

Technical Report: Nursing Home Cost and Quality Trajectory Clustering

Evaluation of the NF Payment Reform Legislation

2021 Report to the Legislature

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Executive Summary

Purpose

It has been hypothesized that greater spending on direct care should lead to higher quality care. However, the quantitative link between care cost and care quality has been difficult to establish at the macro level. The Value Based Reimbursement (VBR) policy change, effective January 1, 2016, incentivized greater spending on care related costs with the expectation that this would contribute to greater quality of care. An increase in spending on care related to VBR has been observed, but not a similar related rise in quality scores. The purpose of this analysis is to identify sub-groups of facilities in terms of care related cost and quality score trajectories. These sub-groups may indicate differing strategies or constraints that facilities use and face when responding to the VBR policy.

Methods

Latent Class Growth Analysis is used to simultaneously cluster facilities by their care related cost and quality score trajectories. Once an optimally fitting model is found, these clusters are then compared across a range of facility characteristics to better understand the sub-groups. Hospital attached facilities were removed from the clustering analysis and presented in the tables as a separate cluster.

Results

- Three clusters were identified: Cluster 3 maintains relatively higher costs, began with relatively high quality and ended in the middle of the clusters for mean quality score. Cluster 1 and Cluster 2 tracked fairly closely with relatively lower costs, but Cluster 1 began and ended with relatively higher quality scores while Cluster 2 began with low quality, improved in the middle of the period, and declined in quality scores at the end of the period.
- Cluster 2 (relatively lowest quality scores) is characterized by a higher rate of CHOW, for-profit ownership, relatively higher administrative costs per resident day, relatively low revenue to long term lease ratios (for those facilities with long term leases), lower overall staff retention, scored relatively worse on all quality measures, and spent relatively less on group medical insurance per resident day.
- Cluster 1 (relatively low cost and highest quality) is notably similar to Cluster 2 in many facility and spending characteristics not otherwise noted, but has the best quality scores for hospitalization rate per 1000 resident days, quality indicator score, MDH inspection score, and overall quality score. Cluster 1 has relatively much more favorable total revenue to long term lease costs (for those facilities with long term leases) and spends the most on group medical insurance per resident day.
- Cluster 3 (relatively highest cost, middle quality) has a much higher average number of admissions, made up of mostly non-profit and government facilities, higher acuity and occupancy, lowest percentage of Medicaid days, almost entirely located in the Metro area, highest care related costs, best staff retention, best adjusted community discharge and hospitalization rates, and highest quality of life scores (marginally).
- Cost trajectories are more stable (smooth) than quality score trajectories.

Trajectory Clustering

This section of the report describes the analysis that explores the relationship between quality and care related costs for subsets of facilities. Latent Class Growth Analysis was utilized to better understand the sub-population structure of Minnesota nursing facilities in terms of spending on direct care costs and quality scores. Data were derived from the 2013-2019 Facility Cost Reports and data from the Minnesota Quality Report Cards. Quadratic growth models were used and the number of clusters was set to a range from 2-5, and various fit criterion (eg. AIC/BIC) and estimation quality (eg. condition number) were assessed for the best fitting model. The model with three clusters was superior. Cost and quality were modeled jointly as the response and the algorithm iteratively assigned each facility to a cluster in order to maximize model fit of the parameters. All modeling results in this report were fit on non-hospital attached facilities, although the hospital attached facilities are displayed as a comparison cluster.

Initial Clusters

Table 1: Mean Growth Parameters from the Three Clusters

Cluster	Quality Intercept	Quality Slope	Quality Quadratic	Cost Intercept	Cost Slope	Cost Quadratic	N
1	76.59	0.75	-0.12	99.52	3.24	0.66	163
2	70.85	3.93	-0.75	98.44	7.90	-0.01	87
3	77.09	0.82	-0.24	126.09	4.57	0.26	40

Table 1 displays the estimated mean growth parameters for the three clusters. Cluster size ranges from 40-163 facilities. The table also gives the intercept (starting quality or care related cost in year 2013), slope (linear growth component), and quadratic term (quadratic growth component). The quadratic model is used as the linear model proved to be inadequate as several facilities show exponential, logarithmic, and parabolic growth or decline patterns. For example, Cluster 2 has a quality intercept of 70.85, slope of 3.93, and quadratic term of -0.75. The intercept indicates that the cluster mean at the beginning of the period (2013) was a quality score of 70.85. The combination of a slope of 3.93 and quadratic term of -0.75 indicates a pattern of initial growth with a peak in the middle then a decline in the latter half of the time period (inverted “U” shape). This translates to an increase of 3.18 points in 2014, 1.68 points in 2015, 0.18 points in 2016, a decrease (-1.32 points) in 2017, (-2.82) in 2018, and (-4.32) in 2019. This trend and other cluster trends is represented graphically in the appendix (red line in spaghetti plots).

