Article

Cost Analysis of the Ohio Nursing Home Industry

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This study was part of a major review of long-term care policy in the state of Ohio. The authors analyzed 1532 cost reports filed by nursing homes in 1975–1976 with the Ohio Medical Assistance (Medicaid) program. The objective was to guide policy on size (economies of scale), ownership, certification status, and reimbursement. Economies of scale were not found important: skilled nursing facilities (SNFs) offered the only evidence of operation below optimal scale, and the savings attributable to achieving optimal scale (increasing average bed size from 108 to 143) amounted to only $0.20 per patient day. Proprietary facilities were consistently less costly than voluntary or governmental facilities; however, quality measures were not available, and the largest cost differential was in direct cost where quality might be affected. Hypothesized greater efficiency in proprietary facilities could not be rejected—if accurate, the cost savings were very large ($3.92 to $9.14 per patient day for all homes together). As expected, skilled facilities were more costly than intermediate care facilities (ICFs), and the differential ($3.31 per patient day) was large enough to suggest transfer of misplaced patients. High proportional Medicaid utilization of a home tended to reduce cost, possibly because of the very low ceiling rates paid by the Ohio Medicaid program during the period of this study (1975–76 data). High utilization in general reduced average cost, presumably by spreading fixed cost.

One of the fastest growing institutional components of the health care industry is the nursing home sector. Annual per capita national expenditures for nursing home care increased from $0.25 in 1940 to $89.46 in 1980,

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an increase of approximately 16 percent per year. This rate of acceleration substantially exceeded the growth rate of the hospital industry over the same period, and the trends are expected to continue as our nation's population ages.[1]

Cost control in the nursing home industry is becoming increasingly important as it claims a larger percentage of our total national health care expenditures. The cost effects of alternatives to institutionalization have been studied.[2] However, there are relatively few published studies which provide any empirical cost analysis of the nursing home industry, in sharp contrast to the great number of hospital cost studies.[3] This paper reports the results of a large-scale cost study that used data contained in Medicaid cost reports for Ohio nursing homes. Emphasis is given to the effects on nursing home costs of a set of variables which can be manipulated by policy decision.

COST CONTROL POLICY AREAS IN LONG-TERM CARE

The increase in expenditures for long-term care by state governments and the imminent decline in Federal support have placed a heavy burden on budgets already constrained by inflation and taxpayer resistance. Policy-makers are asked to curtail or at least moderate Medicaid expenditures, but also to provide sufficient financing to insure the provision of adequate quality care and an expansion in supply to meet projected future increases in demand.[4] While the number of possible alternatives for cost control in the nursing home industry is large, our analysis is constrained by space and available data to four potential policy areas:

— economies of scale
— type of ownership
— certification status
— reimbursement

Within these areas we have also been selective, because of the same limitations. For instance, our discussion of reimbursement is limited to features observable in our data, and is not a general review of financing long-term care.

ECONOMIES OF SCALE

There is a widespread belief that bigger health care facilities either are or should be less costly. This belief has created a number of policy directives designed to promote bigness in the industry, in spite of the failure of most

empirical studies to give clear evidence of scale economies. Many Health Systems Agencies (HSAs) have imposed formal or informal criteria for minimum bed sizes for approved nursing home projects. Figures commonly used are 50 or 100 beds; we can find no compelling justification for those figures (or any figure). At least one state—California—relates Medicaid reimbursement ceilings to bed size. Larger homes are not permitted the same level of per diem reimbursement as smaller homes. While a reimbursement strategy such as this may be equitable to existing homes, it diminishes the incentive for larger scale operations if in fact economies of scale do exist.

The promotion of larger scale operations, especially in the nursing homes industry, does not occur without some cost. Larger homes will usually mean greater commuting distances for friends and relatives of the patient and thus increased costs. More importantly, it may also mean reduced visits by family and friends, possibly adversely affecting patient recovery potential. Finally, promotion of larger homes may discourage entry into the industry except by larger corporations which are able to meet the increased investment costs. This may retard industry growth necessary to meet increased demand and result in increasing utilization of more expensive acute care beds or premature discharges, neither of which is likely to be cost effective. In addition, a bias toward corporate ownership could have substantial impact on economic concentration and long-run industry performance.

Most recent studies have questioned the empirical relevance of economies of scale in the nursing home industry. In both the Skinner and Yett[5] study and the Ruchlin and Levey[6] study there is no conclusive evidence for the existence of economies of scale. Smith and Fottler[7] do report a declining cost function, though the magnitude of the slope is not large and no provision is made for curvature in the relationship.

TYPE OF OWNERSHIP

Relative to the hospital industry, the nursing home industry has a very high percentage of proprietary ownership. In our Ohio sample, 74 percent of the nursing home beds were investor-owned. Concrete assessments of the relative merits of proprietary ownership cannot be made until some determination about both the quality and nature of output provided by proprietary and voluntary facilities has been reached. In the Levey et al. study, one noteworthy finding was that nonprofit nursing homes showed higher per diem costs but did not show higher quality ratings.[8]

Since no direct measures of quality are available in our study, our results reflecting the relative efficiencies of proprietary versus voluntary

ownership effectively assume identical quality (except when quality varies with other things, such as SNF (skilled nursing facility) or ICF (intermediate care facility) certification. However, it is possible to determine what specific cost categories are more likely to be affected by quality variation and thus make some inference about the strength of any finding with respect to ownership.

