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Assessing Contributors to Cost of Care in Nursing Homes

Executive Summary

- In 1994 12.7% of the population was 65 and over, while 10.6% were 85 and over.
- Expenditures for nursing homes reached $72.3 billion in 1994 (much of which is tax-supported) accounting for 8.7% of all personal health money spent.
- Data from the 1993 Missouri Medicaid cost reports for 403 nursing homes were reviewed to determine differences in costs per resident day (PRD) and discover which factors most influenced these differences.
- Mid-sized facilities with 60-120 beds reported the lowest resident-related PRD costs.
- PRD expenses for aides and orderlies were higher in tax-exempt facilities, which was thought to be related to their "more altruistic" mission.
- Investor-owned facilities showed significantly greater administrative costs PRD, which may relate to higher administrative salaries and fancier offices.
- The authors suggest further study that would incorporate location, occupancy rate, quality of care, case mix, and payer mix data.

A NUMBER OF factors are leading to increased interest in the nursing home industry. For one, the population is aging, and increased life expectancy will increase the need for long-term care services. In 1980, 11.3% of the population was age 65 and over, with 8.8% of that population age 85 and over; in 1994, the respective percentages were 12.7 and 10.6.

These segments of the population are projected to continue to increase rapidly in the future. By 2025 an estimated 18.4% of the population will be age 65 and 12.1% will be age 85 and over (Bureau of the Census, 1995). The aging of the population is an important factor since age is the major determinant of admission to a nursing home; the number of elderly requiring long-term care is expected to double by 2025. Currently, the number of nursing home residents per 1,000 population age 65 and over is approximately 46, and the rate per 1,000 increases to 220 for the population age 85 and over (Centers for Disease Control and Prevention, 1995). With almost 25% of the population 85 and over residing in nursing homes and that segment expected to continue to grow rapidly, the demand for long-term care will have important implications for the future of the nursing home industry.

Another factor fueling increased interest is that nursing home care

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expenditures are increasing rapidly. In 1980, the nursing home industry consumed $17.6 billion and accounted for 8.1% of all expenditures on personal health care services. In 1994, expenditures on nursing home services were $72.3 billion and accounted for 8.7% of all personal health care expenditures (Levitt et al., 1996). As the total expenditures on the nursing home industry increase and the industry consumes a larger share of all personal health care expenditures, efforts increase to curtail the cost of the industry.

Background

As expenditures on nursing home care rise, interest in determining the major contributors to those costs increases, especially since public programs finance a disproportionate share of long-term care services. Before efforts can be successful in containing the costs of any sector of health care, however, it is necessary to understand the factors contributing to those costs. Earlier research (Bishop & Dor, 1994; Cohen & Dubay, 1990; Nyman, 1988b) exploring the costs in nursing homes has led to inconsistent conclusions. The relationship of ownership to costs in nursing homes has been studied (Bell & Krivich, 1990; Davis, 1993; Holmes, 1996), and the conclusions reached have been relatively consistent: tax-exempt nursing homes have higher total costs per resident day (PRD) than investor-owned homes. Conceptually, investor-owned nursing homes have an incentive to minimize costs within given quality parameters to maximize the profits earned for their investors. Given this assumption, then, investor-owned homes could be expected to have lower PRD costs than tax-exempt facilities, who may have societal goals other than profit maximization. This hypothesis was supported earlier by Meiners (1982), who found that average total PRD costs were about 7% lower in investor-owned facilities than they were in tax-exempt facilities; the difference was even greater when only operating costs of the facilities were considered. These conclusions are consistent with more recent findings reached by other researchers (Aaronson, Zinn, & Rosko, 1994; Arling, Nordquist, & Capitman, 1987; McKay, 1991).

