POLICY ANALYSIS SERIES

ISSUES RELATED TO WELSCH v. NOOT / NO. 4

COST FUNCTION ANALYSIS OF MINNESOTA INTERMEDIATE CARE FACILITIES FOR MENTALLY RETARDED (ICF-MR) PER DIEMS

I. INTRODUCTION

The direction and magnitude of deinstitutionalization may be determined in the future by cost arguments - at both the national and state levels. The recent Welsch v. Noot Consent Decree (1980) makes it especially imperative that policymakers identify and examine the many factors which affect the cost of community residential care in Minnesota. Future research will examine the total system costs for state hospitals and community programs, projected costs for alternative types of living arrangements, and the efficacy of existing funding mechanisms.

The primary purpose of the present study is to identify the critical factors (separately and in combination) which produce variations in per diem costs in Intermediate Care Facilities for Mentally Retarded (ICF-MR). The population frame included all ICF-MRs in Minnesota (N = 185) for which reliable data were available. (The most recent data available from the Department of Public Welfare and the Department of Health were for late 1979; the reader is cautioned about using information from this report for other purposes. A cost function analysis using 1980 data is forthcoming.)

Data for this study were compiled from several sources. The primary sources include:

- facility characteristics, per diems and staffing patterns from Rule 52 Cost Reports and computer listings on file in the Audit Division of the Department of Public Welfare;
- years of operation and client population (adult or children) from ICF-MR files in the Licensing Division/DPW;
- resident characteristics, functioning levels and the type of facility license (Class A or Class B) from Quality Assurance and Review program reports, Minnesota Department of Health.

II. METHODOLOGY

The statistical methodology employed in this study is a replication of the cost function analysis component of a national study on the costs of residential care (Wieck and Bruininks, 1980). That report contains a thorough review of literature of previous cost studies and a discussion of the "theory" which underlies this study's treatment of cost-related variables.

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This study, like all statistical analysis, is not definitive. Statistical techniques cannot "prove" cause-effect relationships. They can, however, help policy-makers to estimate/predict cause-effect relationships with greater reliability; hence to make better decisions about allocating scarce resources. The present study attempts to identify several factors and their probable impact upon ICF-MR per diem rates. One important caveat: data derived from DPW files may represent the reimbursement structure rather than "true" cost. That is, not all "costs" of operation are necessarily reimbursable; not all costs are quantifiable in terms of dollars, although they are costs of operation nonetheless.

III. ANALYSIS OF VARIANCE

The first objective of this study is to test hypotheses about the relationship of selected locational, organizational, and resident characteristic variables with cost. These hypotheses, and results, are summarized as follows:

Locational Factors

1. Ho_1: There are no differences in the per diem rates for community residential services between Minnesota's eleven economic development regions.[1]

According to the results of a one-way analysis of variance test, there were significant differences ($p < .01$)[2] in the per diem rates of the ICF-MRs located in the various economic development regions. The ICF-MRs located in the Minneapolis-Saint Paul metropolitan area (Region 11) were operating during 1979 at the highest mean rate ($44.11), while the ICF-MRs in Regions 6 and 1 were operating at the lowest mean rate ($31.50 and $31.84 respectively). The mean per diem rate for ICF-MRs located in the metropolitan region was significantly different ($p < .01$) from the mean per diems of all other regions. The analysis of variance and table of means and standard deviations appear in Tables 1 and 2 respectively.[3]

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[1]There are actually 13 economic development regions within the state. For the purposes of this study, Regions 6E and 6W were combined and treated as a single economic development region (Region 6); likewise for Regions 7E and 7W (Region 7). See the Appendix for a map of the State's economic development regions.

[2]The F-test is a statistical measure of the degree of variation among statistical groups. The larger the F-score, the smaller the probability that variation among the groups is statistically equal. A "significant" F-score indicates that there is a large probability (usually 95 percent or more) that a quantifiable statistical difference exists among groups.

[3]The "Mean" ($\bar{X}$) is a common measure of the central tendency of several variables. It is often referred to as the "average."

Variance (σ^2) is a measure of the dispersion of the data about the mean; it is a way of measuring how the individual per diems "cluster" around the mean value. The variance will be small where the per diems are very similar. The primary goal of this report is to identify and "explain" variations in per diem rates, i.e., identify those factors which are likely to "cause" differences in per diem rates.

Standard Deviation (σ/SD) is another measure of variance. It is a more obvious and intuitive measure of variation than is Variance because it is based upon the same units as the original variable (in this case, dollars).