CERTIFICATION STATUS

Until 1972 Medicaid provided reimbursement for skilled nursing care only; intermediate care was not officially recognized.[9] In P.L. 92–603, which established the current distinction, Congress insisted that there be a reasonable cost difference between skilled (SNF) and intermediate (ICF) care. The Social Rehabilitation Services/Medical Services Administration may penalize any state in which a reasonable difference does not exist between the average per diem amounts paid for these two levels of care.[10]

The rationale behind legislation authorizing two levels of care for Medicaid was cost control. It was generally believed that many patients were housed in skilled facilities when in fact their care requirements were less. Inappropriate placement may still be a problem today. Winn cites several studies which indicated that 22 to 85 percent of all nursing home patients were misplaced.[11] Most of this misplacement resulted from the provision of higher levels of care than that required. In the state of Ohio, a study done in 1975 determined that 9 percent of all nursing home patients were misplaced.[12] This value appears low when compared with other studies because it includes only patients seen by a medical review team and recommended for immediate transfer.

Some health professionals expressed fear that a wholesale transfer of patients from SNFs to ICFs would occur as a result of the legislation. The resulting impact on state budgets would be favorable, but the impact on patient care might be disastrous because of both patient "relocation shock" and lower nurse staffing standards in ICFs. To some extent, these fears have been realized, especially in California.[13]

One study that attempted to determine the impact of this legislation found no statistically significant differences between SNFs and ICFs in a five state sample, except for New York where reimbursement policy affected the analysis.[14] Confounding the analysis of this issue is the vagueness of Medicare and Medicaid certification requirements, which will be discussed below.

REIMBURSEMENT

In a recent survey of long-term care experts, the major problem identified was inadequate reimbursement.[15] Inadequate reimbursement may not

necessarily translate into inadequate profitability, especially for the larger corporations involved in the provision of nursing home services.[16] Low levels of reimbursement, especially from Medicaid which accounts for over half of all nursing home financing, may indeed produce incentives for the curtailment of costs in essential service-related areas.

For example, given the lack of specificity in Medicaid certification standards, nursing home providers might be able to cut direct patient care-related expenditures, especially for nurse staffing, significantly below what adequate quality care levels would dictate. One state at least—Washington—has recognized the severity of this problem and attempted to deal with it in the Medicaid reimbursement formula. The state of Washington permits reimbursement for actual costs incurred in direct care-related expenditure areas such as dietary and nursing. Ceilings are then imposed for indirect costs where the relationship between quality of care and expenditure is less direct.

An allegedly common strategy of nursing home providers reacting to inadequate levels of reimbursement is screening patients. With a flat reimbursement rate, nursing home providers have a strong financial incentive to prefer those patients whose care requirements are minimal. Given the existing two-category classification of Medicaid patients and the absence of good criteria for the determination of appropriate care levels in most states, opportunities for patient screening exist. A possible remedy in future reimbursement schemes would be to determine reimbursement in part by case mix, which Skinner and Yett have shown is related to cost.[17]

Finally, occupancy may also be an important reimbursement policy variable. Ohio Medicaid reimbursement formulas provide a penalty for nursing homes operating below 85 percent occupancy and a reward for homes above 95 percent. (The fixed-cost element of the per diem rate cannot be larger than what would have occurred at 85 percent occupancy or smaller than at 95 percent occupancy.) Since prior studies have shown a significant relationship between cost and occupancy, this variable is of importance in our study.[18]

THE MODEL

The principal results of this study are drawn from multiple regression analysis with cost as the dependent variable. Three measures of cost were used: total cost, direct cost, and indirect cost. The indirect costs are primarily overhead costs; they are not all entirely fixed but are more so than direct costs, and are less directly related to patient care. All were

expressed as cost per patient day because of the problem of heteroskedasticity in a sample of nursing homes of widely varying sizes.

The estimating equations took the form:

$$AC = b_0 + b_1\ Size + b_2\ Size^2 + b_3\ Occ + b_4\ Medic + b_5\ Govt + b_6\ Prop \\ b_7\ SNF + b_8\ Comb$$

where
- $Size$ = size of the facility, measured in beds
- $Size^2$ = the square of size
- Occ = average occupancy, expressed as a proportion
- $Medic$ = the proportion of patient days covered by Medicaid
- $Govt$ = binary variable coded 1 for government ownership, 0 otherwise
- $Prop$ = binary variable coded 1 for proprietary ownership, 0 otherwise
- SNF = binary variable coded 1 for *SNF* certification, 0 otherwise
- $Comb$ = binary variable coded 1 for combination *SNF/ICF* certification, 0 otherwise
- AC = one of the measures of average cost

The omitted values for the ownership and certification binary variables imply that the intercept reflects not-for-profit ownership and ICF certification. The model was also estimated separately by certification category, in which case SNF and Comb were dropped. Interaction terms were investigated, but did not prove significant.

