th>LPN NSR</th>
<th>RN NSR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NFP</td>
<td>FP</td>
<td>NFP</td>
</tr>
<tr>
<td><strong>Medicaid Rates – Model 2A</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medicaid Cost of Ownership Incentive</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>(.6469)</td>
<td>(.2693)</td>
<td>(.9669)</td>
</tr>
<tr>
<td><strong>Medicaid Rates – Model 2B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FY00 Medicaid COI</td>
<td>0.01</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>0.024</td>
<td>0.012</td>
<td>0.054</td>
</tr>
<tr>
<td></td>
<td>(.6422)</td>
<td>(.2672)</td>
<td>(.9540)</td>
</tr>
<tr>
<td>FY011st Diff Medicaid COI</td>
<td>0.00</td>
<td><strong>0.07</strong></td>
<td>-0.10</td>
</tr>
<tr>
<td></td>
<td>(.9775)</td>
<td>(.0280)</td>
<td>(.6332)</td>
</tr>
</tbody>
</table>

4.4.4.4  Hypothesis 3.1

4.4.4.4.1  Clinically Significant Moderation between Rate per CMU and RN NSR

The 95% confidence intervals of the coefficients for rate per CMU using Model 2A and three different measures of quality are displayed in Figure 4. The only difference that was statistically significant using the method described in Section 3.2 was the difference between NFPs and FPs with respect to the relationship between the rate per CMU and RN nurse staffing ratios. But instead of NFPs having a stronger positive relationship than FPs as hypothesized, NFPs had a nonsignificant relationship between the rate and quality while FPs had a significant positive relationship.

As described in Section 3.2, clinically significant moderation was evaluated at
various levels of Medicaid occupancy using the coefficients (derived using weighted rates) multiplied times unweighted rates while holding Medicaid occupancy constant for both strata, e.g., 50%, 65%, and 100%. Holding Medicaid occupancy and the unweighted rate constant for both strata, the clinically significant thresholds are a minimum difference between the sectors of 0.035 points for the NA NSR, 0.077 points for the LPN NSR, and 0.053 points for the RN NSR.

Table 13 lists the rates and their percentiles for the total sample and each stratum. Medicaid occupancy rates used in simulating the effects of Medicaid rates at varying levels of Medicaid occupancy were 25%, 50%, stratum means, 75% and 100%.

In examining the relationship between the rate per CMU and RN NSR, none of these clinically significant thresholds were met and clinically significant moderation between the rate per CMU and RN NSR was rejected.
Figure 4  95% Confidence Limits for Rate per Case Mix Unit Coefficients in Relationship to Quality

Table 13  Rates per Case Mix Unit Used to Evaluate Moderation

<table>
<thead>
<tr>
<th>Unweighted Rate per CMU for FY00/FY01</th>
<th>Pooled Percentile</th>
<th>NFP Percentile</th>
<th>FP Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>$25.46</td>
<td>10&lt;sup&gt;th&lt;/sup&gt;</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>13&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>$28.93</td>
<td>25&lt;sup&gt;th&lt;/sup&gt;</td>
<td>8&lt;sup&gt;th&lt;/sup&gt;</td>
<td>32&lt;sup&gt;nd&lt;/sup&gt;</td>
</tr>
<tr>
<td>(FP Mean) $31.40</td>
<td>41&lt;sup&gt;st&lt;/sup&gt;</td>
<td>21&lt;sup&gt;st&lt;/sup&gt;</td>
<td>49&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>$32.50</td>
<td>50&lt;sup&gt;th&lt;/sup&gt;</td>
<td>23&lt;sup&gt;rd&lt;/sup&gt;</td>
<td>60&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>(NFP Mean) $36.74</td>
<td>74&lt;sup&gt;th&lt;/sup&gt;</td>
<td>45&lt;sup&gt;th&lt;/sup&gt;</td>
<td>85&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>$37.09</td>
<td>75&lt;sup&gt;th&lt;/sup&gt;</td>
<td>46&lt;sup&gt;th&lt;/sup&gt;</td>
<td>86&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>$40.94</td>
<td>90&lt;sup&gt;th&lt;/sup&gt;</td>
<td>81&lt;sup&gt;st&lt;/sup&gt;</td>
<td>97&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
<tr>
<td>$45.72</td>
<td>100&lt;sup&gt;th&lt;/sup&gt;</td>
<td>100&lt;sup&gt;th&lt;/sup&gt;</td>
<td>100&lt;sup&gt;th&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
4.4.4.4.2 Clinically Significant Moderation between Medicaid ICI and RN NSR