Table 1

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Region

Source of Variation	df	SS	MS	F^2
Between Groups	10	3978.56	397.86	3.78**
Within Groups	174	18323.76	105.31	
Total	184	22302.32		

**p < .01

Table 2

Mean Per Diems of ICF-MRs by Region

Region	Mean	SD	N
Region 1	31.84	8.51	7
Region 2	32.90	3.52	4
Region 3 (Duluth)	35.20	6.64	24
Region 4 (Moorhead)	35.97	10.62	18
Region 5	35.03	.19	2
Region 6	31.50	10.55	7
Region 7 (St. Cloud)	32.76	7.55	14
Region 8	40.18	11.53	8
Region 9 (Mankato)	37.77	7.28	8
Region 10 (Rochester)	38.39	9.26	18
Region 11 (Mpls.-St. Paul)	44.11	12.05	75

A second one-way analysis of variance was run between those facilities located in the Minneapolis-Saint Paul region (which contained approximately one-half of the State's population and 42 percent of all ICF-MRs in 1979) and all facilities located outside of the seven county metropolitan area. There was a significant difference ($p < .01$) between metropolitan per diems ($\bar{X} = \$44.11$) and out-state, non-metropolitan per diems ($\bar{X} = \$35.56$).

The data contained in this study have not been adjusted in advance for cost-of-living differences which may exist among the regions. Adjustment indices are published for national census regions for a hypothetical family of four in an urban area, but are rarely published for measuring within-state variation. The reader is advised that differences in ICF-MR per diems, although statistically significant, may indeed be indicative of cost-of-living differences rather than "real" cost differences.

Organizational Factors

Eight organizational factors have been suggested in previous studies (Wieck & Bruininks, 1980) as affecting cost differences: (1) size, (2) ownership of facility, (3) membership in a system or chain of residential facilities under one general ownership, (4) occupancy rate, (5) number of staff, (6) staff-resident ratio, (7) years of operation, and (8) the type of license (Class A or Class B). Estimates of staff turnover were not available for this analysis.

2. Ho_2: There is no relationship between per diem rates of residential services and facility size (size is defined in terms of number of residents).

Facilities were grouped into five size categories: (1) six or fewer residents, (2) seven to 12 residents, (3) 13 to 16 residents, (4) 17 to 32 residents, and (5) 33 or more residents. There were significant differences ($p < .05$) in the per diem rates of community residential facilities according to these size categories. The highest per diems were associated with the larger facilities ($42.13/33 or more residents) and the smallest facilities ($41.08/six or fewer residents). The lowest per diem ($35.55) was reported by facilities that had seven to 12 residents. The specific comparisons that produced significant differences ($p < .01$) were facilities in group 2 with groups 1, 4 and 5; and group 3 with groups 1, 4 and 5. All other comparisons were not significant.

The analysis of variance and table of means and standard deviation appear in Tables 3 and 4 respectively.

Table 3

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Size Categories

Source of Variation	df	SS	MS	F
Between Groups	4	1299.90	324.97	2.78*
Within Groups	180	21002.42	116.68	
Total	184	22302.32		

*$p < .05$

Table 4

Mean Per Diems of Minnesota ICF-MRs by Size Categories

Size Categories	Mean	SD	N
Group 1: 6 residents or fewer	41.08	6.89	64
Group 2: 7 - 12 residents	35.55	8.63	49
Group 3: 13 - 16 residents	36.66	11.95	27
Group 4: 17 - 32 residents	39.77	14.64	16
Group 5: 33 or more residents	42.13	16.37	29

An inverse relationship between size and per diem (cost) is commonly assumed, that is, as size increases per diem decreases. Traditional economic theory suggests, however, that there is a U-shaped relationship between average cost and size, with very small or very large facilities incurring higher average costs. Economy of scale may be more easily achieved within mid-size facilities; these economies may be reflected in lower average costs.

Wieck and Bruininks' national study (1980) indicated that there was a positive relationship between size and per diem: as the size of facilities increases, per diems increase. This relationship may be attributed to the increased amount of services typically provided by larger facilities. The results of this study suggest that the effects of economy of scale can be greatly affected by such factors as resident characteristics, staff-resident ratio, etc. In order to make meaningful statements about size and per diems, the issue must be studied longitudinally.

3. Ho_3: There is no relationship between per diem rates of residential services and ownership of facility.

Table 5 presents a summary of the analysis of variance (see Table 6 for means and standard deviations) for type of legal ownership with per diem as the dependent variable. These results indicate that, unlike nursing homes and community residential facilities in several national studies, the proprietary facilities in Minnesota are operating at higher per diems ($40.22) than non-profit facilities ($38.05); the difference is not statistically significant, however.

Table 5

Summary of Analysis of Variance of Minnesota ICF-MRs by Profit/Nonprofit Ownership

Source of Variation	df	SS	MS	F
Between Groups	1	216.65	216.65	1.80
Within Groups	183	22085.66	120.69	
Total	184	22302.32		

Table 6

Mean Per Diems of Minnesota ICF-MRs by
Profit/Nonprofit Ownership

Type	Mean	SD	N
Proprietary	$40.22	12.03	83
Non-profit	$38.05	10.06	102

In follow-up to this analysis, a one-way analysis of variance was run comparing facilities that are "family owned and operated" with those that are not. Wieck and Bruininks (1980) reported that on a national level "family-owned and operated facilities operat[ed] at a much lower rate than non-profit facilities...and proprietary facilities" (p. 136). A similar result occurred in this study, with significant differences ($p < .01$) occurring between family owned and operated facilities ($34.22) and those that were not ($41.00). Tables 7 and 8 present the summary of the analysis of variance test and the table of means and standard deviations.