Research about the factors contributing to these cost differences, however, has not been as consistent in its findings. Elwell (1984) found staff PRD hours to be greater in tax-exempt facilities than in investor-owned facilities, a conclusion contradictory to other research that found nursing and nursing aide hours to be unrelated to ownership (Linn, Gurel, & Linn, 1977; Munroe, 1990; Spector & Takada, 1991). Zinn (1993), however, reported finding lower RN staffing and higher LPN staffing in investor-owned facilities than in tax-exempt facilities, with insignificant differences in nursing aide staffing. This staffing substitution between higher paid RNs and LPNs would be consistent with cost-minimization incentives in investor-owned facilities. As these findings indicate, further research is needed to determine the relationship among factors contributing to total costs and the type of ownership of facilities.

ANOTHER FACTOR studied with respect to nursing home costs involves size of the facility (Birnbaum, Bishop, Lee, & Jenson, 1981; Bishop, 1980; Lee & Birnbaum, 1983; Palm & Nelson, 1984; Ullmann, 1981). An underlying hypothesis is that size and unit cost should be inversely related due to the greater efficiencies achieved in larger-scale operations. However, this research has not reported consistent findings regarding the relationship between size and cost per resident day in nursing homes. Several studies have reported either no significant relationship between the size of facilities and their PRD costs, or the hypothesized inverse relationship (Nyman, 1988a; Ruchlin & Levey, 1972; Ullmann, 1985). Christianson (1979) and Meiners (1982), however, reported that the relationship between size and cost appears to be curvilinear in the nursing home industry, reflecting U-shaped economies of scale. Again, additional research is needed to establish the relationship between size and cost and to determine if different factors are associated with cost differentials in different size facilities.

This research contributes to understanding the factors influencing costs in the nursing home industry. It contributes to prior research findings by examining a variety of direct cost factors related to facility size, facility ownership, and to the interaction of size and ownership. By segmenting the types of expenditures incurred in nursing homes, it is possible to identify which factors have the greatest direct relationship with costs per resident day in nursing home care.

Data Sources

The unit of analysis was individual skilled and intermediate care nursing homes in Missouri; included in the analysis were 403 homes. The use of a single state for the analysis avoids complications encountered when facilities are analyzed that operate in various regulatory and licensing environments. The nursing homes included in this analysis represent 90% of the 448 Medicaid-certified nursing homes in Missouri. Data were obtained from the 1993 Missouri Medicaid cost reports. To be included in the analysis, the facility had to participate in the Missouri Medicaid program and provide complete data on all items used in the analysis on its 1993 Medicaid cost report. The complete data stipulation eliminated some facilities from the analysis, but ensured that all categories of analyses were based on the same set of facilities. Calculations were based

Table 1.
Median Costs per Resident Day by Size and Ownership for Missouri Nursing Homes, 1993

	Bed Size of Facility			Ownership of Facility	
	<61	61-120	121+	Investor-Owned	Tax-Exempt
Number of Homes	109	218	76	297	106
Occupancy Rate	87.3	85.5	86.3	85.1	89.0
Type of Beds					
% ICF Bed Days	23.3	24.2	20.3	21.7	27.5
% SNF Bed Days	42.0	44.7	47.0	50.1	28.2
% Other Bed Days	34.7	31.1	32.7	28.2	44.3
Source of Payment					
% Medicaid Days	65.8	69.5	67.3	72.2	56.5
% Medicare Days	1.8	3.8	3.7	3.8	1.8
% Private Pay Days	32.2	25.8	28.2	23.2	41.6
% Other Days	0.2	0.9	0.8	0.8	0.1
RN Salary Expense	$3.22	$2.78	$3.14	$2.98	$2.96
LPN Salary Expense	$4.95	$4.96	$5.70	$5.11	$4.88
Aides/Orderlies Salary Expense	$10.51	$11.04	$12.89	$10.53	$13.96
Other Resident Care Salary Expense	$1.71	$1.58	$1.55	$1.64	$1.49
Direct Resident Care Expense	$26.67	$26.59	$30.17	$26.45	$29.78
Ancillary Services Expense	$0.28	$0.89	$1.85	$1.14	$0.38
Administrative Expense	$8.48	$7.63	$7.64	$8.06	$6.00
Other Nondirect Expense	$24.36	$24.53	$24.47	$25.23	$21.81
Total Resident Related Expense	$36.06	$35.16	$40.04	$36.15	$36.64
Total Expense	$59.20	$61.79	$65.50	$62.50	$59.56

on median PRD costs day to provide a standard unit of measurement across size of facility.