The expected signs on the coefficients follow from our earlier discussion. To produce the "usual" U-shaped cost curve, the size coefficient must be negative and that on size-squared must be positive. Economies of scale would also require that the function decline over a range sufficient to indicate clear benefit to larger size. Rising occupancy would presumably have a negative impact on average cost, principally as a result of spreading fixed costs. The effect of high Medicaid utilization is also hypothesized negative, because the rather ungenerous reimbursement levels would constrain discretionary spending considerably as the proportion of Medicaid patients rose. The remaining binary variables are intended to reflect case mix and economic motivation. Relative to the intercept (not-for-profit ICF), we hypothesize a negative impact for proprietary control and a positive impact for government control and for SNF or combination certification.

As shown above, the estimating equation reflects an essentially technical rather than behavioral specification. The data set does not permit incorporating input prices or case mix, both of which would

improve our confidence in the technical specification. However, case mix is captured partly by the certification status, especially in the separate estimation by type of facility which permits the other coefficients to vary. The absence of input prices should operate to diminish the apparent efficiency of larger urban facilities which are likely to be in high price areas. The same general direction of bias should be true for case mix.

Alternatively, the model could have been approached more behaviorally, as in Scanlon's recent work on the nursing home market.[19] However, Scanlon does not address the nature of the cost function, and his model is developed for a cross-section of geographical areas (states) rather than individual facilities. Many of his most important variables have no counterpart in our study because our data all come from the same state. It will be interesting to see whether future researchers working on cost estimation can move Scanlon's approach to the micro level.

Although we cannot directly investigate the Scanlon behavioral model with our data, his work suggests a potential problem with ordinary least squares estimation. According to Scanlon, nursing homes admit private-pay patients preferentially and then admit as many Medicaid patients as can be accommodated without violating the relevant optimization rule. In proprietary homes, this is assumed to be profit maximization (operating where marginal revenue equals marginal cost) and in voluntary homes, it is quantity maximization (operating where average revenue equals average cost).

Thus the proportion of Medicaid patients in a facility is in part determined by cost, especially by the relationship of cost to revenue (which is itself frequently a cost-based reimbursement). In the simple OLS specification, cost is constrained by the proportion of Medicaid patients because of the reimbursement limitations; if the converse is also true (Medicaid patient proportion constrained by cost), then a simultaneous equation estimation method is required. In the results below, both OLS and two-stage least squares are shown, the latter treating average cost and Medicaid utilization as jointly dependent.

DATA

The data for this study consist of parts of 1532 cost reports filed by nursing homes with the Ohio Medical Assistance (Medicaid) program. Each observation contains the information from schedules A, A-1, and B of the cost report received for the six month period July 1, 1975, to December 31, 1975, or January 1, 1976, to June 30, 1976. These schedules report basic identifying characteristics of the institutions (such as control, type of

institution), aggregate size and utilization (beds, patient days, etc.), and expense in 14 categories.

The data source presented both unusual opportunities and problems for the researchers. No other study could be identified which has had such a large sample of institutions at this level of detail. Thus, the conclusions drawn from the data are not likely to be biased by sample composition. All the institutions in the sample participated in the Medicaid program during the time period of the survey; only the most exclusive private homes and the lowest quality homes which could not meet Medicaid standards are systematically excluded, as almost all homes have at least some Medicaid recipients.

As with all large data sets, some problems were encountered. Some observations were incomplete, and some variables proved to be unusable because they had been frequently misreported in ways that could not be corrected by the researchers. Except where an obvious correction could be made, observations with errors were deleted. In addition, 15 observations which represented a special class of facility for the mentally retarded were deleted from the statistical analysis. After these deletions, 1382 observations were available for the study. An examination of the deleted observations revealed no patterns which were likely to bias the remaining sample.

CHARACTERIZATION OF OHIO NURSING HOMES

Probably the single most important measure of nursing home utilization is the occupancy rate. In 1976, the nation's nursing homes used 89.0 percent of their available bed capacity to provide 452,878,700 patient days of care.[20] Table 1 depicts a slightly higher utilization of available beds for the state of Ohio—92.8 percent for all nursing homes. The occupancy rate varies slightly with certification status. Nationwide in 1976, skilled nursing facilities (SNFs) had higher occupancy rates than either intermediate care facilities (ICFs) or combination ICF/SNF facilities.[21] The same is true in Ohio, except the differences are not quite as large.

Sources of payment to Ohio nursing homes could not be determined from our data, with the exception of Medicaid. Nationwide, in 1976, 50.6 percent of all nursing home expenditures were financed with Medicaid payments.[22] In the state of Ohio the Medicaid market share was 55.6 percent (Table 1). However, this percentage is based on the proportion of patient days rather than expenditures; to the extent that Medicaid pays less than its share of full costs in Ohio, the expenditure share may be closer to the nationwide value of 50.6 percent.

In 1976, the nation's average cost per patient day of nursing home

Table 1: Summary Statistics for Ohio Nursing Homes—July 1975–June 1976

	All Nursing Homes	*SNF*	*ICF*	*Combination*
Total patient days	16,458,664	8,840,446	5,409,352	2,208,866
Medicaid patient days	9,126,332	4,322,586	3,603,626	1,200,120
Average occupancy	93.5%	93.9%	93.3%	92.6%
Medicaid days/ Inpatient days	55.4%	48.9%	66.6%	54.3%
Total cost	$342,640,288	$196,465,685	$98,574,708	$47,599,895
Average cost/ Patient day	$19.91	$22.02	$18.22	$22.05

care was $23.84, compared with Ohio's $20.85. Broken down by certification status, the national average costs per patient day for SNFs, ICFs and combination facilities were $29.71, $18.37 and $26.53.[23] These national figures are somewhat higher than the comparable Ohio values in Table 1. It should be noted that the cost values for Ohio reflect only the first half of 1976 and the last half of 1975. An adjustment for inflation would have raised these values slightly on a calendar year basis.

