The Increase in Contract CNA Staffing in U.S. Nursing Homes and Associated Care Quality Outcomes

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Executive Summary

Introduction

Higher levels of certified nursing assistant (CNA) staffing are positively associated with improved care quality outcomes for nursing home residents,[1] but low wages and other job quality concerns drive high turnover and job vacancies within the CNA workforce.[2] Evidence suggests that nursing homes have addressed workforce pressures by increasing their reliance on contract CNAs from staffing agencies in recent years,[3] particularly during the COVID-19 pandemic.[4] This trend raises concerns about staffing quality and continuity in nursing homes, with pre-pandemic research indicating that adding contract CNA staffing does not improve care quality outcomes.[5]

This study examines trends in contract CNA staffing from 2017 through 2022 and the impacts of contract CNA staffing on resident care quality, addressing three research questions:

1. How did contract CNA staffing patterns vary in relation to nursing home occupancy from 2017 through 2022?
2. How did contract CNA staffing trends vary according to nursing home-level characteristics?
3. What is the relationship between contract CNA staffing levels and care quality for nursing home residents?

Data & Methods

In this research, we conducted descriptive and regression analyses using merged data from several national data sets. To address the first research question, we used the Payroll Based Journal (PBJ) Daily Nurse Staffing files from the Centers for Medicare & Medicaid Services (CMS) spanning the first quarter of 2017 through the fourth quarter of 2022 to analyze daily staffing patterns for regularly employed and contract CNAs by resident census per nursing home. We calculated the percent of fully employed versus contract CNAs across nursing homes and the proportion of nursing homes relying on any contract CNAs from 2017 to 2022; then we calculated the proportion of total CNA hours per resident day (HPRD) that were filled by contract CNAs versus fully employed CNAs in the same time period.

We also drew on the LTCFocus data files from Brown University and the National Institute on Aging and the CMS Nursing Homes Data Archive to compare contract CNA staffing proportions by nursing home characteristics, including profit status (for-profit versus non-profit) and chain status. Then we examined the relationship between contract CNA staffing and nursing home resident care quality outcomes, including the composite CMS 5-Star Care Quality measure from 2017 to 2022 and specific care quality measures from 2022. We used regression analyses to analyze the relationships between the proportion of total CNA HPRD filled by contract CNAs and each care quality outcome measure, controlling for nursing home characteristics, resident demographics and acuity, and state-level unemployment and COVID-19 infection rates. Unemployment and COVID-19 infection data were drawn from the Bureau of Labor Statistics (BLS) and Centers for Disease Control and Prevention (CDC), respectively.

Results

The results show that, prior to the start of the COVID-19 pandemic, nursing homes were already steadily increasing their use of contract CNA staffing, and this trend accelerated dramatically after the onset of the pandemic—particularly in late 2020 and early 2021. Both the percentage of nursing homes using any contract CNA staffing and the proportion of total CNA hours that nursing homes filled with contract CNA staff increased. Contract CNA staffing also increased when adjusted for resident census, meaning that the proportion of total CNA hours per resident day (HPRD) filled by contract CNAs also increased from 2017 to 2022.

While these trends were largely consistent across nursing homes, there were some moderate variations by profit and chain status. Specifically, this study found that non-profit, non-chain nursing homes used contract CNA staffing at slightly higher levels and continued to increase contract CNA staffing levels into 2022, even as the trend leveled off in other nursing homes. Still, the use of contract CNA staffing remained high across all types of nursing homes at the end of the study period.

From the regression analyses, we found that higher levels of contract CNA HPRD in nursing homes were significantly associated with worse care quality outcomes for residents. This finding remained true for both the overall 5-Star quality rating and for several specific care quality outcomes, including higher rates of catheters inserted and left in, urinary tract infections (UTIs), and pressure ulcers, and lower rates of residents making improvements in function, controlling for nursing home-level characteristics and state-level unemployment and COVID-19 infection case rates.

Conclusions

Adequate CNA staffing in nursing homes is vital for the safety and wellbeing of both CNAs and residents, but low wages and poor job quality present workforce recruitment and retention challenges. The increased use of contract CNAs to fill staffing deficits raises concerns about care delivery, with this study showing that contract CNA staffing is associated with worse care quality outcomes for nursing home residents. It is therefore crucial to increase wages and improve job quality for regularly employed CNAs in nursing homes to ensure that adequate staff can be recruited and retained to maintain continuity and quality of care. It is also increasingly urgent to improve support for both contract CNAs and regularly employed CNAs in workplaces with a mix of employee types.