Methodology

In conducting the analysis, Missouri nursing homes were grouped into two ownership categories: investor owned (n=297) and tax exempt (n=106), with the tax-exempt designation including all government and not-for-profit facilities. The average occupancy rate was 85.1% in investor-owned facilities and 89.0% in tax-exempt facilities. Investor-owned facilities had about 50% skilled nursing beds, compared to 28% in tax-exempt facilities; alternatively tax exempt had 44% in "other" types (mainly mental health), compared to 28% in investor owned. Intermediate care beds composed 28% in tax-exempt facilities and 22% in investor owned. In addition, the facilities were grouped into three size categories based on bed size: small — 60< beds (n=109), mid-sized — 61 to 120 beds (n=218), and large — >120 beds (n=76). Small facilities had an occupancy rate of 87.3%, mid-sized 85.5%, and large facilities 86.3%. The type of beds in each sized facility was similar across facilities. The expense categories included in the analyses were: (a) direct resident care salaries paid to RNs, LPNs, aides/orderlies, and a residual category of all other direct resident care salaries; (b) broad categories encompassing all direct resident care expenses (including salaries in the preceding category), ancillary services expenses, administrative expenses, another residual category of "other" nondirect resident care expenses; total resident-related expenses; and (c) the total expenses of the facility.

Since the data include 90% of the total population of Medicaid-certified nursing homes in Missouri, statistical inference is not strictly necessary. However, under the assumption that the Missouri facilities are a part of a larger population of Medicaid facilities, then the following statistical analysis is appropriate.

For each of the previously identified expense variables, a two-way analysis of variance (ANOVA) was performed with factors being facility size and facility ownership. Histograms of the expense per patient day variables indicated that some of the variables were highly skewed, and that expenses for therapists and ancillary services were often reported to be zero. The combination of heavy skew and a large number of tied values indicate that the usual ANOVA assumption of normally distributed data was not tenable with this data set. Thus, the statistical analysis employed nonparametric methods. The ANOVAs

Table 2.
Statistically Significant ANOVA Results

Direct Resident Care Salaries	
Overall RN Salaries Per Resident Day	$p = 0.023$
Facility Ownership	$p = 0.78$
Facility Size	$p = 0.008$
Small versus Mid-sized	$p = 0.009$
Small versus Large	$p = 0.81$
Mid-sized versus Large	$p = 0.012$
Overall LPN Salaries Per Resident Day	$p = 0.026$
Facility Ownership	$p = 0.072$
Facility Size	$p = 0.57$
Overall Aides/Orderlies Salaries Per Resident Day	$p = <0.0001$
Facility Ownership	$p = <0.0001$
Facility Size	$p = <0.0001$
Small versus Mid-sized	$p = 0.34$
Small versus Large	$p = <0.0001$
Mid-sized versus Large	$p = <0.0001$
"Other" Resident Care Salaries Per Resident Day	$p = 0.02$
Facility Ownership	$p = 0.02$
Facility Size	$p = 0.02$
Small versus Mid-sized	$p = 0.02$
Small versus Large	$p = 0.007$
Mid-sized versus Large	$p = 0.33$
Other Expenses	
Overall Direct Resident Care Expenses Per Resident Day	$p = <0.0001$
Facility Ownership	$p = <0.0001$
Facility Size	$p = <0.0001$
Small Versus Mid-sized	$p = 0.38$
Small versus Large	$p = <0.0001$
Mid-sized versus Large	$p = <0.0001$
Overall Ancillary Services Expenses Per Resident Day	$p = 0.013$
Facility Ownership	$p = 0.08$
Facility Size	$p = 0.012$
Small Versus Mid-sized	$p = 0.18$
Small versus Large	$p = 0.005$
Mid-sized versus Large	$p = 0.02$
Overall Administrative Expenses Per Resident Day	$p = <0.0001$
Facility Ownership	$p = <0.0001$
Facility Size	$p = 0.08$
Overall "Other" Nondirect Care Expenses Per Resident Day	$p = 0.012$
Facility Ownership	$p = 0.001$
Facility Size	$p = 0.45$
Overall Total Resident Related Expenses Per Resident Day	$p = 0.0004$
Facility Ownership	$p = 0.39$
Facility Size	$p = 0.0002$
Small Versus Mid-sized	$p = 0.81$
Small versus Large	$p = 0.0005$
Mid-sized versus Large	$p = 0.0006$
Overall Total Expenses Per Resident Day	$p = 0.017$
Facility Ownership	$p = 0.2$
Facility Size	$p = 0.007$
Small versus Mid-sized	$p = 0.70$
Small versus Large	$p = 0.003$
Mid-sized versus Large	$p = 0.004$