A number of factors might explain the rather large difference ($7.69 per day) between the average per diem cost of SNF care in Ohio and that of the nation. One popular explanation is the level of approved SNF rates under Medicaid in Ohio. The state of Ohio during this time period permitted a relatively low maximum rate of reimbursement per day for SNF care, $26.00 per day in fiscal 1976 (up from $17.00 per day in fiscal 1975). The rate was considerably lower than Medicaid rates for SNF care in the contiguous states of Michigan, Indiana, Pennsylvania, Kentucky and West Virginia, especially in 1975. This rate difference was not found to exist for ICF care. With approximately 49 percent of all SNF care in Ohio being delivered to Medicaid patients, Ohio nursing home providers may have felt constrained to provide that care at significantly reduced costs if they wished to attract adequate volume.

The fact that Ohio's SNF average cost was below both the national average and the permitted ceiling in the state can also be explained in terms of Scanlon's model.[24] If the industry was in an "excess demand equilibrium" such as he describes, the observed average cost could lie below the reimbursement rate because profit-maximizing homes would be operating to achieve marginal cost equal to the reimbursement ceiling (marginal revenue).

Ohio had a slightly larger percentage of its total nursing home beds operated by proprietary providers in 1976 than the national average (73.7 percent versus 66.9 percent). Consistent with other research, this may partially explain the difference between national and Ohio per diem costs.[25] However, neither the difference between Ohio and national proprietary concentration nor the difference in cost attributable to proprietary control is likely to yield Ohio's 25.9 percent cost difference from the national mean for SNFs.

Licensure and certification requirements may explain some of the cost difference. Under the Medicare program only reimbursement for skilled nursing care is permitted, while Medicaid allows reimbursement for both skilled and intermediate care. Because certification standards, especially staffing standards, are nebulous under both Medicare and Medicaid, the prime regulatory mechanism for enforcement in many states has been the state's licensure provisions.[26] In the state of Ohio, all licensed nursing homes above 50 beds meet both Medicare and Medicaid certification requirements for both intermediate and skilled care. This lack of clear differentiation of SNF and ICF standards may partially explain why the differences in per diem costs for skilled and intermediate care were so much less in Ohio than in the nation.

RESULTS

The OLS regression results for the pooled sample and separate estimations by type of facility are presented in Tables 2-5. While the coefficients of multiple determination (corrected for degrees of freedom) are not as high as we would like, they are in all cases significant at the .01 level. A substantial amount of unexplained variance still exists. Probably, this reflects our inability to include measures of case mix in the regression as well as the large underlying variance common to large micro data sets, some of which may be accounted for by a lack of uniformity in reporting.

ECONOMIES OF SCALE

In general, our findings give little support for the existence of important economies of scale in the nursing home industry. This finding is consistent with earlier cited studies.[27] For example, in the pooled average total cost regression (Table 2), the coefficient for size squared is significant at the .01 level, but the size coefficient is not and the signs are in the "wrong" direction. If both were significant, they would imply an inverted U-shaped cost curve with a maximum cost occurring at 65 beds. Since the average bed size of a nursing home for Ohio was 72 beds, this means a

Table 2: Linear Regression Results—All Homes

Independent Variables	*Dependent Variables*		
	Average Total Cost	*Average Direct Cost*	*Average Indirect Cost*
Intercept	38.886 (25.66)**	19.934 (21.19)**	18.952 (23.36)**
Size	.0078 (1.15)	-.0038 (0.91)	.0115 (3.20)**
$Size^2$	-.00006 (2.75)**	-.00002 (1.19)	-.00004 (3.76)**
Occupancy	-17.595 (11.05)**	-7.417 (7.51)**	-10.178 (11.94)**
Medicaid utilization	-1.404 (2.90)**	-1.524 (5.06)**	.1199 (0.46)
SNF	3.307 (9.34)**	2.059 (9.37)**	1.248 (6.58)**
Combination	2.250 (4.61)**	1.293 (4.27)**	.9567 (3.66)**
Government	5.217 (6.03)**	2.879 (5.36)**	2.338 (5.05)**
Proprietary	-3.919 (10.42)**	-2.888 (12.38)**	-1.031 (5.12)**
R^2	.321	.314	.224
N	1382	1382	1382
F	81.12**	78.66**	49.57**

Note: absolute *t* values are in parentheses
*denotes significance at the .05 level
**denotes significance at the .01 level

general increase in bed size might lead to a decrease in average cost. An examination of the size coefficients for the regressions separated by type of facility in Tables 3-5 yields inconsistent findings for the average total cost regressions. The size coefficients for average total cost in the ICF sector are not significant.

The size coefficients for average total cost in the SNF sector are significant at the .05 level and do imply a traditional U-shaped cost curve with minimum average total cost occurring at 143 beds. Since the average SNF is currently 108 beds, some increase in bed size might be beneficial.