Mean Patterns in Care Related Cost and Quality Scores for Largest Clusters

Figure 1 and Figure 2 display the mean trajectories for care related costs and overall quality score for the 3 clusters. In both figures, the means are calculated as the average across the facilities within a cluster for each year and the trend line is a simple connecting of the dots. Figure 2 indicates that there is a general upward trend in costs with Cluster 3 maintaining relatively higher costs in the group, cluster 2 and 3 track more closely, beginning and ending nearer to each other than in the middle of the period. Mean quality scores for the group tended to be higher than 70 until 2018-19 when cluster 2 drops into the 60s. Despite having the highest costs Cluster 3 had a small decline in quality scores towards the end

of the period (2017-19) leaving them as the middle performing cluster. Despite the lowest costs cluster 1 finished with the highest quality scores of the three groups.

Appendix Spaghetti Plots

Spaghetti plots by cluster are included in the appendix (Figure A3) to illustrate the estimated trajectories and level of variability among the facilities. Two spaghetti plots are included for each cluster, quality score and care related cost trajectory. Each facilities values are represented by an individual line, the solid red line gives the estimated cluster trajectory from the growth model. For example, cluster three shows an inverted parabola for quality (upside down U) and linear cost growth.

Cluster Characteristics

Table 2 through Table 10 describe the 3 clusters and hospital attached facilities using facility characteristics (Table 2), spending patterns (Table 4), staffing patterns (Table 6), quality metrics (Table 8), and employee compensation metrics (Table 10). These tables can help characterize or tell the story of each cluster. Cluster 2 is of primary interest as Figure 1 indicates that although care related costs of Cluster 2 track fairly closely to Cluster 1, quality scores are much lower and seem to have decreased relative to the other two groups over the last three years (2017-2019). Cluster 2 will be compared for characteristics relative to the other facilities.

Table 2 shows that Cluster 2 facility characteristics are similar in many respects to Cluster 1, but stands out as having the highest rate of ownership change (37% vs 22% for cluster 1 / 13% for cluster 3), for profit facilities (46% vs 38/20%), and having increasing occupancy over the last year (+1.5% vs -0.8/-0.2%). Both Cluster 2 and Cluster 1 lag behind Cluster 3 (relatively highest cost and middle quality) number of admissions (408 vs 141/164) and occupancy rate (90% vs 84%). Cluster 3 is notably 73% non-profit facilities, has the lowest percentage of Medicaid days (51% vs 56/59%), highest rate of Other RUG Paid days (40% of non-MA days vs 28/30%), and is primarily located in the Metro area (95% vs 66/63%).

Table 4 shows that the mean spending patterns of Cluster 1 and 2 track fairly closely while Cluster 3 tends to spend more on care related costs per standardized day (\$162 vs \$142/144). Cluster 3's total spending in the aggregate are notably higher on Central Office and Other Administrative Costs (\$889K vs \$435K/\$495K) and Net Administrative Costs less Insurance/Working Capital/Bad Debt (\$1326K vs \$716K/\$774K). However, when adjusting these costs per standardized resident day, cluster 2 was highest for both categories (\$21.28 vs \$19.41/\$20.99 and \$33.28 vs \$31.96/\$31.30 respectively). Importantly, 30% of Cluster 2 facilities report long term lease costs with an average ratio of total revenue per long term lease cost of \$115, comparable to 17% of Cluster one with \$162,695 of total revenue to long term lease cost and 23% of Cluster 3 with \$2,004 of total revenue to long term lease cost.

Table 6 displays staffing patterns across the clusters. Retention is measured as the percentage of employees from beginning of the cost year (October 1) remaining employed by the facility at the end of the cost year (September 30). Cluster 2 is the lowest in overall retention (64% vs 67/72%) retention of nurse administrators (71% vs 79/73%), RNs (66% vs 71/74%), LPNs (70% vs 73/74%), social workers (59% vs 77/81%), activities staff (67% vs 75/80%), and other direct care staff (25% vs 32/62%). Compensated direct care hours per resident day are noticeably higher for Cluster 3 in RNs (0.88 vs 0.63/0.65) in total

for direct care (5.25 vs 4.82/4.84), and for social workers (0.2 vs 0.15/0.14), but don't differ greatly between the three groups in the other categories.

Table 8 presents the mean quality scores and measures for the clusters. Cluster 2 has the lowest scores for those measures that were used in the clustering (expected as a function of the model) and for those measures not used in the clustering (not necessarily expected). Cluster two was lowest on overall quality score (66.9 vs 77.1/73.4) as well as each sub-component, quality indicators (30.5 vs 36.7/34), quality of life (31.7 vs 32.5/32.7) and the Minnesota Department of Health score (4.7 vs 7.9/6.7). Cluster two was also lowest on the measures not used for trajectory clustering such as adjusted community discharge within 30 days of admission (31% vs 34/39%), between 31-90 days (31% vs 33/35%), adjusted re-hospitalization rates within 30 days of admission (12.5% vs 12.3/11.9%), and unadjusted hospitalization rate per 1000 resident days (1.75 vs 1.53/1.55).