Level of Significance = 0.01 for Overall Categories
Level of Significance = 0.05 for Individual Variables
The test for interaction between size and ownership was not statistically significant for any variable.
Small = <60 beds; Mid-Sized = 61-120 beds; Large = >120 beds

were performed using the rank regression function RREG available in the Minitab® statistical software package. A good introduction to theory of rank-based regression can be found in Chapter 6 of Birkes and Dodge (1993).

THE "OVERALL TEST" for each ANOVA addresses the question: "Do values for the cost variable being considered tend to differ by facility size, or facility ownership, or with the interaction of size and ownership?" When the overall test was statistically significant ($p<0.05$), the source of the significance was sought by examining the ANOVA tests for the interaction term and main effects of size and ownership. A significant "size effect" in the absence of interaction was followed by pairwise comparisons. When the overall test was not statistically significant, no further analysis was performed on that variable.

The cost variables analyzed were: (a) RN salaries PRD, (b) LPN salaries PRD, (c) aides/orderlies salaries PRD, (d) a residual category of all other direct resident care salaries PRD, (e) total direct resident care expenses PRD, (f) ancillary services expenses PRD, (g) administrative expenses PRD, (h) other nondirect resident care expenses PRD, (i) total resident-related expenses PRD, and (j) total expenses PRD. Table 1 provides summary, descriptive statistics for the nursing homes included in the analysis.

Results

The test for an interaction effect of size and ownership of facility was not significant for any of the expense variables included in the analysis. This absence of an interaction effect simplifies the interpretations in that the main effects of facility size and facility ownership can each be interpreted independently.

Resident Care Salary Expenses

In the overall ANOVA performed on resident care salary costs per resident day (see Table 2 for a summary of the ANOVA results), statistically significant results at the p=0.05 level were obtained for the variables RN salaries PRD (p=0.023), LPN salaries PRD (p=0.026), aides/orderlies salaries PRD (p=<0.0001), and for "other" resident care salaries PRD (p=0.02). The findings of statistically significant differences for aides/orderlies are inconsistent with the results of previous research, which reported no differences in the costs of aides/orderlies PRD.

In the ANOVA tests for interpreting the impact of size, RN salaries per resident day, small facilities (<60 beds) do not differ significantly from large-sized facilities (>120 beds), but mid-sized facilities (61-120 beds) differed significantly from both small-sized facilities and large-sized facilities. The median PRD expense for RN salaries in the smallest facilities was $3.22; the median expense in mid-sized facilities was $2.78; and the median in large facilities was $3.14. This U-shaped cost curve is similar to results obtained by Christianson (1979) and Meiners (1982) for total staffing costs in nursing homes.

In the ANOVA tests for interpreting the impact of facility size on aides/orderlies salaries, the smallest-sized facilities ($10.51 PRD) did not differ significantly from mid-sized facilities ($11.04 PRD), but both small-sized facilities and mid-sized facilities differed significantly from large-sized facilities ($12.89). In the ANOVA tests on "other" resident care salaries per resident day, the only statistically significant differences were between the small-sized facilities and the large-sized facilities; the median expense per resident day for the smallest facilities was $1.71; for mid-sized facilities $1.58; and for large facilities $1.55. Size was not a significant factor for differences in LPN salaries per resident day in nursing home costs.