Table 3: Linear Regression Results—Skilled Nursing Facilities

Independent Variables	*Dependent Variables*		
	Average Total Cost	*Average Direct Cost*	*Average Indirect Cost*
Intercept	54.096	29.838	24.258
	(15.28)**	(14.15)**	(14.07)**
Size	-.0487	-.0429	-.0058
	(2.74)**	(4.05)**	(0.66)
Size^2	.00017	.00014	.00003
	(2.73)**	(3.77)**	(1.00)
Occupancy	-26.084	-12.586	-13.498
	(7.21)**	(5.84)**	(7.66)**
Medicaid utilization	-3.108	-2.601	-.5071
	(3.21)**	(4.50)**	(1.07)
Government	8.613	4.767	3.846
	(4.87)**	(4.53)**	(4.47)**
Proprietary	-4.548	-3.650	-.8990
	(6.76)**	(9.10)***	(2.74)***
R^2	.313	.360	.212
N	490	490	490
F	36.77**	45.23**	21.67**

Note: absolute *t* values are in parentheses
*denotes significance at the .05 level
**denotes significance at the .01 level

However, increasing bed size from 108 to 143 would only reduce average total costs by $.20 per day. The size coefficients are also significant at the .05 level for combination facilities, but imply an inverted U-shaped curve with a maximum average total cost occurring at 122 beds. Since the current average bed size for combination facilities is 107, an increase in bed size could be cost inflating.

Focusing on the average direct and average indirect cost functions for the pooled sample of the three nursing home sectors does not improve significance. It was anticipated that findings of economies of scale might be more likely to occur in the indirect cost area where larger output might imply lower overhead per unit. However, such was not the case. Both parameters of size for indirect costs were significant for the total and for combination facilities, but the cost pattern was an inverted U-shaped

Table 4: Linear Regression Results—Intermediate Care Facilities

Independent Variables	*Dependent Variables*		
	Average Total Cost	*Average Direct Cost*	*Average Indirect Cost*
Intercept	34.418	17.107	17.311
	(23.96)**	(17.70)**	(18.80)**
Size	-.0062	-.0030	-.0032
	(0.55)	(0.39)	(0.44)
$Size^2$	.000003	-.00004	-.00004
	(0.05)	(0.82)	(0.94)
Occupancy	-12.945	-5.100	-7.844
	(8.84)**	(5.18)**	(8.36)**
Medicaid utilization	-1.085	-1.182	.0970
	(2.21)*	(3.59)**	(0.31)
Government	-4.548	-2.785	-1.753
	(3.67)**	(3.35)**	(2.21)*
Proprietary	-3.443	-2.323	-1.119
	(8.08)**	(8.11)**	(4.10)**
R^2	.201	.158	.124
N	767	767	767
F	31.80**	23.72**	17.99**

Note: absolute *t* values are in parentheses
*denotes significance at the .05 level
**denotes significance at the .01 level

curve. Significance at the .01 level for average direct costs was found in both the SNF and combination sectors. However, a traditional U-shaped curve occurred only in the SNF sector.

Thus our regression results show no clear pattern of scale economies, because of insignificant coefficients and the variation of results by type of home. It is reasonable to argue that SNFs do have potential scale economies from our results, but the magnitude appears to be too small for real policy importance. There are four factors which may partially explain the inconclusiveness of our results in this area.

First, there is no real measure of output difference within types of homes in our regressions. It may well be that larger homes typically have more complex and difficult cases than smaller homes. This is generally true in the hospital industry and cannot be rejected as a possibility for

Table 5: Linear Regression Results—Combination Facilities

Independent Variables	*Dependent Variables*		
	Average Total Cost	*Average Direct Cost*	*Average Indirect Cost*
Intercept	38.509	16.833	21.676
	(7.86)**	(6.30)**	(7.59)**
Size	.0464	.0236	.0228
	(2.83)*	(2.64)**	(2.38)*
$Size^2$	-.00019	-.00010	-.00009
	(4.75)**	(4.66)**	(3.80)**
Occupancy	-16.326	-3.534	-12.792
	(2.99)*	(1.19)	(4.02)**
Medicaid utilization	-4.229	-4.447	.218
	(2.49)**	(4.80)**	(0.22)
Government	8.276	5.010	3.266
	(5.06)**	(5.62)**	(3.42)**
Proprietary	-2.554	-1.631	-.992
	(2.26)*	(2.65)**	(1.40)
R^2	.478	.523	.347
N	125	125	125
F	18.02**	21.61**	10.46**

Note: absolute t values are in parentheses
*denotes significance at the .05 level
**denotes significance at the .01 level

nursing homes. Our separation of homes into skilled, intermediate and combination facilities should remove much of the output difference problem, but a substantial residual may still exist. It should be noted, however, that in the Skinner and Yett study, measures of patient severity were included in the regression model and still no conclusive economy of scale finding resulted.[28] Second, there is a possibility that the cost data contained in the Medicaid cost reports are not uniformly reported. However, there should be few problems with the average total direct and average total indirect cost analysis since account classification is less important than if we were investigating departmental (e.g., nursing) cost. There should be no problems with analysis of average total cost assuming the total cost figure reported in the cost report is unbiased. Third, economies of scale are really long-run phenomena referring to changes in

size with no change in the kind of outputs being produced. We are forced to search for economies of scale in the short run and in cross-section, where differences among homes in output, management, and unmeasured input may obscure the question of size efficiency. Finally, some researchers have pointed out that inclusion of the size-squared variable in the regression model might overstate the curvature of the cost curve and produce an inverted U-shaped curve.[29] It should be noted that when the size-squared term is dropped from the regression model, the regression coefficient for the size variable becomes consistently negative (indicating a possibility of economies of scale), but not consistently statistically significant.