Background

Certified nursing assistants (CNAs) play a critical role in supporting quality of care and quality of life for nursing home residents. They provide the vast majority of direct resident care,[6] an essential contribution that also positions them to observe, record, and report changes in residents' conditions that may require intervention. Research has clearly shown the importance of having adequate CNA staffing to fulfill this critical role. Higher CNA staffing levels have long been associated with improved care quality outcomes for residents, while inadequate staffing levels are associated with lower quality of care and quality of life.[7]

Sufficient staffing levels are also vital for workers' own safety and wellbeing. As one indicator, CNAs in nursing homes experience disproportionately high rates of workplace injury—over three times higher than the injury rate for typical U.S. workers according to pre-pandemic data[8]—with over half of CNAs reporting a workplace injury in the past year.[9] Injury rates for CNAs rose to nearly eight times the overall U.S. worker injury rate during the pandemic[10] due to the rapid spread of COVID-19 in nursing homes, and nursing home jobs were deemed "one of the deadliest jobs of 2020."[11] However, research has long shown that higher levels of staffing can help offset the physical risks of the job, for example, by ensuring sufficient support for moving and repositioning residents.[12] Indeed, nursing homes with higher levels of CNA staffing experienced fewer COVID outbreaks and COVID-related deaths.[13]

Despite the fact that sufficient CNA staffing is crucial to safety and care quality, poor job conditions make recruitment and retention of these essential workers challenging. Persistently poor wages, lack of recognition and respect, inadequate support for teamwork, high injury rates (as named above), and low staffing, among other factors, are all associated with high turnover and job vacancies among nursing assistants in nursing homes[14]—in turn generating more staffing pressures and adverse outcomes. To note, however, staffing levels and their consequences are not evenly distributed across nursing homes. For-profit chains have been shown to have more CNA staffing turnover, lower overall CNA staffing levels, and worse care quality outcomes.[15]

One strategy that nursing homes can use to address staffing deficits is to hire CNAs temporarily through staffing agencies. These CNAs, known as "contract CNAs," are not employees of a nursing home but rather work in the nursing home through a staffing agency or other contractual arrangement. Contract staffing employment arrangements vary widely, from gig work models, wherein contract staff are engaged by the hour or shift, to travel nursing agency staffing, which may include contracts lasting several weeks or months (with accommodation included). Research and reports from the field indicate that nursing homes' reliance on contract staffing escalated during the acute staffing crisis caused by the COVID-19 pandemic, in addition to their implementation of other measures such as overtime scheduling, cross-training staff, and adjusting staff-to-resident ratios.[16]

While contract CNAs may help alleviate staff pressures and may offer higher hourly wages and greater flexibility for employers and workers, reliance on contract staffing also raises concerns around rising total labor costs and precarious employment, lack of benefits, and inadequate protections for contract CNAs. Further, earlier studies have identified associations between contract staffing levels and care quality for residents. One pre-pandemic study found that contract licensed nurse staffing was associated with worse care quality outcomes[17] and another showed that, while an increase in regularly employed CNA staffing was associated with improved care quality outcomes, an increase in *contract* CNA staffing did not lead to similar improvements.[18] Evidence from the pandemic also indicates that stop-gap staffing measures, including the use of more contract staff, have exacerbated staff burnout and escalated concerns about nursing home care continuity and quality.[19]

There has been insufficient research examining the changes in contract staffing patterns over a longer period of time, however, and the impacts of contract CNA staffing on care quality outcomes. This study addresses this gap by examining the shifts in contract CNA staffing in nursing homes from 2017 through 2022 and the impacts of contract CNA staffing on care quality outcomes. Specifically, this research examines the following three research questions:

- How did contract CNA staffing patterns vary in relation to nursing home occupancy from 2017 through 2022?
- How did contract CNA staffing trends vary according to nursing home-level characteristics?
- What is the relationship between contract CNA staffing levels and care quality for nursing home residents?