Table 10 displays compensation related measures across the clusters such as salary, insurance and benefits, and union presence. Cluster 2 spends the least on group medical insurance in the aggregate (\$267 vs \$298K/\$555K) and on the per resident day basis (\$12.02 vs \$13.58/\$13.16). Salary per resident day for Cluster 2 tends to be above Cluster 1 and below Cluster 3 with the exception of CNAs (\$40.81 vs \$41.34/\$43.64), direct care trainer (\$3.37 vs \$3.42/\$4.61), mental health worker (\$3.43 vs \$3.58/\$5.31), and social worker where the order is reversed (\$4.92 vs \$5.37/\$4.90).

Summary

This report represents the best fitting model using all non-hospital attached facilities with cost report and quality data from 2013-2019. It is possible that removing certain outlying facilities from the analysis, that tend to form small or individual clusters when larger numbers of clusters are used in the modeling, may lead to a well-fitting model with greater resolution (larger number of clusters/sub-populations of facilities). The current analysis highlights three clusters. Cluster 1 and Cluster 2 have similar cost trajectories, while Cluster 3 had substantively higher mean costs. Cluster 1 maintained the highest mean quality, while Cluster 3 settled into the middle at the end of the period, and Cluster 2 initially closed the gap and then fell away to a greater gap at the end then they began with. Although Cluster 2 has comparable costs to Cluster 1, Cluster 2 appears to struggle more with retention which may be in part due the larger proportion of facility change in ownership and slightly lower benefit compensation such as health insurance. Notably cluster 2 also has much less favorable long term lease positions relative to the other clusters. Understanding the mechanisms underlying these problems will be imperative to remedying the quality gap.

Figure 1: Mean Facility Quality Score and Cost Trajectory by Assigned Cluster Membership