Table 7

Summary of Analysis of Variance of Minnesota ICF-MR
Per Diems by Family Ownership

Source of Variation	df	SS	MS	F
Between Groups	1	1756.65	1756.65	15.65**
Within Groups	183	20545.67	112.27	
Total	184	22302.32		

**$p < .01$

Table 8

Mean Per Diems of Minnesota ICF-MRs
by Family Ownership

Type	Mean	SD	N
Family Owned and Operated	34.22	8.15	54
Non-Family Owned and Operated	41.00	11.44	131

4. Ho_4: There is no relationship between per diem rates of residential services and membership in a system. (A system is a group of residential facilities owned and operated by one parent organization.)

Significant differences ($p < .05$) were found between community residential facilities that were members of systems and those that were not. The average per diem of system ICF-MRs was $40.52; and $36.87 for those that were not affiliated with a system. Tables 9 and 10 present the analysis of variance and table of means and standard deviations respectively.

These results corroborate the finding of Wieck and Bruininks' national study (1980). Further examination of this issue appears necessary before meaningful conclusions can be drawn.

Table 9

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by System Membership

Source of Variation	df	SS	MS	F
Between Groups	1	598.40	598.40	5.045*
Within Groups	183	21703.92	118.60	
Total	184	22302.32		

*$p < .05$

Table 10

Mean Per Diems of ICF-MRs by System Membership

Type	Mean	SD	N
Member of System	$40.52	9.14	109
Non-member of System	$36.87	13.00	76

5. H_{05}: There is no relationship between per diem rates of residential services and occupancy rate.

Occupancy rate was defined as the number of residents divided by the licensed bed capacity. Occupancy ranged from less than 80 percent to 100 percent. The rates were categorized as follows: (1) 80 percent or less, (2) 81 to 90 percent, (3) 91 to 95 percent, and (4) 96 to 100 percent.

Previous studies have suggested that substantial variation in occupancy rates has had important consequences for cost, primarily because per diem is calculated on the number of residents (Peat, Marwick, Mitchell, & Co., 1976; Piasecki, Pittinger, & Rutman, 1977). ICF-MRs in Minnesota typically operate at or near licensed capacity. During 1979, nearly 84 percent of the facilities (N = 155) were operating at more than 95 percent of their licensed capacity.

No significant differences were found in comparing means of facilities grouped by occupancy rates, although facilities with occupancy rates of 81 to 90 percent had the highest per diem ($43.56). Tables 11 and 12 present the analysis of variance and table of means and standard deviations, respectively.

Table 11

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Occupancy Rate

Source of Variation	df	SS	MS	F
Between Groups	3	424.70	141.57	1.117
Within Groups	181	21877.62	120.87	
Total	184	22302.32		

Table 12

Mean Per Diems of ICF-MRs by Occupancy Rate

Occupancy Rate	Mean	SD	N
Group 1: $\leq$ 80%	$34.73	1.38	4
Group 2: 81 - 90%	$43.56	16.73	11
Group 3: 91 - 95%	$36.15	11.59	15
Group 4: 96 - 100%	$39.09	10.57	155

6. Ho_6: There is no relationship between per diem rates of residential services and number of staff.

A Pearson correlation coefficient was calculated between the number of full-time equivalent (FTE) direct care staff and per diem rates. The number of direct care staff was positively correlated ($r = .39$) at a significant level ($p < .01$).

7. Ho_7: There is no relationship between per diem rates of residential services and staff-resident ratio.

The staff-resident ratio factor illustrates the difficulty of identifying cause-effect relationships within residential care organizations. Staff-resident ratio, resident characteristics and facility services--as well as "artificial" conditions created by rules and regulations--appear to be highly correlated.

There is considerable evidence to suggest that staff-resident ratio is very much related to an organization's per diem rate. Residential services are labor-intensive industries; consequently, any change in the number or wage structure of employees will have a substantial impact upon costs.

In this study, the staff-resident ratio was calculated for each facility by dividing the total number of full-time equivalent direct care staff (40 hour week) by the total number of residents. The staff-resident ratios were categorized into five groups: (1) less than .33, (2) .33 to .65, (3) .66 to .99, (4) 1.00 to 1.32, and (5) 1.33 or more. A one-way analysis of variance was run with significant differences ($p < .01$) found among these groups.

Examination of the table of means (Table 14) indicates a direct relationship between staff-resident ratios and per diem costs: the higher the staff-resident ratio, the higher the per diem. When comparing each group with all others, only one comparison was not significant; that was group number one ($36.49) with group number two ($37.32). Table 13 presents the analysis of variance summary.