Data and Methods

In this study, we conducted descriptive and regression analyses using merged data from several national datasets. To address the first research question, we used the Payroll Based Journal (PBJ) Daily Nurse Staffing data[20] spanning the first quarter of 2017 through the fourth quarter of 2022 to examine nursing home CNA staffing patterns. We defined contract CNAs according to the Centers for Medicare & Medicaid Services (CMS) definition, which includes any CNAs who are not employees of a nursing home and who are "engaged by the nursing home under contract or through an agency."[21] We first analyzed the proportion of nursing homes that relied on any contract CNA staffing over that time period, and compared the hours per resident day (HPRD) for regularly employed CNAs versus contract CNAs. We then calculated the percent of total CNA HPRD filled by contract CNA staffing per nursing home using resident census and total hours for all CNAs, regularly employed CNAs, and contract CNAs.

We also drew nursing home characteristics from the LTCFocus data files from Brown University and the National Institute on Aging, [22] and additional nursing home-level characteristics and resident care quality outcomes from the CMS Nursing Homes Data Archive.[23]

Using this merged dataset, we compared contract CNA staffing proportions by nursing home profit status (for-profit versus non-profit) and chain status. Finally, we examined the relationship between contract CNA staffing levels and resident care quality outcomes, including the CMS 5-Star rating as well as specific care quality outcome measures that are identified in the literature as likely to be related to CNA staffing. These more specific care quality outcome measures included the percentages of long-stay residents with catheters inserted and left in, with urinary tract infections (UTIs), and with pressure ulcers, with depressive symptoms, and receiving antianxiety or hypnotic medications; and the percentages of short-stay residents showing improvements in function and receiving new antipsychotic medications. While we present analysis across all six years (2017-2022) for the CMS 5-Star rating quality outcome measure, the more specific care quality measures were subject to sample size limitations due to inconsistent reporting of variables across years. To minimize these inconsistencies, we only used 2022 data for the analyses of those measures presented here, though we checked for any systematic differences in missing cases and confirmed that the overall associations with contract CNA staffing were consistent in other years.

We used regression analyses to examine the relationships between the proportion of total CNA HPRD filled by contract CNAs and each care quality outcome measure, controlling for resident demographics (percentage of residents of color) and acuity (case mix); nursing home characteristics, including profit and chain status and market share using the Herfindahl-Hirschman Index (HHI)[24]; and state-level unemployment and COVID-19 infection rates drawn from the Bureau of Labor Statistics (BLS)[25] and

Centers for Disease Control and Prevention (CDC),[26] respectively. For the CMS 5-Star rating measure, we used panel ordinal logistic regression. For the more specific care quality outcome measures, we used ordinal least squares regression and calculated the natural logarithm of each specific care quality outcome measure to account for skewed distributions.

Results

The Increase in Contract CNA Staffing

We found that nursing homes' use of contract CNAs had already been increasing in the years leading up to the COVID-19 pandemic and then accelerated dramatically in late 2020 and early 2021. The increase in contract CNA staffing was observable across several measures, including the number of nursing homes using contract CNAs, the proportion of total CNA hours that nursing homes filled with contract CNA staff, and HPRD performed by contract CNAs.

Figure 1 shows the proportion of nursing homes that used contract staffing from 2017 through 2022 as compared to those that did not. The proportion more than doubled from 22% of nursing homes using any contract CNA staffing in 2017 to 56% of nursing homes using contract CNA staffing in 2022.