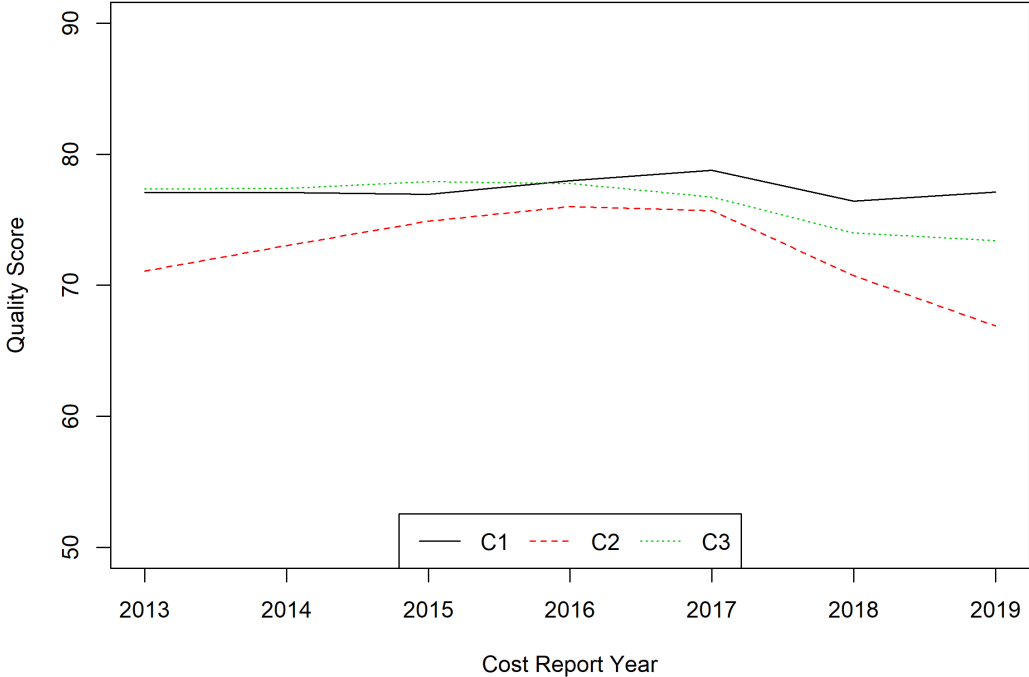


Figure 2: Mean Care Related Cost Trajectories by Assigned Cluster Membership

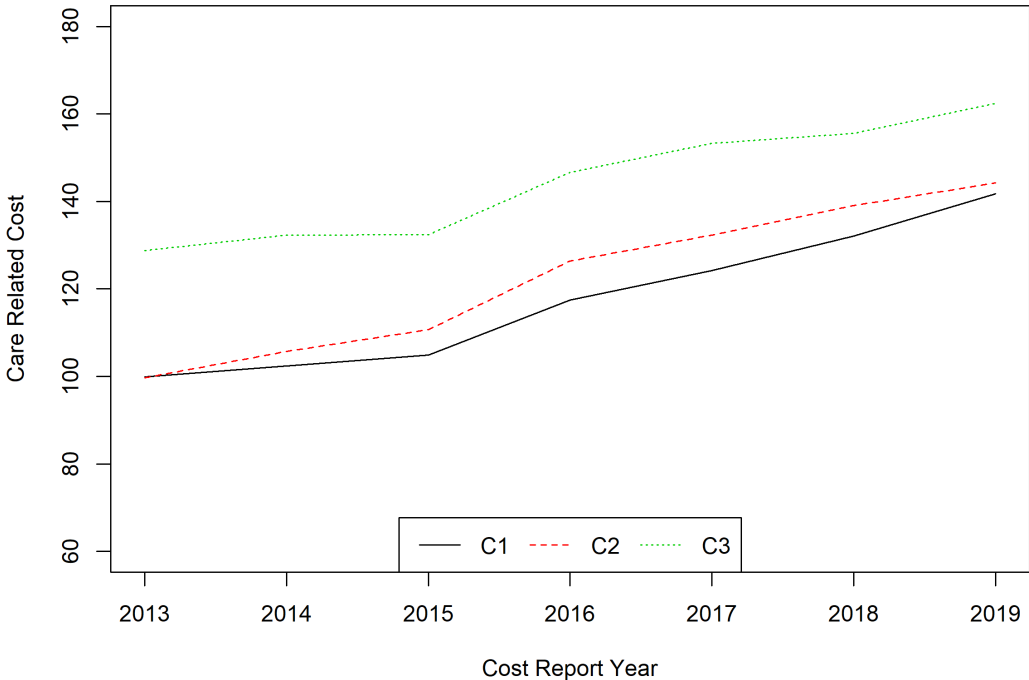


Table 2: Facility Characteristics by Cost/Quality Trajectory Cluster

Cluster	C 1	C 2	C 3	Hospital Attached
Facilities	163	87	40	43
Annual Admissions	140.8	163.8	408.2	74.8
Ownership Change	22%	37%	13%	7%
Ownership: For Profit	38%	46%	20%	2%
Ownership: Non Profit	56%	47%	73%	74%
Ownership: Government	6%	7%	8%	23%
Hospital Attached*	0%	0%	0%	100%
Acuity	1.01	1.02	1.04	0.92
Latest Annual Occupancy %	84%	84%	90%	86%
Latest Annual Occupancy Change	-0.8%	1.5%	-0.2%	-0.8%
Resident Days	22,016	22,565	40,841	18,599
Medicaid Paid Resident Days	12,373	13,390	20,937	11,638
Medicaid Days / Resident Days	56%	59%	51%	63%
Non-Medicaid Paid Resident Days	9,644	9,175	19,904	6,961
Medicare RUG Paid Resident Days	1,747	1,882	4,235	855
Medicare RUG / Non-MA Days	18%	21%	21%	12%
Other RUG Paid Residents Days	2,672	2,784	7,995	1,725
Other RUG / Non-MA Days	28%	30%	40%	25%
Private Pay RUG Paid Resident Days	5,224	4,509	7,674	4,382
Private Pay RUG / Non-MA Days	54%	49%	39%	63%
Total Beds	71.2	73.1	124.9	58.5
Twin City (7 County Area)	23%	28%	90%	5%
Other Metropolitan RUCA	43%	36%	5%	40%
Micropolitan RUCA	15%	15%	3%	19%
Small Town RUCA	13%	16%	0%	14%
Rural RUCA	6%	6%	3%	23%
Medicare LTC Basket Wage Index	0.99	0.99	1.10	0.93
Standardized Days	22,417	23,259	42,372	17,561
Minnesota Only Facility (single state)	71%	66%	60%	93%
Chain Facility	63%	67%	65%	78%

*Hospital attached facilities grouped into their own cluster manually for comparison purposes.