Figure 5 illustrates the 95% confidence intervals for the ICI coefficients based on Model 2A for each of the three quality measures. Once again, only the relationship between the ICI and the RN nurse staffing ratio was statistically significant at the p < .05 level.

Figure 5  95% Confidence Limits for Indirect Care Incentive Coefficients in Relationship to Quality

Using the same approach for evaluating clinically significant moderation between the rate per CMU and RN NSR, the effects of the ICI rate on RN NSRs within each stratum were compared. The effect differences are illustrated in columns 2-4 of Table 15. The highlighted cells represent points along the range that meet the clinically significant
criterion of a change in the RN NSR of at least 0.053 points. Columns 4-6 convert the
point differences into minutes of nursing time provided for a resident of average acuity.
The results are independent of the effects caused by other parts of the model.

Table 14  Rates for Indirect Care Incentive Payments Used to Evaluate
Moderation

| Unweighted ICI for | Pooled Percentile | NFP Percentile | FP Percentile |
| FY00/FY01         |                  |               |              |
| $0.00             | 10\text{th}     | 52\text{nd}  | 11\text{th}  |
| $0.30             | 25\text{th}     | 58\text{th}  | 14\text{th}  |
| (NFP Mean) $1.33  | 31\text{st}     | 65\text{th}  | 19\text{th}  |
| (FP Mean = $3.28) | 50\text{th}     | 79\text{th}  | 40\text{th}  |
| $3.27             |                  |               |              |
| $4.56             | 75\text{th}     | 94\text{th}  | 69\text{th}  |
| $4.96             | 90\text{th}     | 98\text{th}  | 93\text{rd}  |

Table 15  Clinically Significant Moderation based on NFP and FP Differences in
Association of ICI Payments and RN NSRs (Independent of Other Variable Effects)

<table>
<thead>
<tr>
<th>Unweighted ICI Rate (FY00 and FY01 Combined)</th>
<th>(NFP Effect of 1% Change in ICI on NSR) - (FP Effect of 1% Change in ICI on NSR)</th>
<th>Additional Nursing Minutes Provided assuming Resident of Average Need</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medicare Occupancy 50% 75% 100%</td>
<td>Medicare Occupancy 50% 75% 100%</td>
</tr>
<tr>
<td>$0.30</td>
<td>-0.006 -0.009 -0.012</td>
<td></td>
</tr>
<tr>
<td>$1.33</td>
<td>-0.027 -0.040 -0.054</td>
<td>-3.1</td>
</tr>
<tr>
<td>$3.27</td>
<td>-0.066 -0.099 -0.132</td>
<td>-3.8 -5.7 -7.6</td>
</tr>
<tr>
<td>$4.56</td>
<td>-0.092 -0.138 -0.185</td>
<td>-5.3 -7.9 -10.5</td>
</tr>
<tr>
<td>$4.96</td>
<td>-0.100 -0.151 -0.201</td>
<td>-5.7 -8.6 -11.5</td>
</tr>
<tr>
<td>$5.42</td>
<td>-0.110 -0.165 -0.219</td>
<td>-6.3 -9.4 -12.5</td>
</tr>
</tbody>
</table>

To illustrate moderation using all of the model variables’ effects, quality was
reestimated using unweighted rates, the original rate coefficients, and varying levels of
Medicaid occupancy holding all non-rate variables constant. To plot the effect of the rate
per CMU, the value of the rate per CMU was set equal to rates along its entire range.
The other two rate variables were set at their stratum means. Then, the NSR was
calculated for different Medicaid occupancy rates. An example using the ICI rate holding
the other two rates at their stratum means is illustrated in Figure 6.