OWNERSHIP

Of all the policy variables included for analysis in this study, ownership turns out to be the most significant from both a statistical and an absolute dollar perspective. An analysis of the results for the pooled regression in Table 2 yields several conclusions. First, proprietary homes do, in fact, appear to provide care at lower costs than either voluntary or government-controlled homes. This result is consistent with the Ruchlin and Levey study mentioned earlier.[30] Proprietary homes provide care at an average total per diem cost that is $3.92 less than voluntary homes and $9.14 less than government homes ($3.92 + $5.22). The regression coefficient is significant at the .01 level in the presence of variables accounting for other cost-influencing factors such as type of home, Medicaid utilization, occupancy and size. The second observation is that proprietary homes differ significantly from voluntary and government homes in both average direct and average indirect costs. It should be noted, however, that the relative difference between direct and indirect costs is sizable. Apparently, proprietary homes cut costs more in direct cost than in indirect cost areas. In addition to real cost saving, this may imply that quality of care is indeed different and/or that case mix may be less intense in proprietary homes. Additional data on patient mix and quality would be necessary to provide any definite conclusions.

An analysis of the individual sector regressions in Tables 3-5 corroborates the findings of Table 2. Consistently, proprietary homes are less expensive than voluntary homes which are less expensive than government homes. Furthermore, the area of greatest savings for proprietary homes appears to be in direct costs where the impact on quality might be negative. The one specific exception to those general conclusions is in the ICF sector, where proprietary homes are more expensive than government homes but still less costly than voluntary homes. However, this result

should be interpreted with caution since only eight of the total 767 ICF observations were government homes.

Individual cost category means were reviewed (Table 6) to determine areas in which proprietary homes were likely to be significantly below or above voluntary and government homes. The largest savings were in the property cost category. Items included under property expense are maintenance, fuel, utilities and housekeeping (but not depreciation or interest). Compared with nonproprietary counterparts, proprietary homes have apparently been very effective in curtailing these costs. It also appears that they have significantly lower costs for dietary supply and RN expenses, which may influence the quality of the patient care. Finally, it is interesting to note that proprietaries have greater costs than nonproprietaries, both voluntary and government, in ownership expense. Since this is principally depreciation and interest expenses, our finding may reflect the fact that most proprietary homes have heavily debt-financed their operations, creating much larger financing costs than nonproprietary homes which often use internal funds generated from contributions or tax support. The use of internal funds does have a societal cost that cost statements of nonproprietary homes cannot reflect, which makes a fair comparison of the relative costs of proprietary and nonproprietary homes difficult.

CERTIFICATION STATUS

The certification status of a nursing home is also an important independent variable explaining nursing home cost differences. Table 2 shows that ICFs, after adjusting for other factors, are significantly less costly (.01 level) than either SNFs or combination facilities. According to the regression, a day of SNF care in 1976 was likely to cost $3.31 more than a day of ICF care.

While the mean per diem costs of Table 6 are not adjusted for the impact of other cost-influencing variables, some interpretation is possible. First, it can be seen that the largest single cost category difference between SNFs and ICFs is in the RN expense category. SNFs spend, on average, $.99 more per patient day for RNs than ICFs. A large per diem difference for ownership costs—$.79—also emerged. This may reflect larger capital investment in an SNF than an ICF and perhaps greater interest costs. Nursing service–other ($.52) and other–indirect cost ($.51) categories also reflected differences greater than $.50 per day.

Table 6 shows SNFs and combination facilities similar in cost structure. There was no cost category difference larger than $.50 per day. This may simply represent the effect of dual certification in staffing and equipping a facility to provide two different levels of care. If this is the

Table 6: Mean Per Diem Cost by Category—Ohio Nursing Homes: July 1975–June 1976

Cost Category	*SNF*	*ICF*	*Combination*	*All Nursing Homes*
Dietary–Raw food	$1.67	$1.72	$1.67	$1.69
	(.50)*	(.52)	(.52)	(.51)
Dietary–Supply	1.59	.95	1.59	1.24
	(1.04)	(.63)	(.77)	(.88)
Medical–Supply	.49	.20	.41	.32
	(.65)	(.21)	(.43)	(.46)
Social service	.08	.05	.08	.07
	(.17)	(.17)	(.14)	(.18)
RN	1.62	.63	1.56	1.06
	(1.47)	(.78)	(.98)	(1.20)
LPN	1.65	1.92	1.59	1.80
	(2.00)	(1.94)	(1.38)	(1.91)
Nursing service–Other	4.01	3.49	4.09	3.73
	(1.69)	(1.31)	(1.72)	(1.51)
Utilization review	.04	.01	.02	.02
	(.14)	(.05)	(.06)	(.10)
Other direct	.07	.04	.07	.06
	(.27)	(.26)	(.27)	(.27)
Professional services	.26	.19	.28	.23
	(.37)	(.41)	(.31)	(.39)
Total direct	11.47	9.20	11.38	10.21
	(4.14)	(2.40)	(3.76)	(3.43)
Administration & general	3.61	3.31	3.87	3.46
	(1.49)	(1.44)	(1.77)	(1.50)
Property	1.67	1.73	1.99	1.74
	(1.04)	(.99)	(1.26)	(1.05)
Ownership	3.77	2.98	3.39	3.30
	(1.21)	(1.03)	(1.36)	(1.19)
Other indirect	1.50	.99	1.42	1.21
	(.94)	(.79)	(1.01)	(.90)
Total indirect	10.55	9.01	10.67	9.72
	(3.05)	(2.24)	(3.44)	(2.80)
Total Cost	$22.02	$18.22	$22.05	$19.93
	(6.72)	(3.66)	(6.59)	(5.57)
Observations	490	767	125	1382