Table 13

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Staff-Resident Ratio

Source of Variation	df	SS	MS	F
Between Groups	4	5551.59	1387.90	14.914**
Within Groups	180	16750.73	93.06	
Total	184	22302.32		

**$p < .01$

Table 14

Mean Per Diems of ICF-MRs by Staff-Resident Ratio

Staff-Resident Ratio		Mean	SD	N
Group 1:	< .33	$36.49	10.97	83
Group 2:	.33 - .65	$37.32	6.31	63
Group 3:	.66 - .99	$42.56	10.41	28
Group 4:	1.00 - 1.32	$56.61	11.69	8
Group 5:	1.33+	$64.92	16.26	3

8. Ho_8: There is no relationship between per diem rates of residential services and years of operation.

It is not uncommon for newly-opened facilities to experience disproportionately high costs as a result of start-up expenses. Piasecki, et al (1977) suggested that initial costs for establishing a group home may equal or exceed the programs' annual operating budget; these costs might be attributed to building or remodeling requirements, legal fees, personnel recruitment and training or furnishings, supplies and related services.

The year of opening for the facilities was obtained from the Department of Public Welfare and subtracted from the constant year 1979 - the year from which data were derived. The years of operation were categorized into five groups: (1) one to two years, (2) three to four years, (3) five to six years, (4) seven to 20 years, and (5) 21 years or more. A one-way analysis of variance was calculated with significant differences ($p < .01$) occurring among groups. The highest per diem ($45.15) was reported for those facilities which had been operating for less than two years. The lowest mean per diem ($33.73) was associated with facilities which had been operating for seven to 20 years. The post hoc comparisons between each group with every other group revealed significant differences for all combinations except group three and group four, which was not significant. Tables 15 and 16 present the analysis of variance summary and the table of means and standard deviations.

Table 15

Summary of Analysis of Variance of Minnesota ICF-MR
Per Diems by Years of Operation

Source of Variation	df	SS	MS	F
Between Groups	4	2654.35	663.59	6.127**
Within Groups	178	19277.39	108.30	
Total	182	21931.74		

** $p < .01$

Table 16

Mean Per Diems of ICF-MRs by Years of Operation

Number of Years	Mean	SD	N
Group 1: 1 - 2 years	$45.15	12.12	35
Group 2: 3 - 4 years	$39.98	9.86	67
Group 3: 4 - 6 years	$36.34	10.98	46
Group 4: 7 - 20 years	$33.73	8.34	30
Group 5: 21 years or more	$34.28	10.38	5

9. Hog: There is no relationship between per diem rates of residential services and the type of license (Class A and Class B).

ICF-MRs in Minnesota are licensed as either Class A or Class B facilities. The classifications are dependent upon the residents' self-preservation skills (i.e., ability to egress from the building during an emergency). Class B facilities are for those persons who do not possess self-preservation skills. A one-way analysis of variance was run with significant differences ($p < .01$) reported for Class B facilities ($54.55) as compared to Class A facilities ($37.14). Tables 17 and 18 present the analysis of variance summary and the tables of means and standard deviations respectively.

Table 17

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Class A - Class B Categories

Source of Variation	df	SS	MS	F
Between Groups	1	5390.94	5390.94	58.63**
Within Groups	180	16550.83	91.95	
Total	181	21941.77		

**$p < .01$

Table 18

Mean Per Diems of ICF-MRs by Class A - Class B Categories

Type	Mean	SD	N
Class A	$37.14	8.45	162
Class B	$54.55	16.31	20

Resident Factors

There are six variables related to personal characteristics: (1) proportion of residents with severe or profound mental retardation, (2) proportion of residents who must be completely fed, (3) proportion of nonambulatory residents, (4) proportion of residents with severe behavior problems, (5) proportion of residents not toilet trained, and (6) age of residents.

10. Ho_{10}: There is no difference in the per diem rates of residential services and the proportion of severely or profoundly mentally retarded residents.

The proportion of residents who were classified as severely or profoundly mentally retarded was calculated for each facility. These proportions were then categorized into seven groups: (1) zero to five percent, (2) six to nine percent, (3) 10 to 19 percent, (4) 20 to 39 percent, (5) 40 to 49 percent, (6) 50 to 74 percent, and (7) 75 to 100 percent. A one-way analysis revealed significant differences ($p < .05$) with the lowest per diem ($32.99) reported for those facilities serving 40 to 49 percent severely or profoundly mentally retarded residents. This particular group differed significantly ($p < .01$) with all other groups. The analysis of variance summary and table of means and standard deviations appear in Tables 19 and 20 respectively.

Table 19

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Proportion of Severely or Profoundly Mentally Retarded Residents Served

Source of Variation	df	SS	MS	F
Between Groups	6	1922.78	320.46	2.875*
Within Groups	177	19726.89	111.45	
Total	183	21649.67		

*$p < .05$

Table 20

Mean Per Diems of Minnesota ICF-MRs by Proportion of Severely or Profoundly Mentally Retarded Residents Served

Proportion	Mean	SD	N
Group 1: 0 - 5%	$39.46	10.22	31
Group 2: 6 - 9%	$39.93	15.98	7
Group 3: 10 - 19%	$44.11	18.22	8
Group 4: 20 - 39%	$37.71	7.69	44
Group 5: 40 - 49%	$32.99	6.74	23
Group 6: 50 - 74%	$37.65	10.03	36
Group 7: 75 - 100%	$43.58	12.91	35

11. Ho_{11}: There is no difference in the per diem rates of residential services and the proportion of residents who must be fed completely.