Figure 1. U.S. Nursing Homes Using Contract CNAs vs. Not Using Contract CNAs, by Year, 2017-2022
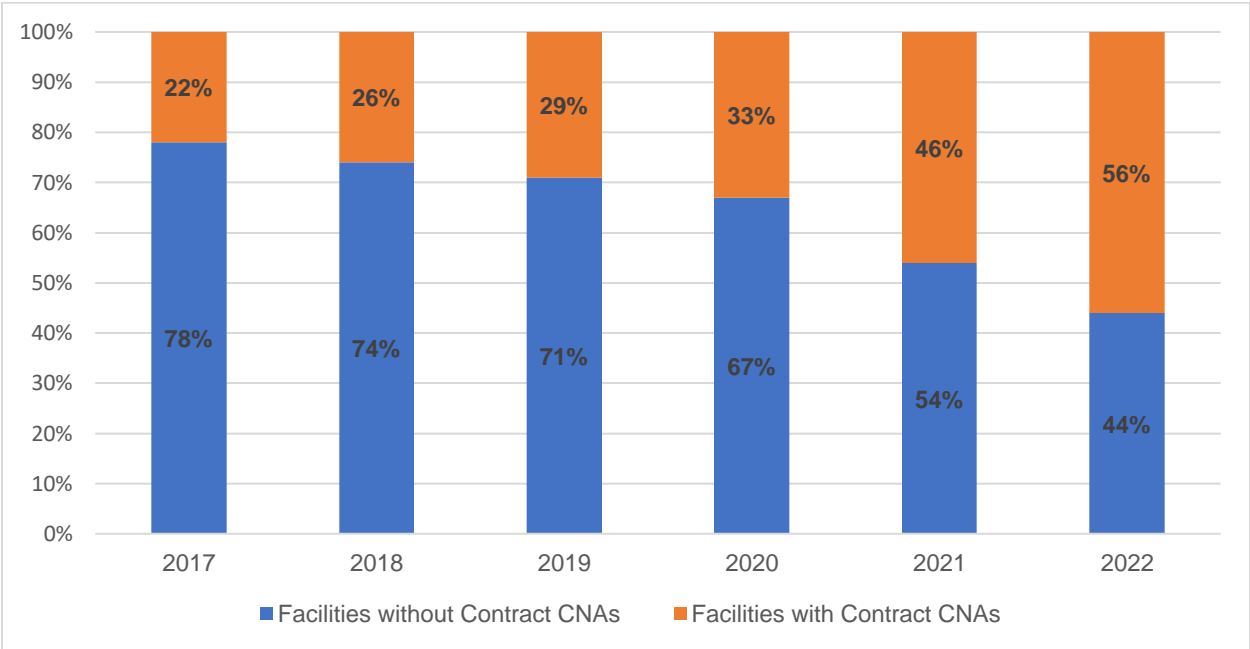
Source: PBJ Daily Nurse Staffing files, CMS, 2017-2022

Figure 2 shows that the proportion of total CNA hours across all nursing homes that were filled by contract CNAs also increased over this time period, growing from 2% of total CNA hours in 2017 to 11% of total CNA hours in 2022.

Figure 1. Percent of CNA Hours by Employment Type in U.S. Nursing Homes, by Year, 2017-2022

Source: PBJ Daily Nurse Staffing files, CMS, 2017-2022

When we consider the number of CNA staffing hours per nursing home, the data show that total CNA hours decreased, while the proportion of contract CNA hours increased. Figure 3 shows, specifically, how both the mean daily total CNA hours per nursing home and mean daily total hours for regularly employed CNAs per nursing home decreased starting in 2020, while the mean daily total hours for co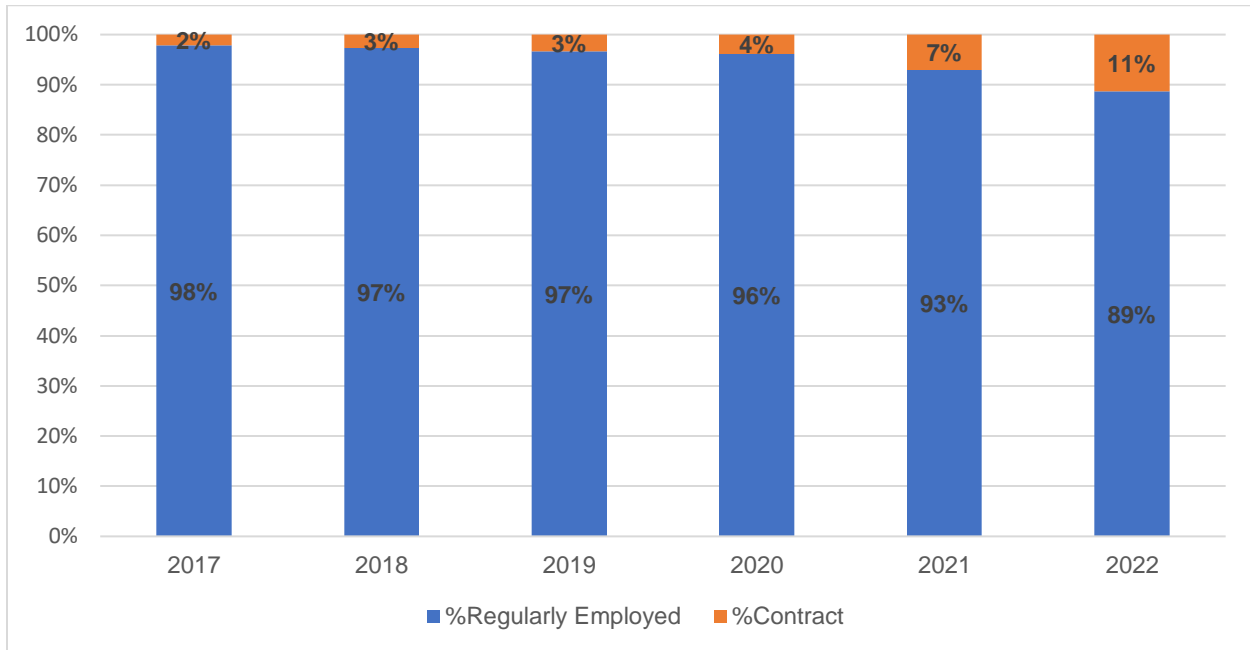ntract CNAs per nursing home increased. Figure 4 shows how, over the same time period, median resident census (meaning the number of residents per nursing home), decreased in line with the decrease in total CNA hours and regularly employed CNA hours. Considering these two figures together reveals how the proportion of total CNA hours filled by contract CNA staffing increased even as resident census decreased.