For aides/orderlies and LPN salaries per resident day, the increase in median PRD cost as facility size increases is the opposite of the hypothesized direction based on the concepts of economies of scale and the curvilinear results found by Christianson (1979) and Meiners (1982). Since size and costs were directly related in these two categories of PRD salaries, production costs reflect diseconomies of scale rather than the anticipated economies of scale. "Other" patient care PRD salaries display the hypothesized inverse relationship, indicating economies of scale. Economies of scale occur due to efficiencies in production resulting in lower costs per unit as the number of units produced increases; diseconomies of scale occur when unit production costs increase as the number of units produced increase (see Table 2).

As mentioned earlier, ownership is expected to have an impact on the costs of care provided in nursing homes. Since investor-owned homes have an incentive to minimize costs within quality constraints to maximize profits, lower salary costs per resident day are hypothesized. In the analyses of the impact of ownership of facilities, ownership was statistically significant at the p=0.01 level only for the salaries of aides/ orderlies. In the analysis, tax-exempt facilities had the hypothesized higher salary PRD expenses for aides/orderlies ($13.96) than did investor-owned facilities ($10.53). For the other three categories of salary expenses, tax-exempt facilities exhibited lower salary expenses than did investor-owned facilities, although RN salaries per resident day were almost identical ($2.98 for investor-owned homes and $2.96 for tax-exempt homes). Again, further analysis into the reasons for the variations among categories in terms of price and quantity must be conducted, along with the amount of substitution among categories of personnel in the facilities.

Other Expenses

In the overall ANOVA performed on the median PRD costs for the nonsalary variables considered in this assessment, statistically significant results at p=.05 were obtained for direct resident care expenses per resident day, ancillary services expenses, administrative costs, "other" nondirect resident care expenses, total resident care expenses, and total expenses per resident day. For direct resident care PRD expenses, both size and ownership of facility were statistically significant at the p=0.01 level. For administrative PRD expenses and for "other" nondirect resident care PRD expenses, only ownership of facility was significant. For total resident-related expenses and total expenses per resident day, only facility size was statistically significant at the p=0.01 level. The interactive effect of size and ownership of facility was not significant for any variable.

In the ANOVA tests for interpreting the impact of size on direct resident care PRD expenses, the smallest-sized facilities and the mid-sized facilities did not differ significantly in their direct resident care PRD expenses; the median resident care PRD expense in the smallest facilities was $26.67; and the median expense in mid-sized facilities was $26.59. However, both the smallest facilities and the mid-sized facilities differed significantly from the largest facilities, which had median resident care expenses of $30.17 per resident day. The direct resident care PRD expenses exhibit a somewhat U-shaped relationship, with mid-sized facilities displaying the lowest costs per resident day.

The analysis for ancillary services expenses per resident day produced a p-value of 0.012. Although this p value is at the

boundary of the 0.01 value used to determine significance, it was found that small-sized facilities (median expense = $0.28) differed significantly from the large-sized facilities (median = $1.85), but that the mid-sized facilities (median = $0.89) did not differ significantly from either the small-sized or the large-sized facilities. The direct relationship between size and expense per resident day reflects the opposite of the direction hypothesized with the concept of economies of scale.

In the ANOVA tests for interpreting the impact of size on total resident-related PRD expenses, the smallest-sized facilities and the mid-sized facilities did not differ significantly in their resident-related expenses; the median expense in the smallest facilities was $36.06 and in the mid-sized facilities was $35.16. However, both the smallest facilities and the mid-sized facilities differed significantly from the largest facilities, which had median resident-related expenses of $40.04. The resident-related PRD expenses exhibit a U-shaped relationship, with mid-sized facilities displaying the lowest resident-related PRD costs. For total PRD expenses, no significant differences were found between the smallest-sized facilities and the mid-sized facilities; however, the large-sized facilities differed significantly from both the smallest facilities and the mid-sized facilities. The direction of these differences were the opposite of those hypothesized within the theory of economies of scale in the production of service — the smallest facilities cost $59.20 per resident day, the mid-sized facilities $61.79, and the largest facilities $65.50.