Note: Standard deviation values are in parentheses.

case, one might expect the cost structure to be closer to that of facilities which provide the higher level of care.

REIMBURSEMENT

An analysis of the regression coefficients for Medicaid utilization in Table 2 provides an initial picture of the effect of Medicaid utilization on nursing home costs. For both average total and average direct cost per patient day, the coefficients are negative and significant. This supports the findings of Ruchlin and Levey[6] and of Skinner and Yett.[31] Apparently, as Medicaid utilization increases, nursing homes do in fact curtail expenses, especially in direct cost areas where the impact on quality of care is likely to be most immediate. The Medicaid utilization parameter in average indirect cost regressions is not significant, implying that all curtailment in cost produced by increasing levels of Medicaid utilization is likely to occur in direct cost areas. Overall, the regression for average total cost implies that a change in Medicaid utilization from .25 to .75 would result in a reduction in cost per day of approximately $.72 (or about 3.6 percent). Obviously the cost impact is not likely to be large in spite of the significance of the coefficient.

The regressions for the three sectors of the nursing home industry in Tables 3–5 corroborate the general conclusions of Table 2. In all three cases, the Medicaid utilization coefficients for both average total and average direct cost are negative and significant at the .05 level. The Medicaid coefficient for average indirect cost was not significant in any of the cases.

Another important issue is the differential effect control status exerts on the Medicaid utilization–costs relationship. It seems reasonable to expect that proprietary homes would be more affected by increasing levels of Medicaid utilization than either voluntary or government homes. Their basic goal orientation is, after all, profit. An increasing Medicaid utilization might lead them to cut costs more dramatically than their nonproprietary counterparts, who may have access to nonoperating sources of funding to subsidize any difference between actual costs and Medicaid reimbursement. In sum, we should expect in our regression analysis to find coefficients for the Medicaid utilization variable which are both negative and significant more often for proprietary facilities than for the other two control types. Separate regressions (not shown here) were run with the data segregated by both type and ownership. The results appear to support the hypothesis that proprietary homes react more to increasing Medicaid utilization than nonproprietary homes, but we view these as tentative because of the possible joint dependency of utilization and cost. In addition, voluntary homes were affected slightly more by the Medicaid

utilization variable than government homes. This would be expected since the availability of outside funding or operating subsidies would appear to be greatest for government homes.

The possible simultaneity bias in the Medicaid utilization coefficient was examined using two-stage least squares (2SLS). No exogenous variables which could clearly be included in the reduced form estimation could logically be excluded from the second stage. Therefore, to avoid violating the identification conditions, it was necessary to arbitrarily exclude at least one exogenous variable from the second stage to make estimation possible.

Table 7 gives the result of a 2SLS estimation on the pooled data with average total cost as the dependent variable. We elected to remove the size variables to make the equation estimable. For comparison, an OLS estimation excluding the same variables is shown, and Table 2 can be reviewed for the equivalent regression with the size variables present. In this version, it appears that the 2SLS results are quite comparable to the OLS results. However, it should be noted that the 2SLS results are much

Table 7: Linear Regression Results—All Homes, Dependent Variable = Average Total Cost

	Estimation Method	
Independent Variables	*2SLS*	*OLS*
Intercept	38.0903	38.0520
	(17.8626)	(25.6061)
Occupancy	-16.6930	-16.7009
	(-10.3207)	(-10.5252)
Medicaid utilization	-1.4955	-1.4055
	(-.4125)	(-2.9090)
SNF	3.1060	3.1237
	(4.0754)	(10.9126)
Combination	1.9394	1.9486
	(3.2759)	(4.2203)
Government	5.0773	5.0547
	(4.0701)	(5.8624)
Proprietary	-3.7060	-3.7258
	(-4.2287)	(-9.9430)
R^2	.3092	.3121

Note: Absolute *t* values are in parentheses.

more sensitive than OLS results to equation specification. Excluding different variables in the second stage can dramatically change coefficients, suggesting that additional exogenous variables are needed in the reduced form before 2SLS estimation is really reliable.

The final variable to be examined is occupancy, which is of special interest because of Ohio's policy of using occupancy in the reimbursement formula as a penalty/reward factor. The regression results from Table 2 indicate that occupancy has a negative and statistically significant effect on average total, direct and indirect cost. On the average, a one percentage point increase in occupancy will reduce average total cost by approximately $.18 per day. In this respect, it appears that the Ohio Welfare Department policy of a reimbursement penalty for homes operating at occupancy level below 85 percent, and reward for homes above 95 percent, is an effective one.