Table 3: Facility Characteristics by Ownership Type

Cluster	For Profit	Non Profit	Government	Hospital Attached
Facilities	110	162	18	43
Annual Admissions	171.5	203.5	94.4	74.8
Ownership Change	62%	2%	6%	7%
Ownership: For Profit	100%	0%	0%	2%
Ownership: Non Profit	0%	100%	0%	74%
Ownership: Government	0%	0%	100%	23%
Hospital Attached*	0%	0%	0%	100%
Acuity	1.01	1.02	1.00	0.92
Latest Annual Occupancy %	80%	88%	84%	86%
Latest Annual Occupancy Change	0.6%	-0.5%	0.1%	-0.8%
Resident Days	22,241	27,362	17,011	18,599
Medicaid Paid Resident Days	14,077	14,200	9,455	11,638
Medicaid Days / Resident Days	63%	52%	56%	63%
Non-Medicaid Paid Resident Days	8,164	13,162	7,555	6,961
Medicare RUG Paid Resident Days	1,740	2,465	1,515	855
Medicare RUG / Non-MA Days	21%	19%	20%	12%
Other RUG Paid Residents Days	3,125	3,818	1,952	1,725
Other RUG / Non-MA Days	38%	29%	26%	25%
Private Pay RUG Paid Resident Days	3,299	6,879	4,088	4,382
Private Pay RUG / Non-MA Days	40%	52%	54%	63%
Total Beds	75.1	84.6	55.3	58.5
Twin City (7 County Area)	42%	31%	6%	5%
Other Metropolitan RUCA	30%	38%	50%	40%
Micropolitan RUCA	9%	15%	22%	19%
Small Town RUCA	14%	10%	22%	14%
Rural RUCA	5%	6%	0%	23%
Medicare LTC Basket Wage Index	1.02	1.00	0.92	0.93
Standardized Days	22,610	28,255	17,111	17,561
Minnesota Only Facility (single state)	74%	60%	100%	93%
Chain Facility	76%	61%	17%	33%

Table 4: Facility Spending Patterns by Cost/Quality Trajectory Cluster

Cluster	C1	C2	C3	Hospital Attached
Facilities	163	87	40	43
Direct Care Cost per Standardized Day	116	120	132	146
Other Care Related Cost per Standardized Day	25.5	24.4	30.6	31.1
Total Care Cost per Standardized Day	142	144	162	177
Other Operating Cost per Resident Day	77.0	78.1	78.9	101.1
Dietary Cost per Resident Day	15.5	15.3	17.4	23.8
Laundry Cost per Resident Day	3.9	3.5	3.7	4.8
Housekeeping Cost per Resident Day	7.4	7.1	8.3	6.6
Physical Plant Cost per Resident Day	15.6	15.8	15.6	9.8
Administrative Cost per Resident Day	34.6	36.4	34.0	56.1
Administrative Management Fees per Resident Day	9.7	9.8	12.7	0.5
Central Office and General Admin Other (K)	435	495	889	62
Central Office and General Admin Other PSRD	19.41	21.28	20.99	3.54
Net Admin less Insurance, Working Capital, Bad Debt (K)	716	774	1,326	1,025
Net Admin less Insurance, Working Capital, Bad Debt PSRD	31.96	33.28	31.30	58.36
Direct Care Cost per Resident Day	118	122	137	134
Other Care Related Cost per Resident Day	25.5	24.7	30.5	28.5
Total Care Related Cost per Resident Day	143	147	168	162
Long Term Lease Cost (K)	333.7	463.8	55.1	33.5
Total Revenue per Long Term Lease Cost	30	22	207	20
Facilities with Long Term Lease	5	8	1	1
Physical Plant Owner: Other	93%	89%	90%	51%
Physical Plant Owner: City	4%	7%	3%	16%
Physical Plant Owner: County	2%	3%	5%	2%
Physical Plant Owner: Hospital	1%	0%	0%	30%
Physical Plant Owner: REIT	0%	1%	3%	0%

Table 5: Facility Spending Patterns by Ownership Type

Cluster	For Profit	Non Profit	Government	Hospital Attached
Facilities	110	162	18	43
Direct Care Cost per Standardized Day	113	123	126	146
Other Care Related Cost per Standardized Day	24.2	27.1	25.0	31.1
Total Care Cost per Standardized Day	137	150	151	177
Other Operating Cost per Resident Day	77.8	77.1	81.0	101.1
Dietary Cost per Resident Day	15.2	15.9	17.1	23.8
Laundry Cost per Resident Day	3.9	3.6	4.5	4.8
Housekeeping Cost per Resident Day	7.6	7.2	8.0	6.6
Physical Plant Cost per Resident Day	14.4	16.4	17.2	9.8
Administrative Cost per Resident Day	36.7	34.0	4.3	56.1
Administrative Management Fees per Resident Day	10.4	10.5	12.7	0.5
Central Office and General Admin Other (K)	476.82	568	285	62
Central Office and General Admin Other PSRD	21.09	20.09	16.65	3.54
Net Admin less Insurance, Working Capital, Bad Debt (K)	754	891	543	1,025
Net Admin less Insurance, Working Capital, Bad Debt PSRD	33.37	31.55	31.75	58.36
Direct Care Cost per Resident Day	114	126	126	134
Other Care Related Cost per Resident Day	23.6	27.6	25.0	28.5
Total Care Related Cost per Resident Day	137	154	151	162
Long Term Lease Cost (K)	383,828	55,095	773,103	33,456
Total Revenue per Long Term Lease Cost	26	207	8	20
Facilities with Long Term Lease	12	1	1	1
Physical Plant Owner: Other	98%	97%	0%	51%
Physical Plant Owner: City	0%	2%	61%	16%
Physical Plant Owner: County	0%	1%	39%	2%
Physical Plant Owner: Hospital	0%	1%	0%	30%
Physical Plant Owner: REIT	2%	0%	0%	0%