**Figure 6**  Illustration of Profit Status Moderation of Relationship between
Indirect Care Incentive Rate and RN NSR: Model 2A – (Taking into Account Other
Variables)

The two vertical lines represent the stratum mean unweighted ICI payments in CY
2000. At the mean unweighted ICI and stratum mean Medicaid occupancy rate (the large
triangles), the NFP RN NSR is .070 points greater than the FP RN NSR. On average, the differences in RN NSRs are clinically significant and favor NFPs. Assuming stratum mean occupancy, a NFP would have to be receiving more than $2.85 to cross the FP regression line, the sector’s 77th percentile. To reach the point at which the facility was actually delivering clinically significantly less time than FPs, the NFP would have to receive $4.50 more in ICI payments, the sector’s 90th percentile.

In fact, 52% of the NFPs received no ICI payment in CY00 compared to 11% of the FPs. Plotted on the vertical axis at their respective stratum mean Medicaid occupancy rate, the expected NFP RN NSR is 0.065 points higher than that for FPs. But, at 100% Medicaid occupancy for FPs and stratum mean Medicaid occupancy for NFPs, the expected FP RN NSR would exceed the NFP’s by about 0.070 points.

4.5 Summary of Results

In general, the data provided little support for moderation of the Medicaid reimbursement and quality relationship. Profit status had a negative relationship with quality based on the results achieved with Model 1. The Medicaid rate per CMU had a positive relationship with quality for both NFPs and FPs. When statistically different from zero, the relationship between Medicaid ICI payments and quality was negative, regardless of profit status. However, over half of the NFPs received no ICI payment during CY 2000 making the mean and parameter estimate less representative of the entire sample. Medicaid capital incentive payments had no relationship with quality for either sector.

Statistically significant moderation, when it did occur, suggests that FP facilities
use more of their Medicaid rate per CMU to increase the RN NSRs (RPCMU) and reduce their RN NSR less as their Medicaid ICI increases compared to NFPs.

Clinically significant moderation occurred in only one instance out of 9 tested and not in the predicted direction. The relationship between ICI and RN NSRs was negative for both sectors but stronger in the NFP sector compared to its counterpart.
5. Limitations and Implications for Policy and Research

5.1 Study Limitations

The study had a number of limitations, some of which may have contributed to the lack of significance in the findings. Limitations include the following:

- Directors of Nursing, RNs by law, were included in the estimates of nursing time provided. The average number of beds in the sample’s FP facilities was 98.7 (s.d. = 45.7) compared to a NFP mean of 109.4 (s.d. = 58.9). Because a DON is required for all facilities, regardless of size, the RN NSR would tend to be higher, all other things being equal, for reasons related to scale.

- None of the models allowed for substitution of nursing time needed by a different level of nursing care professional than what was specified in the time-and-motion studies. While it is unlikely in most cases illegal for a NA to substitute for a licensed nursing professional, both sectors use LPNs to substitute for RNs. By looking at each discipline individually without controlling for the other NSRs (or at least other licensed nursing category), differences in the way each sector uses substitutes was not taken into account when considering moderation.

While Medicaid cost report data are subject to reliability concerns, most of the variables used in this study were validated with rate information from the state Medicaid agency. The exception was non-operating and net-operating revenues. These two
variables, if measured with error, would render the coefficients unreliable. This limitation, however, characterizes all prior research studies using unaudited cost report data.

Finally, operationalizing private pay revenues as a dichotomous variable resulted in a loss of precision for a critical variable. A multi-stage method would be preferred in future efforts to control for variation in payer mix absent information on prices paid by Medicare and private payers.

Finally, the use of RUGs-III data to estimate residents’ needs for nursing care assumes that the facilities that participated in the 1995 and 1997 time and motion studies for CMS were providing nursing care with the optimal mix of skills needed to assure quality in care processes and resident outcomes.