Figure 2. Mean Daily CNA Hours, by Employment Type and Quarter, 2017-2022
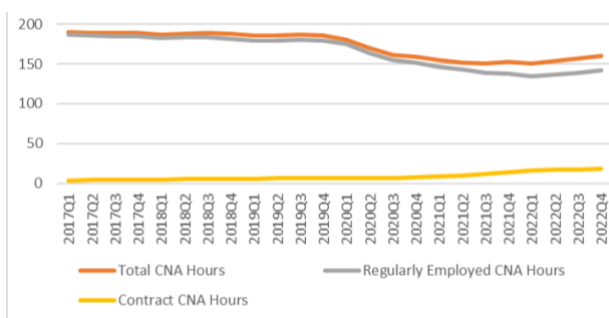
Figure 3. Median Daily Resident Census in U.S. Nursing Homes, by Quarter, 2017-2022
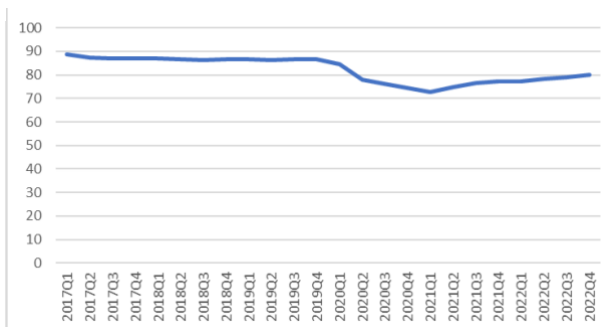
Source: PBJ Daily Nurse Staffing Files, CMS, 2017-2022.

These findings—namely, the increased percentage of nursing homes using any contract CNA staffing (Figure 1), the increased proportion of total CNA hours filled by contract CNAs (Figure 2), and the rise in contract CNA hours relative to total CNA and regular CNA hours (Figure 3)—clearly show that contract

staffing agencies increased their share of CNA employment in nursing homes during the study period, with potential implications for labor costs, worker protections, and care quality.

Contract CNA Hours Per Resident Day Across Nursing Home Types

Consistent with the observed patterns of increases in the proportion of CNA hours filled by contract CNA staff and the percentage of nursing homes using any contract CNA staffing that were reported above, we found that contract CNA HPRD also increased dramatically over the same period (Figure 5). This is because, as shown in Figures 2, 3, and 4, the proportion of total CNA hours filled by contract CNA staffing rose while resident census declined, resulting in an increase in the proportion of contract CNA HPRD.