Table 6: Facility Staffing Patterns by Cost/Quality Trajectory Cluster

Cluster	C1	C2	C3	Hospital Attached
Facilities	163	87	40	43
Staffing Pool Use Percentage	0%	0%	0%	0%
Nursing Pool RN Direct Care Hours (K)	15	25	23	14
Nursing Pool LPN Direct Care Hours (K)	25	27	23	29
Nursing Pool CNA Direct Care Hours (K)	43	38	47	57
Nursing Pool TMA Direct Care Hours	33	9	6	77
Overall Staff Retention	67%	64%	72%	74%
Retention: Nurse Admin	79%	71%	73%	78%
Retention: RN	71%	66%	74%	70%
Retention: LPN	73%	70%	74%	80%
Retention: CNA	60%	60%	66%	68%
Retention: TMA	50%	53%	52%	51%
Retention: MHW	1%	0%	2%	0%
Retention: Social Work	77%	59%	81%	83%
Retention: Activities	75%	67%	80%	87%
Retention: ODC	32%	25%	62%	31%
LPN Compensated DC Hours per Resident Day	0.63	0.67	0.68	0.65
RN Compensated DC Hours per Resident Day	0.63	0.65	0.88	0.72
CNA Compensated DC Hours per Resident Day	2.39	2.33	2.40	2.58
Licensed Compensated DC Hours per Resident Day	1.26	1.32	1.55	1.37
Total Compensated DC Hours per Resident Day	4.82	4.84	5.25	5.19
Activities Staff Compensated DC Hours per Resident Day	0.32	0.29	0.26	0.39
Mental Health Workers Compensated DC Hours per Resident Day	0.00	0.00	0.03	0.00
Nursing Administration Compensated DC Hours per Resident Day	0.32	0.34	0.38	0.30
Social Workers Compensated DC Hours per Resident Day	0.15	0.14	0.20	0.12
Trained Medication Aides Compensated DC Hours per Resident Day	0.30	0.32	0.31	0.28
Other Direct Care Staff Compensated DC Hours per Resident Day	0.03	0.02	0.05	0.07

Table 7. Facility Staffing Patterns by Ownership Type

Cluster	For Profit	Non Profit	Government	Hospital Attached
Facilities	110	162	18	43
Staffing Pool Use Percentage	0%	0%	0%	0%
Nursing Pool RN Direct Care Hours (K)	21	17	29	14
Nursing Pool LPN Direct Care Hours (K)	27	22	51	29
Nursing Pool CNA Direct Care Hours (K)	43	38	75	57
Nursing Pool TMA Direct Care Hours	55	2	0	77
Overall Staff Retention	62%	69%	69%	74%
Retention: Nurse Admin	70%	82%	60%	78%
Retention: RN	66%	73%	73%	70%
Retention: LPN	69%	74%	73%	80%
Retention: CNA	57%	63%	64%	68%
Retention: TMA	38%	59%	66%	51%
Retention: MHW	2%	0%	0%	0%
Retention: Social Work	59%	79%	83%	83%
Retention: Activities	68%	77%	73%	87%
Retention: ODC	11%	53%	7%	31%
LPN Compensated DC Hours per Resident Day	0.67	0.63	0.66	0.65
RN Compensated DC Hours per Resident Day	0.60	0.71	0.71	0.72
CNA Compensated DC Hours per Resident Day	2.16	2.50	2.53	2.58
Licensed Compensated DC Hours per Resident Day	1.28	1.34	1.37	1.37
Total Compensated DC Hours per Resident Day	4.49	5.13	5.12	5.19
Activities Staff Compensated DC Hours per Resident Day	0.26	0.33	0.38	0.39
Mental Health Workers Compensated DC Hours per Resident Day	0.01	0.00	0.00	0.00
Nursing Administration Compensated DC Hours per Resident Day	0.31	0.36	0.24	0.30
Social Workers Compensated DC Hours per Resident Day	0.15	0.15	0.12	0.12
Trained Medication Aides Compensated DC Hours per Resident Day	0.25	0.33	0.39	0.28
Other Direct Care Staff Compensated DC Hours per Resident Day	0.01	0.04	0.00	0.07