Resident data on feeding skills was obtained from the Department of Health and categorized into five groups: (1) zero to five percent, (2) six to nine percent, (3) ten to 19 percent, (4) 20 to 39 percent, (5) 40 percent or more. Significant differences ($p < .01$) were found when a one-way analysis of variance was run on the various group means. There was a positive relationship between proportion of residents who were completely fed and the per diems. Almost all of the ICF-MRs (N = 175) had a low proportion (zero to 5 percent) of residents who had to be completely fed. Table 21 presents the analysis of variance summary while Table 22 presents the table of means and standard deviations.

Table 21

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Proportion of Residents Completely Fed

Source of Variation	df	SS	MS	F
Between Groups	4	4927.23	1231.81	12.76**
Within Groups	180	17375.09	96.52	
Total	184	22302.32		

**p < .01

Table 22

Mean Per Diems of Minnesota ICF-MRs by Proportion of Residents Completely Fed

Proportion	Mean	SD	N
Group 1: 0 - 5%	$37.86	9.41	175
Group 2: 6 - 9%	$49.38	12.68	2
Group 3: 10 - 19%	$51.02	0	1
Group 4: 20 - 39%	$60.19	19.50	5
Group 5: 40% +	$71.38	17.08	2

12. Ho_{12}: There is no difference in the per diem rates of residential services and the proportion of residents who are non-ambulatory

Again, resident data on non-ambulation were obtained from the Department of Health and classified into three groups: (1) zero to nine percent, (2) ten to 19 percent, and (3) 20 to 39 percent. Significant differences ($p < .01$) were found among groups as shown in Table 23. As the proportion of non-ambulatory residents increases, so does the per diem (as shown in Table 24); with the lowest per diem ($37.72) for facilities with zero to nine percent non-ambulatory residents and the highest per diem ($61.95) for facilities with 20 to 39 percent non-ambulatory residents.

Table 23

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Proportion of Residents Who are Non-ambulatory

Source of Variation	df	SS	MS	F
Between Groups	2	5243.71	2621.86	27.973**
Within Groups	182	17058.61	93.73	
Total	184	22302.32		

**$p < .01$

Table 24

Mean Per Diems of Minnesota ICF-MRs by Proportion of Residents Who are Non-ambulatory

Proportion	Mean	SD	N
Group 1: 0 - 9%	$37.72	9.24	174
Group 2: 10 - 19%	$49.37	12.68	2
Group 3: 20 - 39%	$61.95	16.33	9

13. Ho_{13}: There is no difference in the per diem rates of residential services and the proportion of residents who have severe behavior problems.

Facilities were classified into three groups by proportion of residents who have severe behavior problems (defined by the Department of Health as "uncooperative, wanders, withdrawn, crying, hallucinates, disruptive/runs away...assaultive"): (1) zero to nine percent, (2) ten to 19 percent, and (3) 20 percent or more.

Significant differences ($p < .01$) in per diems were revealed when a one-way analysis of variance was run. The highest per diems ($51.21) were associated with facilities in which 20 percent or more of the residents were classified as having severe behavior problems. Tables 25 and 26 present the analysis of variance summary and tables of means and standard deviations.

Table 25

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Proportion of Residents with Behavior Problems

Source of Variation	df	SS	MS	F
Between Groups	2	1754.57	877.29	7.77**
Within Groups	182	20547.74	112.9	
Total	184	22302.32		

** $p < .01$

Table 26

Mean Per Diems of Minnesota ICF-MRs by Proportion of Residents with Behavior Problems

Proportion	Mean	SD	N
Group 1: 0 - 9%	$36.78	8.91	150
Group 2: 10 - 19%	$38.89	9.90	25
Group 3: 20% +	$51.21	15.15	10

14. Ho_{14}: There is no difference in the per diem rate of residential services and the proportion of residents who are not toilet trained.

Facilities were grouped according to the proportion of residents who were not toilet trained: (1) zero to five percent, (2) six to 19 percent, and (3) 20 percent or more. A one-way analysis of variance revealed significant differences ($p < .01$) in group per diems with the highest per diem ($59.47) reported for facilities with 20 percent or more residents who were not toilet trained. The summary of the analysis of variance and tables of means and standard deviations appear in Tables 27 and 28 respectively.