Table 2 also illustrates that the largest savings are likely to occur in the indirect cost area. This seems reasonable since these costs are more likely to be fixed, and thus increasing occupancy would create declining average cost. A one percentage point increase in occupancy would result in a reduced average direct cost of $.07 and a reduced average indirect cost of $.10. Regression results on the three nursing home sectors in Tables 3–5 imply findings similar to those in Table 2.

DISCUSSION

The analyses reported in this paper rely heavily on the validity of cost report data submitted to the Ohio Department of Public Welfare. As indicated earlier, there does appear to be some lack of uniformity in reporting for individual cost categories. A quick examination of the figures in Table 6 illustrates this point. Standard deviations for many of the individual cost categories appear to be far larger than one might expect because of variability in operations. The authors do believe that the aggregate values of average total, direct and indirect cost are reliable. We thus focused most of our attention on the analysis of these three dependent cost variables.

This does raise an interesting point, however, in future rate/reimbursement regulation of the nursing home industry. If screens on individual cost categories are to be used, as they have been in Ohio since 1977, some system of uniform reporting should be in place. This is a prerequisite for rate control that has been mentioned by others.[32] Without uniform reporting and some system of audit verification, inequitable rates are likely to result which will provide strong financial incentives for manipulative accounting.

We also found that existing formal or informal Health Systems Agency criteria for minimum bed size of nursing homes may not be appropriate. There did not appear to be any significant finding for the existence of economies of scale. Until more definitive results are obtained, it would appear that regulators should be very cautious about imposing arbitrary bed-size criteria. Imposing these criteria does have some negative impact on patient access, and may also restrict entry into the industry and so increase costs because of the relaxing of competitive pressure.

The future role of proprietary organizations in the nursing home industry is a hotly debated topic. Our results, which are consistent with earlier studies, indicate that proprietary homes are likely to be significantly less costly than either voluntary or government-owned homes.[33] Significant cost reductions associated with proprietary ownership were likely to occur in both the direct and indirect cost categories, although the cost differences are approximately three times larger in direct costs.

Because of our inability to incorporate direct measures of case mix and quality into our regression model, these results should be interpreted carefully. It is possible that proprietary homes are more likely to care for a less complex case mix because of effective patient screening methods, although accounting for the type of home in the regression model should have removed some of this case-mix difference. It is also possible that quality may be lower in proprietary homes than in voluntary or government homes. However, until more definitive studies are conducted which incorporate cost-case mix-quality profiles, it would appear that proprietary ownership should not be discouraged in the nursing home industry.

When Congress authorized payment for two levels of care under the Medicaid program, the objective was cost reduction. Our study found that statistically significant differences between SNF and ICF costs did exist. Of the $3.80 difference in mean average total per diem cost (Table 6), $3.31 can be attributed to certification status (SNF vs. ICF). Our finding contradicts that of an earlier study which did not find statistically significant SNF–ICF cost differences. Our results would indicate that potentially large savings could be realized if patients were appropriately classified according to the level of care needed.[34]

It appears that cost differences between SNFs and ICFs nationally are likely to be even larger than those in Ohio. Nationally, the difference in mean per diem costs in 1976 was $14.36 ($33.80—$19.44). The difference in Ohio was only $3.80 ($22.02—$18.22). Much of this difference can probably be attributed to a very low Medicaid ceiling for SNF rates in Ohio ($17.00) immediately preceding our sample period.

It was also found that a higher proportion of Medicaid utilization reduced average per diem costs. This was affected by ownership status.

Either proprietary homes have more incentive to reduce cost as the proportion of patients who are Medicaid funded increases or, as Scanlon would suggest, lower cost homes can afford to offer more of their capacity to Medicaid patients. It is also interesting to note that all of the observable cost reduction associated with increasing Medicaid utilization occurred in the direct cost categories. In the indirect cost categories, increases may have occurred as a result of increasing Medicaid utilization, but these results were not statistically significant.

This last finding has important implications for reimbursement design. If, in fact, the relationship between quality and expenditures is strongest in the direct cost categories, ceilings on average total cost which do not differentiate between cost categories might have a negative impact on quality by providing incentives for reducing direct costs such as nursing and dietary. A reasonable strategy for correcting this problem might be to permit actual cost reimbursement for expenditures in areas directly related to quality of care, and impose ceilings on other more indirect cost areas. This system of reimbursement for nursing home care has already been adopted by the state of Washington. Naturally, any such plan will introduce distortion in provider behavior which must be anticipated and evaluated carefully.

Finally, it was found that increased occupancy reduces average per diem costs. This was true for both direct and indirect costs; however, the effect was more significant in indirect cost areas as we hypothesized. Thus, reimbursement strategies which tie reimbursement to occupancy levels by imposing a penalty/reward structure may be beneficial. However, it is also possible that this incentive may encourage overutilization. Nursing home providers may be unwilling to discharge patients when their care needs no longer require institutionalization. Such an outcome could be counterproductive to effective cost control. Studies of utilization comparing states that have and do not have an occupancy incentive factor might be very revealing.

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