Table 8. Facility Quality Patterns by Cost/Quality Trajectory Cluster

Clusters	C1	C2	C3	Hospital Attached
Facilities	163	87	40	43
Adjusted Community Discharge Rate (3-30 Days)	34%	31%	39%	38%
Adjusted Community Discharge Rate (31-90 Days)	33%	31%	35%	32%
Adjusted Re-hospitalization Rate (3-30 Days)	12.3%	12.5%	11.9%	12.2%
Hospitalization Rate per 1000 Resident Days	1.53	1.75	1.55	1.14
Overall Quality Score	77.11	66.89	73.42	73.70
Quality Indicators (Scaled out of 50)	36.69	30.51	34.00	33.15
Minnesota Department of Health Quality Score (out of 10)	7.88	4.66	6.69	7.73
Quality of Life Quality Score (out of 40)	32.53	31.72	32.74	32.82

Table 9: Facility Quality Patterns by Ownership Type

Clusters	For Profit	Non Profit	Government	Hospital Attached
Facilities	110	162	18	43
Adjusted Community Discharge Rate (3-30 Days)	29%	37%	33%	38%
Adjusted Community Discharge Rate (31-90 Days)	31%	34%	32%	32%
Adjusted Re-hospitalization Rate (3-30 Days)	13.0%	11.9%	11.6%	12.2%
Hospitalization Rate per 1000 Resident Days	1.92	1.39	1.56	1.14
Overall Quality Score	71.50	74.81	74.48	73.70
Quality Indicators (Scaled out of 50)	33.66	34.88	35.63	33.15
Minnesota Department of Health Quality Score (out of 10)	5.98	7.33	6.25	7.73
Quality of Life Quality Score (out of 40)	31.87	32.59	32.60	32.82

Table 10: Employee Compensation Patterns by Cost/Quality Trajectory Cluster

Clusters	C1	C2	C3	Hospital Attached
Facilities	163	87	40	43
Total Employer Health Insurance Expenditures (K)	302	259	555	625
Group Medical Insurance (K)	298	267	555	453
Nursing Admin Union	1%	2%	5%	2%
RN Union	6%	13%	15%	21%
LPN Union	17%	22%	25%	35%
CNA Union	21%	33%	38%	30%
Trained Medical Ast Union	19%	28%	23%	12%
Med Records Union	6%	7%	8%	5%
Mental Health Union	1%	0%	0%	0%
Social Workers Union	1%	1%	5%	2%
Activities Staff Union	17%	24%	20%	21%
Other DC Staff Union	4%	10%	8%	7%
Pharmacy Union	1%	2%	0%	0%
DC Staff Trainers Union	1%	7%	0%	0%
Direct Care Salary per Resident Day	96.62	100.47	115.09	106.87
Nursing Admin Salary per Resident Day	11.09	11.84	13.01	12.13
RN Salary per Resident Day	20.62	21.80	30.16	25.66
LPN Salary per Resident Day	17.43	19.17	20.91	17.55
CNA Salary per Resident Day	41.34	40.81	43.64	46.18
TMA Salary per Resident Day	5.47	6.04	6.11	5.25
Activities Salary per Resident Day	0.67	0.80	1.26	0.10
Direct Care Trainer Salary per Resident Day	3.42	3.37	4.61	3.28
Medical Records Salary per Resident Day	0.02	-	0.59	-
Mental Health Worker Salary per Resident Day	3.58	3.43	5.31	3.25
Social Worker Salary per Resident Day	5.37	4.92	4.90	6.90
Scholarship Cost per resident Day	1.12	0.87	1.15	0.78
Group Medical & HSA per Employee	\$3,152	\$3,076	\$3,169	\$5,997
Total Insured Employees (Medical)	37.6	34.0	81.3	43.2

Table 11: Employee Compensation Patterns by Cost/Quality Trajectory Cluster

Clusters	For Profit	Non Profit	Government	Hospital Attached
Facilities	110	162	18	43
Total Employer Health Insurance Expenditures (K)	319	351	274	625
Group Medical Insurance (K)	203	405	341	453
Nursing Admin Union	2%	1%	6%	2%
RN Union	11%	9%	6%	21%
LPN Union	22%	18%	22%	35%
CNA Union	35%	23%	22%	30%
Trained Medical Ast Union	26%	19%	22%	12%
Med Records Union	5%	8%	0%	5%
Mental Health Union	0%	1%	0%	0%
Social Workers Union	1%	1%	6%	2%
Activities Staff Union	24%	17%	22%	21%
Other DC Staff Union	13%	2%	6%	7%
Pharmacy Union	2%	1%	0%	0%
DC Staff Trainers Union	5%	2%	0%	0%
Direct Care Salary per Resident Day	93.30	105.05	100.72	106.87
Nursing Admin Salary per Resident Day	11.52	11.96	8.48	12.13
RN Salary per Resident Day	20.33	23.60	22.50	25.66
LPN Salary per Resident Day	19.02	18.15	17.43	17.55
CNA Salary per Resident Day	37.45	43.87	44.85	46.18
TMA Salary per Resident Day	4.55	6.37	7.15	5.25
Activities Salary per Resident Day	0.43	1.09	0.31	0.10
Direct Care Trainer Salary per Resident Day	3.03	3.96	3.29	3.28
Medical Records Salary per Resident Day	0.24	-	-	-
Mental Health Worker Salary per Resident Day	3.88	3.75	3.22	3.25
Social Worker Salary per Resident Day	4.50	5.48	6.44	6.90
Scholarship Cost per resident Day	0.64	1.32	1.13	0.78
Group Medical & HSA per Employee	\$2,538	\$3,969	\$3,443	\$5,997
Total Insured Employees (Medical)	28.2	36.4	52.9	43.2