Table 27

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Proportion of Residents Not Toilet Trained

Source of Variation	df	SS	MS	F
Between Groups	2	3689.85	1844.93	18.04**
Within Groups	182	18612.46	102.27	
Total	184	22302.32		

**$p < .01$

Table 28

Mean Per Diems of Minnesota ICF-MRs by Proportion of Residents Not Toilet Trained

Proportion	Mean	SD	N
Group 1: 0 - 5%	$37.92	9.41	174
Group 2: 6 - 19%	$52.95	22.11	5
Group 3: 20% +	$59.47	16.37	6

15. Ho_{15}: There is no difference in the per diem rates of residential services and the age of residents served.

The last one-way analysis of variance test was run on four categories of residential facilities grouped by age of residents: (1) zero to 12 years, (2) 13 to 20 years, (3) 21 to 40 years, and (4) 41 years or more. Significant differences were indicated. The highest costs ($51.16) were associated with children's facilities; the lowest costs ($33.57) were associated with ICF-MRs serving older populations (41 years or more).

Table 29

Summary of Analysis of Variance of Minnesota ICF-MR Per Diems by Age of Residents

Source of Variation	df	SS	MS	F
Between Groups	3	3243.96	1081.32	10.269**
Within Groups	181	19058.36	105.29	
Total	184	22302.32		

**$p < .01$

Table 30

Mean Per Diems of Minnesota ICF-MRs by Age of Residents

Proportion	Mean	SD	N
Group 1: 0 - 12 years	$51.16	15.74	9
Group 2: 13 - 20 years	$44.18	11.92	28
Group 3: 21 - 40 years	$38.65	10.17	109
Group 4: 41+ years	$33.57	7.38	39

IV. COST FUNCTION ANALYSIS

The second objective of this study will be development of an explanation of cost relationships using a cost function approach. A cost function is the testing of statistical relationships between inputs (the independent variables) and cost (the dependent variable) using multiple regression techniques.

Input factors were selected from the results of the first component of this study. The two primary purposes in selecting multiple regression for this study were: (1) to derive the best linear prediction equation from a large set of independent variables, and (2) to evaluate the respective contributions of a specific variable while holding other factors constant within a multivariate context.

Regression Analysis

The dependent measure was per diem cost. Seventeen independent variables were initially entered into the equation, including: (1) region, (2) metropolitan/non-metropolitan location, (3) profit/non-profit status, (4) family operation, (5) system membership, (6) licensed capacity, (7) occupancy rate,

(8) size, (9) number of full-time employees in direct care, (10) proportion of severely or profoundly mentally retarded residents, (11) proportion of residents that needs to be completely fed, (12) proportion of non-ambulatory residents, (13) proportion of residents with severe behavior problems, (14) proportion of residents who are not toilet trained, (15) average age of residents, (16) staff to resident ratio, and (17) years of operation.

Table 31 presents a correlation matrix of the predictors and per diem costs for ICF-MRs. Staff to resident ratio was most highly correlated with per diem cost ($r = .70$, $p < .01$). In descending order of magnitude, per diem cost was correlated with the proportion of residents who were not toilet trained ($r = .55$, $p < .01$) and who need to be completely fed ($r = .51$, $p < .01$). Average age of residents was negatively correlated with per diem cost ($r = -.46$, $p < .01$).

The correlation ratios are in agreement with the analysis of variance results reported earlier in this paper. Higher staff to resident ratios were associated with higher per diems. Higher proportions of non-toilet trained residents were associated with higher per diems. Higher proportions of residents who had to be completely fed were associated with higher per diems. An inverse relationship existed between per diem and average age of residents.

It is obvious that there is some degree of correlation among the independent variables. For example, facilities with higher proportions of non-ambulatory residents or those which serve children may require higher staff complements. All three of these variables are associated with higher per diem rates. The implications are that correlated variables "pick up" and reflect influences exerted by other variables thereby increasing their own apparent "causal" impact upon the dependent variable. The results become mixed because of correlation; readers must, therefore, exercise caution in interpreting these findings and should not point to a single variable as <u>the</u> determinant of per diem variation.

The results of the multiple regression analysis for ICF-MRs suggest that eight variables were statistically significant determinants of per diem rates: (1) staff to resident ratio, (2) number of non-ambulatory residents, (3) years of operation of facility, (4) average age of residents, (5) profit/non-profit status of facility, (6) facility size, (7) family owned and operated facilities, and (8) licensed capacity.

The overall multiple regression analysis accounted for 75 percent of the variance in per diems (multiple $R = .87$). The eight statistically significant variables accounted for 73 percent of that variance and were significant at the $p < .01$ level.

These findings corroborate earlier work by O'Connor and Morris (1978) and Wieck and Bruininks (1980) who reported that factors reflecting dependency level of residents, staff to resident ratio, and age of residents are extremely intertwined with the services provided by the facility and concomitant costs.