In terms of facility ownership (tax exempt and investor owned), statistically significant results were found for differences in direct resident care expenses, administrative expenses, and "other" nondirect resident care expenses per resident day. The tax-exempt facilities exhibited higher PRD expenses than did the investor-owned facilities for direct resident care expenses and for total resident-related expenses; they exhibited lower PRD costs for administrative expenses and "other" nondirect resident care expenses. While type of ownership was not statistically significant for total PRD expenses (p=0.2), tax-exempt facilities displayed lower total PRD costs ($59.56) than did investor-owned facilities ($62.50). This finding is opposite than expected, given the assumed goal of profit maximization for investor-owned facilities with the minimization of costs to achieve that goal, and the previous research findings indicating investor-owned facilities had lower PRD costs than tax-exempt facilities.

Discussion

The results of this analysis indicate the factors contributing to the costs of nursing homes. In addition to simply evaluating the factors traditionally included (total PRD costs or nursing PRD costs), this analysis examined the impact of administrative costs, type of nursing cost, ancillary costs, direct resident care costs, and nondirect resident care costs per resident day. It also controlled for ownership of facility (investor owned or tax exempt) and the bed size of the facility (<60 beds, 61-120 beds, >120 beds).

PREVIOUS RESEARCH (Aaronson et al., 1994; Arling et al., 1987; Christianson, 1979; Cohen & Dubay, 1990; Davis, 1993; Holmes, 1996; McKay, 1991; Meiners, 1982) has attempted to establish the relationship between type of ownership and cost, bed size and cost, and the interactive effects of those factors, with inconsistent results. The findings of this research did not show a significant interaction effect between size and ownership for any of the variables considered. Unlike previous research that has shown that tax-exempt facilities have higher PRD costs, this research found that tax-exempt facilities in Missouri had lower costs than did investor-owned facilities, although the results were not statistically significant (p=0.2). While this lack of statistical significance limits the interpretations of the results, inference can be drawn that investor-owned homes do not have significantly lower costs than tax-exempt facilities. This result tends to be inconsistent with much of the previously reported research. One possible contributing factor to this inconsistent finding may be the timing of the analysis; much of the earlier research was conducted during periods of rapidly growing expenditures in health care with relatively little competitive pressures on efficiency. This study is based on 1993 data, which represents a time of relatively high competitive pressures and limited resources among all firms in the industry in Missouri.

While total expenditures per resident day did not differ significantly between tax-exempt and investor-owned facilities, statistically significant results for ownership were observed when only direct resident care expenses per resident day were considered. In this case, tax-exempt facilities did have significantly higher PRD costs ($29.78 versus $26.45). This finding tends to support the previously stated observation that tax-exempt facilities may have social goals other than cost minimization and profit maximization, and are able to pursue those goals at a higher cost.

To understand why direct resident care costs differ between investor-owned and tax-exempt facilities, the contribution of salaries by type of personnel was examined. In this instance, RN salary expense, LPN salary expense, and "other" resident care expense per resident day did not differ significantly between tax-exempt facilities and investor-owned facilities, although investor-owned facilities consistently

demonstrated higher salary expenses in these areas. Where salary costs did differ significantly was in the greater use of nursing aides/orderlies in tax-exempt facilities ($13.96 PRD versus $10.53). The net result of the differences in sources of salary costs per resident day is a significantly higher cost per resident day for direct resident care in tax-exempt facilities.

In nondirect resident care expenses, investor-owned facilities had significantly greater administrative PRD costs than did tax-exempt facilities ($1.14 versus $0.38). This finding offers support for the argument that managers in investor-owned facilities may seek nonpecuniary gains, as well as profits, in any given period. These nonpecuniary gains for the organization may include higher administrative salaries, more pleasant office and physical environments, or more prestige. The existence of these multiple goals in investor-owned facilities is especially applicable in an industry that includes a substantial number of tax-exempt firms (Frech, 1976), since price competition from these firms may be less, reflecting reduced economic discipline in those organizations. These differences may change over time, as increased pressures for efficiency in resource use occurs among all types of facilities.