**Appendix –
Spaghetti Plots of Care Related Costs and Quality Scores**

Figure A1 and Figure A2 display the individual facility observed mean patterns in quality scores (Figure A1) and care related cost (Figure A2). Each line on the plot gives a facilities observed quality score and care related costs, the trend line connects the observations. Common colors indicate those facilities were clustered together. The primary takeaways from these plots are that there is more heterogeneity in quality scores than costs (i.e. costs show a stronger pattern of stratification by color), more volatility in the quality scores (i.e. the pattern over time is less clear), and more outlying observations in the quality scores.

Figure A1: Spaghetti Plot of Facility Quality Score Trajectory by Assigned Cluster Membership

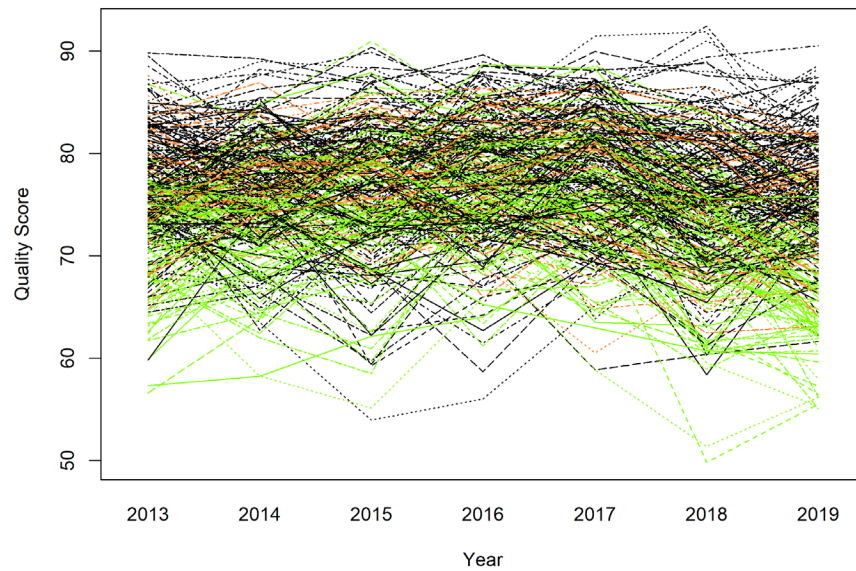


Figure A2: Spaghetti Plot of Facility Care Related Cost Trajectory by Assigned Cluster Membership

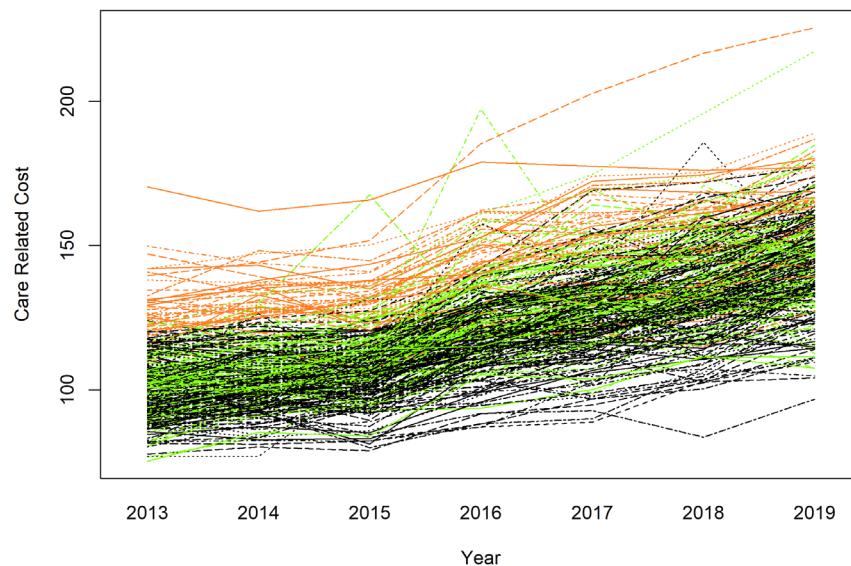


Figure A3: Spaghetti Plots of Cost and Quality for Each Cluster (Red Line Gives Modeled Trend)