While this trend of increasing contract CNA HPRD was evident across nursing home types, there was slight variation across profit and chain status. Figure 5 shows the mean contract CNA HPRD for all nursing homes, as well as the trend lines for nursing homes in four different profit and chain status categories (non-profit non-chain, for-profit non-chain, non-profit chain, and for-profit chain). Across these nursing home types, contract CNA HPRD increased steadily from 0.04 HPRD in 2017 to 0.07 HPRD in early 2020, then dramatically accelerated at the end of 2020 and beginning of 2021, plateauing at 0.22 HPRD in 2022.

As an exception, however, non-profit non-chains continued to increase their use of contract CNAs through the end of 2022 (rather than leveling off). Non-profit non-chains also had a higher starting point for their use of contract CNA staffing and, according to prior research, are more likely than other nursing home types to maintain higher overall staffing levels.[27] Taken together, these findings suggest that non-profit, non-chain nursing homes rely on contract CNAs to maintain their historically higher staffing (rather than primarily to fill gaps at lower staffing levels).

Figure 5. Mean Contract CNA HPRD by Nursing Home Type in U.S. Nursing Homes, by Quarter, 2017-2022
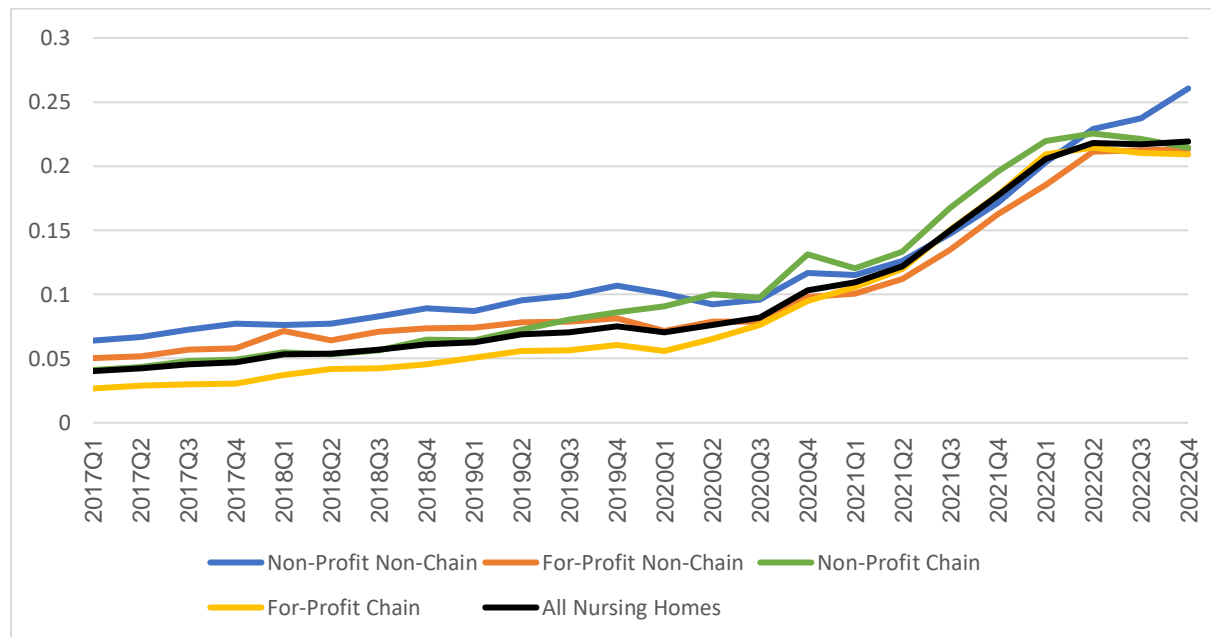
Sources: PBJ Daily Nurse Staffing Files, CMS, 2017-2022; LTCFocus data, Brown University and the National Institute on Aging; CMS Nursing Homes Data Archive

When restricting the sample to just those nursing homes that used *any* contract CNA staffing over the study period, we see a similar increase over time but with higher start and end points for all nursing home types. Figure 6 shows that amongst all nursing homes that used any contract CNA staffing, mean contract CNA HPRD grew from 0.20 in 2017 to 0.39 HPRD in 2022.