5.2 Implications for Policy

Regardless of the study’s limitations, the study raises the possibility of biased estimates in health services researchers’ tendency to use of total average Medicaid rates to model the relationship between Medicaid reimbursement and quality. This study found positive relationships between one component of Ohio’s daily total Medicaid rate, a negative relationship with a different component, and no relationship with a third.

The current study also contributed something new to the most recent studies on the topic of Medicaid reimbursement and quality:

- Use of RUGs-III data to derive case-mix adjusted nurse staffing ratios as the input-based measure of quality;
- State-level data avoiding confounding the results due to state-level variations in what Medicaid rates cover and FP/NFP mix across states; and
- Testing the role of profit status as a moderator in the relationship.

The fact that profit status, by and large, did not moderate the relationship between any of the rate variables should reassure those who are convinced that FP providers use Medicaid dollars differently than NFP providers. However, the study does highlight differences between NFPs and FPs reflecting differences in spending behavior (and subsequent reimbursement rates). And the differences between the two sectors are not minor. In fact, unadjusted for any other facility or market covariates, a resident of average acuity can expect to receive 26 more minutes of total nursing time per day, 11% of his or her total nursing care requirements in a NFP facility compared to a FP facility. Table 16 illustrates more of these differences.

Table 16  NFP and FP Differences in Nurse Staffing according to Case-Mix Adjusted Nurse Staffing Ratios

<table>
<thead>
<tr>
<th>Type of Nursing Care</th>
<th>Avg Nursing Minutes Needed per Day</th>
<th>Case-Mix Adjusted Ratio</th>
<th>Difference in Nursing Minutes (NFP – FP)</th>
<th>% Nursing Time Needed per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>NFP</td>
<td>FP</td>
<td></td>
</tr>
<tr>
<td>All</td>
<td>239.2</td>
<td>1.05</td>
<td>.94</td>
<td>26.3</td>
</tr>
<tr>
<td>Licensed</td>
<td>96.5</td>
<td>0.96</td>
<td>0.88</td>
<td>7.7</td>
</tr>
<tr>
<td>RN</td>
<td>57.1</td>
<td>0.69</td>
<td>0.62</td>
<td>4.0</td>
</tr>
<tr>
<td>LPN</td>
<td>38.7</td>
<td>1.36</td>
<td>1.26</td>
<td>3.9</td>
</tr>
<tr>
<td>NA</td>
<td>142.8</td>
<td>1.10</td>
<td>0.97</td>
<td>18.6</td>
</tr>
</tbody>
</table>
While some might perceive these differences as unimportant or nurse staffing ratios greater than 1.0 as inefficient, staffing levels measured in hours per resident day in Ohio nursing homes is below nationally recommended levels and FPs are significantly lower than NFPs. Table 17 below lists the recommended nurse staffing levels from the Hartford Foundation (Harrington et al., 2000b) and based on the research of Kramer et al (Kramer et al., 2001) and Schnelle et al (Schnelle et al., 2001) and the percentages of NFP and FP sample facilities below these levels.

| Table 17  Percent of Study Sample Nursing Facilities Below Recommended Staffing Levels: CY2000 |
|----------|------------------|------------------|------------------|
|          | NFP (N=145)     | FP (N=391)       | Pr > Chi-sq      |
| Hartford Foundation (2000) and NCCNHR (1998) |                  |                  |                  |
| Total Nursing (including Administrative Nursing Personnel) < 4.55 HPRD | 75.2              | 88.8             | <.0001           |
| Kramer et al, 2001 - Long-stay pop |                  |                  |                  |
| Total Nurse Aides < 2.78 HPRD | 65.5              | 86.5             | <.0001           |
| Total Licensed Nursing Personnel (excluding Administrative Nursing Personnel) < 1.30 HPRD | 36.6              | 52.2             | 0.0013           |
| Total RNs (excluding Administrative Nursing Personnel) < 0.75 HPRD | 78.6              | 87.0             | 0.0172           |
| Total Nursing (excluding Administrative Nursing Personnel) < 4.08 HPRD | 51.7              | 79.8             | <.0001           |
| Schnelle et al, 2001 - Low Case Mix |                  |                  |                  |
| Total Nurse Aides < 2.80 HPRD | 66.2              | 87.5             | <.0001           |
| Schnelle et al, 2001 - High Case Mix |                  |                  |                  |
| Total Nurse Aides < 3.20 HPRD | 85.5              | 94.9             | 0.0003           |