The other component where significantly different PRD costs was observed was in "other" nondirect resident care expenses. In this case, also, investor-owned facilities had a significantly higher PRD cost ($25.23) than did tax-exempt facilities ($21.81). This finding is consistent with expectations, since it includes the distribution of earnings to investors. The net result of all these factors is that, contrary to most previous research, tax-exempt facilities in Missouri do not have higher total PRD costs than their investor-owned counterparts.

The second area of interest was in improving explanatory power of the role of economies of scale in producing nursing home services. The theory of economies of scale states that average costs will decline as output increases; conversely, diseconomies of scale occur when average costs increase as output increases. Economies of scale occur when the firm has sufficient size to take advantage of specialization of labor, flexibility in the delegation of tasks, maximum use of capacity, efficient use of equipment, and discounts in purchasing. Diseconomies occur when size increases to the point that increased efforts are required to coordinate and control work in the larger organizations. The results of this analysis (small facilities = $59.20 PRD; mid-sized facilities = $61.79; large facilities = $65.50) do not support the argument promoted in earlier research that economies of scale occur in the production of nursing home care; if anything, the data indicate that diseconomies of scale may be occurring in the production of nursing home services in Missouri.

The next step was to analyze total PRD expenditures to gain insight into the relationships between size of facility and the costs associated with the factors. Statistically significant results were obtained for RN salaries, aides/orderlies salaries, direct resident care expenses, total resident-related expenses, and total expenses per resident day. Unlike ownership of facilities, administrative costs per resident day and "other" nondirect care service costs did not vary significantly among different sized facilities. As the data in Table 1 demonstrated, the expenditures for salaries of aides/orderlies (<60 beds = $10.51; 61-120 beds = $11.04; >120 beds = $12.89) and the salaries of LPNs ($4.95, $4.96, and $5.70, respectively) demonstrate diseconomies of scale rather than the expected economies of scale or the U-shaped average cost curve. Since these expenses are almost a fifth of total PRD costs, they have a substantial impact on the variations in total costs per resident day observed. "Other" direct resident care salaries, on the other hand, display the expected economies of scale (<60 = $1.71; 61-120 = $1.58; >120 = $1.55); these expenses, however, are a very slight proportion of total expenditures. RN salaries demonstrated a U-shaped curve — small facilities = $3.22, mid-sized = $2.78, and large = $3.14.

FINALLY, as discussed, the results of this analysis indicate that total expenses per resident day do vary among different sized facilities in a statistically significant way. These total expenses, however, reflect diseconomies of scale rather than the expected economies of scale. To gain a better understanding of the cost functions of nursing homes, then, it becomes necessary to look at various factors contributing to the total costs of the homes. When individual items are examined, the analysis showed that the factor having the largest impact on cost differentials was salaries of aides/orderlies. Administrative costs and other nondirect resident care costs were important in explaining variations between investor-owned and tax-exempt facilities, but did not contribute to the economies of scale debate for most efficient size of facility. Additional research is needed to relate the findings of this study to the quality of care and the case mix issue associated with nursing home care. In addition, occupancy rate, payer mix, and urban/rural location must be explored as contributing factors to the findings discussed in this analysis.**$**

REFERENCES

Aaronson, W.E., Zinn, J.S., & Rosko, MD. (1994). Do for-profit and not-for-profit nursing homes behave differently? *Gerontologist, 34*(6), 775-786.

Arling, G., Nordquist, R.H., & Capitman, J.A. (1987). Nursing home cost and ownership type: Evidence of interaction effects. *Health Services Research, 22*(2), 255-269.

Bell, R., & Krivich, M. (1990). Effects of type of ownership of skilled nursing facilities on residents' mortality rates in Illinois. *Public Health Reports, 105*(5), 515-518.

Birkes, D., & Dodge, Y (1993). *Alternative methods of regression.* New York: John Wiley & Sons, Inc.