TABLE 31
Correlation Matrix of Predictors and Dependent Variable for ICF-MRs

	Per Diem	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Region	.36																
2. Metro/Non-Metro	.37	.75															
3. Profit/Non-Profit	-.09	-.04	.06														
4. Family Operated	.28	.26	.19	-.60													
5. System Member	-.08	-.05	-.11	.15	-.50												
6. Licensed Capacity	-.01	.17	.15	.09	.00	.20											
7. Occupancy Rate	.00	.09	.15	.05	.16	-.24	-.04										
8. Size	-.02	.17	.15	.10	.01	.19	1.00	-.01									
9. FTE Direct Care	.38	.26	.24	-.09	.11	.18	.81	-.10	.80								
10. Staff to Resident Ratio	.70	.28	.31	-.31	.24	-.13	-.04	-.08	-.06	.39							
11. Years of Operation	-.19	-.21	-.13	.13	-.30	.20	.22	-.20	.22	.23	-.01						
12. Severe Profound MR	.25	-.06	-.02	-.08	.03	.01	.03	-.13	.03	.20	.34	.18					
13. Completely Fed	.51	.09	.10	-.10	.05	.12	.18	-.01	.17	.53	.47	.10	.32				
14. Non-Ambulatory	.57	.06	.06	-.08	.08	.14	.19	.01	.19	.52	.42	.05	.35	.86			
15. Severe Behavior Problems	.06	.00	-.02	-.20	.17	-.01	.08	.04	.08	.14	.00	-.04	.03	.05	.12		
16. Not Toilet Trained	.55	.07	.06	-.09	.06	.14	.22	-.02	.22	.59	.46	.12	.36	.96	.91	.10	
17. Average Age	-.46	-.24	-.28	.05	-.24	.18	.05	-.14	.06	-.21	-.40	-.17	-.22	-.32	-.31	.32	-.35

V. SUMMARY OF FINDINGS

Location

There were significant differences ($p < .01$) in the per diems of ICF-MRs located in Minnesota's eleven economic development regions. Mean rates ranged from $31.50 and $31.84 in Regions 6 and 1 to $44.11 in Region 11. Regional variations may be due to general cost-of-living differences, or to differences in the supply and demand of one or more factors of "production" (e.g., labor, capital, and materials).

ICF-MRs located in the seven-county, Minneapolis-Saint Paul metropolitan area (Region 11) have significantly ($p < .01$) higher per diems than those in non-metropolitan areas. These differences may be attributable to cost-of-living differences between urban and rural areas.

Size

A U-shaped relationship between size and per diem costs was found. Facilities serving six or fewer residents and ICF-MRs serving 33 or more residents reported the highest per diems ($41.08 and $42.13, respectively). There was a significant difference ($p < .05$) in per diems by size categories; the per diem differences between facilities serving seven to 12 persons ($35.55) and 13 to 16 residents ($36.66) and the other three sizes were especially significant ($p < .01$ for both). The question of economy of scale for residential services remains unresolved.

During 1979 there were approximately 3,470 persons living in Minnesota's 185 Intermediate Care Facilities for Mentally Retarded; the facilities ranged in size from six to 171. Seventy-five percent (N = 139) of the facilities were licensed to serve sixteen or fewer individuals; they served only 35.4 percent (N = 1,228) of the total resident population. The five largest facilities--averaging 123 residents--had a resident population of 616 persons. For further discussion of facility "size, " see Policy Analysis Series No. 2 (Developmental Disabilities Program, 1981).

Ownership

No significant differences were found between proprietary and non-profit facilities in the single variable analysis (refer to footnote #4, page 24 for multiple regression results). Family-owned and operated facilities reported significantly ($p < .01$) lower per diems ($34.22) than non-family owned and operated agencies ($41.00).

Systems

The results of this study indicate that systems of ICF-MRs operate at a significantly ($p < .05$) higher cost ($40.52) than ICF-MRs not affiliated with a system ($36.37). This result is similar to the findings of the national study by Wieck and Bruininks (1980).

Occupancy Rate

No statistically significant differences were reported in per diems based on occupancy rates. ICF-MRs in Minnesota typically operate at a high occupancy level.

Number of Staff
A positive Pearson correlation coefficient ($r = .39$, $p < .01$) was reported between the number of FTE direct care staff and the per diem.

Staff-Resident Ratio
Statistically significant differences were reported for facilities based on level of staff-resident ratio ($p < .01$). As the staff-resident ratio increases, the per diem also increases in a direct, positive relationship. Per diems ranged from $36.49 for facilities with a .33 staff-resident ratio or less to $64.92 for ICF-MRs with a staff-resident ratio of 1.33 or more.

Years of Operation
The highest per diems ($45.15) were reported by new facilities (two or less years of operation) while the lowest per diems ($33.73) were reported by ICF-MRs which were seven to 20 years old. These differences were statistically significant ($p < .01$).

Class A or Class B
The analysis indicated that the difference between per diems for Class B facilities ($54.55) and Class A facilities ($37.14) was statistically significant ($p < .01$).

Proportion of Severely/Profoundly Mentally Retarded Residents
Facilities that served resident populations in which 40 to 49 percent were severely/profoundly mentally retarded had lower per diems than facilities serving other proportions. Those differences were statistically significant ($p < .01$).