Ohio’s levels of understaffing are probably not that different from other states but the dominance of the FP sector places conceivably more residents than states with a smaller FP industry sector at higher risk of adverse outcomes associated with low levels of nurse staffing.
In other analyses, not presented here, the case-mix adjusted nurse staffing ratios reveal trends in nurse staffing that contradict those based on the conventional and more frequently used measure, hours per resident day. This highlights the importance of making case-mix adjusted staffing information available to families, residents, and prospective purchasers on a daily basis.

Case-mix adjusted reimbursement is not a guarantee that residents’ needs will be met. Under prospective payment systems, rates are based on either the facility’s own or peer group’s historical spending. This fact tends to preserve inequities in the system at the time of initial adoption. Unless providers have real incentives to change spending behavior, PPS is not conducive to quality improvements that add cost. Therefore, market-based approaches are vital to encouraging providers to improve quality. Until researchers develop better methods of measuring quality, consumers should be permitted to have access to case-mix adjusted nurse staffing measures to decide for themselves whether they want to select one nursing home over another. It is an important parameter and not currently provided by CMS or Ohio.¹⁰

The fact that the indirect care incentive based payments under Ohio’s reimbursement system were found to have a negative relationship with quality, regardless of profit status, has important relevance for the many states that still have these systems. While Medicaid rate-setting methodologies vary around the country, this finding should motivate policy-makers to consider other market-based means to incent cost-saving behaviors, e.g., providing consumers with more useful and accessible information to

¹⁰ CMS currently has a contract with the University of Colorado to develop case-mix adjusted nurse staffing information for consumers.
select a nursing home.

5.3 Implications for Future Research

This study has a number of implications for future research. Low levels of nurse staffing have been directly linked to poorer outcomes and higher overall health care system costs (Kramer et al., 2001; Schnelle et al., 2004; Dorr et al., 2005). More research is needed to determine the cost trade-offs of low levels of nurse staffing and overall health care systems costs. The effects of understaffing have certainly taken a toll on the industry as evidenced by increasing liability claims and tort cases filed involving nursing home residents (Bourdon et al., 2005).

The nursing shortage, especially for RNs, will necessitate continued research into ways to reduce the need for RNs. Quality care in nursing homes, while generally low-tech in the types of care provided, depends on good communication among different levels of nursing care and ancillary care staff that interact with residents 24 hours a day, 7 days a week. Information necessary to provide good care to a nursing home resident is very different from the information necessary to provide good care to a hospital patient with an acute illness. While nursing homes are just beginning the move to electronic medical record-keeping, it will take time to incorporate this technology into care giving protocols, tools for monitoring and improving care, and revising estimates of time needed for various types of nursing care professionals.

Health services researchers have tended to rely on federal surveyor data to adjust for facility variations in acuity. The RUGs-III system, used to pay billions of Medicare and Medicaid dollars for nursing home care, offers a cluster-based approach to adjusting
for acuity instead of a regression-based approach. Because of its classification system-
based approach to adjustment, it takes into account a broader range of residents. The
time studies, albeit in need of updating along with the highest intensity categories of the
RUGs-III system, allow researchers to translate resident acuity into RN, LPN and NA
times needed. Greater use of these measures as risk adjusters may yield better estimates
of study variables whenever resident acuity is an adjuster or main variable of interest.

Finally, the fact that reimbursement explains very little of the variation in
facility’s responses to resident care needs suggests the presence of other fixed and
random effects waiting to be discovered that might help policy makers to affect quality
improvements. More qualitative research is needed to improve our understanding about
the range of decisions being made in nursing homes that affect care processes, internal
communication, management, adoption of quality-enhancing ways of doing business, as
well as staffing. Only in this way can we begin to develop effective training programs
and technology to improve the quality of care and the quality of life for the nation’s
nursing home residents.
Reference List


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