Birnbaum, H., Bishop, C., Lee, A.J., & Jenson, G. (1981). Why do nursing home costs vary? The determinants of nursing home costs. *Medical Care, 91*(11), 1095-1107.

Bishop, C.E. (1980). Nursing home cost studies and reimbursement issues. *Health Care Financing Review, 2*(3), 47-64.

Bishop, C.E.. & Dor, A. (1994). Medicare costs in urban and rural nursing homes: Are differential payments required? *Inquiry, 31*(2), 153-162.

Bureau of the Census. (1995). *The American almanac: Statistical abstract of the United States.* Austin TX: The Reference Press, Inc.

Centers for Disease Control and Prevention. (1995). *Trends in the health of older Americans: United States, 1994.* Hyattsville, MD: U.S. Department of Health and Human Services.

Christianson, J.B. (1979). Long-term care standards: Enforcement and compliance. *Journal of Health Politics, Policy and Law, 4*(3), 414-434.

Cohen, J.W., & Dubay, L.C. (1990). The effects of Medicaid reimbursement method and ownership on nursing home costs, case mix, and staffing. *Inquiry, 27*(2), 183-200.

Davis, M.A. (1993). Nursing home ownership revisited: Markets, cost and quality relationships. *Medical Care, 31*(11), 1062-1068.

Elwell, F. (1984). The effects of ownership on institutional services. *Gerontologist, 24*(1), 77-83.

Frech, H.E. III (1976). The property rights theory of the firm: Empirical results from a natural experiment. *Journal of Political Economy, 84*(2), 143-152.

Holmes, J.S. (1996). The effects of ownership and ownership change on nursing home industry costs. *Health Services Research, 31*(3), 327-346.

Lee, A.J., & Birnbaum, H. (1983). The determinants of nursing home operating costs in New York state. *Health Services Research, 18*(2, Part II), 285-308.

Levitt, K.R., Lazenby, H.C., Sivarajan, L., Stewart, M.W., Braden, B.R., Cowan, C.A., Donham, C.S., Long, A.M., McDonnell, P.A., Sensenig, A.L. Stiller, J.M., & Won, D.K. (1996). National health expenditures, 1994. *Health Care Financing Review, 17*(3), 205-242.

Linn, M.W., Gurel, L., & Linn, B.S. (1977). Patient outcomes as a measure of quality in nursing home care. *American Journal of Public Health, 67*(4), 337-344.

McKay, N.L. (1991). The effect of chain ownership on nursing home costs. *Health Services Research, 26*(1), 109-124.

Meiners, M.R. (1982). An economic analysis of the major determinants of nursing home costs in the United States. *Social Science and Medicine, 16*(8), 887-898.

Munroe, D.J. (1990). The influence of registered nurse staffing on the quality of nursing home care. *Research in Nursing & Health, 13*(4), 263-270.

Nyman, J.A. (1988a). The effect of competition on nursing home expenditures under prospective reimbursement. *Health Services Research, 23*(4), 555-574.

Nyman, J.A. (1988b). The marginal cost of nursing home care in New York. *Journal of Health Economics, 7*(4), 393-412.

Palm, D.W., & Nelson, S. (1984). The determinants of nursing home costs in Nebraska's proprietary nursing homes. *Socioeconomic Planning Science, 18*(3), 171-177.

Ruchlin, H., & Levey, S. (1972). Nursing home cost analysis: A case study. *Inquiry, 9*(3), 3-15.

Spector, W.D., & Takada, H.A. (1991). Characteristics of nursing homes that affect resident outcomes. *Journal of Aging and Health, 3*(4), 427-454.

Ullmann, S.G. (1981). Assessment of facility quality and its relationship to facility size in the long-term health care industry. *Gerontologist, 21*(1), 91-97.

Ullmann, S.G. (1985). The impact of quality on cost in the provision of long-term care. *Inquiry, 22*(3), 293-302.

Zinn, J.S. (1993). The influence of nurse wage differentials on nursing home staffing and resident care decisions. *Gerontologist, 33*(6), 721-729.