Resident Dependency
There was a positive, direct relationship between dependency level (feeding, ambulation, toilet training, behavior problems) and per diems. ICF-MRs that serve higher proportions of residents who must be completely fed, are non-ambulatory, are not toilet trained, or who have severe behavior problems report higher per diems. The differences in per diems for all of these facilities were statistically significant ($p < .01$).

Mean per diems by proportion of residents who are completely fed ranged from $37.86 (zero to five percent) to $71.38 (40 percent or more); by proportion of non-ambulatory residents, the range was $37.72 (zero to nine percent) to $61.95 (20 to 39 percent). Per diems by proportion of non-toilet trained residents went from a low of $37.92 (zero to five percent) to a high of $59.47 (20 percent or more); for those facilities serving persons with severe behavior problems, per diems ranged from $36.78 (zero to nine percent) to $51.21 (20 percent or more).

Age of Residents
A statistically significant ($p < .01$) inverse relationship exists between average resident age and per diem. ICF-MRs serving children reported the highest per diems ($51.16). Facilities for older populations (41 years or older) reported the lowest per diems ($33.57). Facilities for teenagers (13 to 20 years) and younger adults (21 to 40 years) reported costs of $44.18 and $38.65, respectively.

Multiple Factors

When all of these factors are considered simultaneously, the variables producing statistically significant variations in per diem rates were: (1) staff to resident ratio, (2) proportion of residents who are non-ambulatory, (3) number of years in operation, (4) age of residents, (5) profit/non-profit status,[4] (6) facility size, (7) family owned and operated facilities, and (8) licensed capacity.

Correlation among variables makes all variables important, however, when considering per diem rates in ICF-MRs and when determining policies relative to the operation and regulation of intermediate care facilities for the mentally retarded.

VI. DISCUSSION

This study may have some significance in terms of deinstitutionalization generally, and the Welsch v. Noot Consent Decree specifically. The data presented here and the issue of size must, however, be considered within a context broader than cost. Given this State's commitment to community placement of developmentally disabled persons and its often-stated policy of establishing less restrictive, normalized living environments, the underlying concepts of deinstitutionalization must be considered as well:

- Admissions to public residential facilities should be prevented by finding and developing alternative residential facilities;
- All persons who have been prepared through programs of habilitation and training to function in appropriate community settings should be returned to community residential facilities;
- Residential environments which protect human and civil rights and which contribute to the expeditious return of individuals to normal community living must be established and maintained.

(National Association of Superintendents of Public Residential Facilities for the Mentally Retarded, 1974)

Within this context, it becomes important that policy-makers (and those making decisions about the allocation of public funds) become aware of all the costs of operating a community residential program--the psychosocial and developmental as well as the fiscal (Regional Institute of Social Welfare, 1976).

In a programmatic sense, decisions about facility size cannot be based solely upon dollar costs. Although the literature is not definitive, research indicates that "smaller" community residences are more likely to provide environments which are more culturally normative and more influential in producing

[4]The variable "profit/non-profit status" is significant in the multiple regression whereas it is not in the single variable analysis. When the variables are separated, as they are in the multiple regression, the correlation effects on "profit/non-profit" are reduced making the variable statistically relevant.

gains in adaptive behavior and general developmental growth. Various authors have identified some factors which contribute to the psychosocial/developmental growth of developmentally disabled residents (These factors are more often associated with smaller facilities):

- individualized attention (Baroff, 1980)
- resident-oriented care practices (Balla, 1976; Baroff, 1980; King, Raynes & Tizard, 1971; McCormick, Balla & Zigler, 1975)
- absences of security features, existence of personal effects, privacy in bathroom and bedroom areas (Balla, 1976; Baroff, 1980)
- community exposure, social interaction (Crawford, 1979; Baroff, 1980)
- experienced, trained direct care staff (Dellinger & Shope, 1978; Baroff, 1980)

The results from this study (again, the reader is advised that the data are from late 1979) indicate that per diem rates are higher for facilities serving six or fewer individuals; lower for residences serving from seven to 12 persons and then increase again as the size of the facility exceeds 12 residents. Another study of group home costs in Minnesota (Department of Public Welfare, 1978) suggested that "smaller" facilities are capable of producing "positive client changes at a better rate than larger ones; and...without significantly higher costs" (p. 75).

Cost is, of course, an important consideration--particularly during times of economic instability. The data from this study suggest, however, that smaller residential facilities are not incompatible with cost considerations; nor are they inconsistent with State policy and the objectives specified in the Welsch v. Noot Consent Decree.

Many factors are involved in establishing and maintaining appropriate community residences (Developmental Disabilities Program, 1981). And while costs are a very real and necessary consideration, they should not overshadow the individual needs of potential residents. As this study points out, there are a number of variables which influence the per diem rates of ICF-MRs--many of those variables are directly or indirectly related to the characteristics of the persons living in those facilities.

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The purpose of this series is to enhance communication among state and local agencies, service providers, advocates, and consumers on timely issues. We encourage reader participation by giving us feedback on your ideas and perceptions of this problem.

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APPENDIX

Minnesota Economic Development Regions