Figure 4. Mean Contract CNA HPRD by Nursing Home Type in U.S. Nursing Homes with Any Contract CNA Staffing, by Quarter, 2017-2022

Sources: PBJ Daily Nurse Staffing Files, CMS, 2017-2022; LTCFocus data, Brown University and the National Institute on Aging; CMS Nursing Homes Data Archive

Above, we saw that the average total contract CNA HPRD per nursing home increased from 2017 to 2022. When we examine this trend in terms of the percentage of total CNA HPRD filled by contract CNAs, we see a similar increase. Figure 7 shows that, across nursing home types, the percentage of CNA HPRD that were filled by contract CNAs grew dramatically from 3% in 2017 to 18% in 2022, remaining high for all nursing homes through the end of the study period.

Similar to the findings about average contract CNA HPRD, non-profit non-chain nursing homes also diverged somewhat from other nursing home types with regard to the percentage of total CNA HPRD filled by contract CNA staffing. These nursing homes continued to increase their use of contract CNA staffing through the end of 2022, while other nursing homes peaked and leveled off or decreased the percentage of CNA HPRD that they filled with contract CNAs.

Figure 5. Percent Contract CNA HPRD per Total CNA Hours in U.S. Nursing Homes, by Quarter, 2017-2022

Sources: PBJ Daily Nurse Staffing Files, CMS, 2017-2022; LTCFocus data, Brown University and the National Institute on Aging; CMS Nursing Homes Data Archive

Restricting the sample again to just those nursing homes that used contract CNA staffing, we found a similar trend with higher start and end points. Figure 8 shows that, among these nursing homes, the percentage of CNA HPRD filled by contract CNAs more than doubled, from 15% in 2017 to 32% in 2022.

Figure 6. Percent Contract CNA HPRD per Total CNA Hours in U.S. Nursing Homes with Any Contract CNA Staffing, by Quarter, 2017-2022
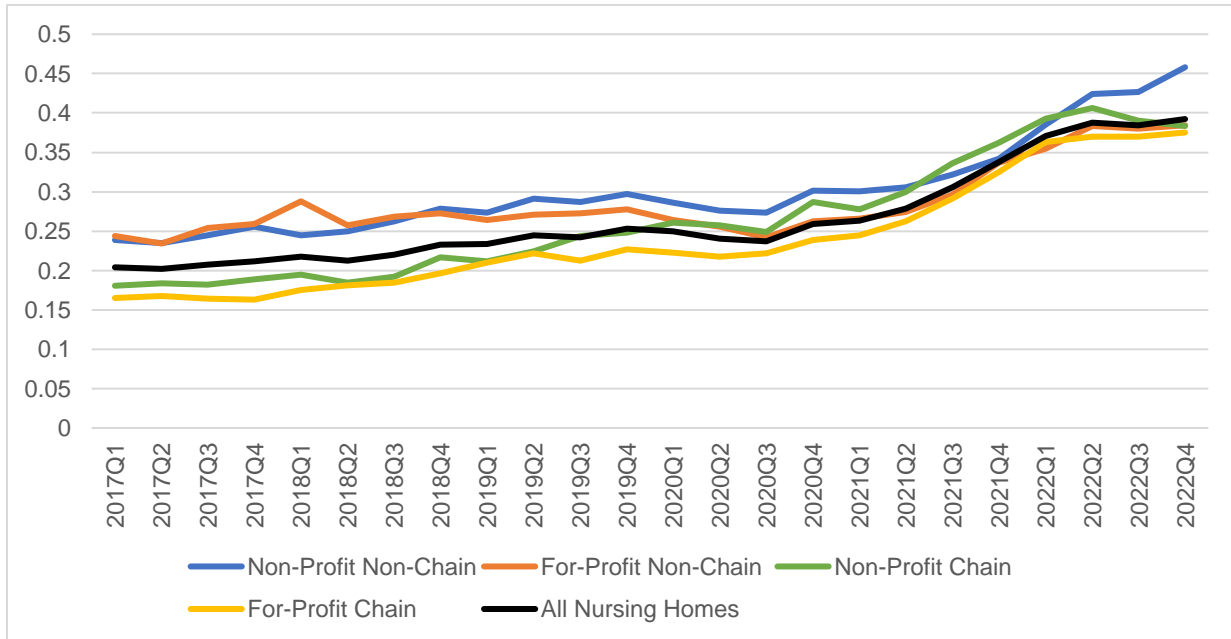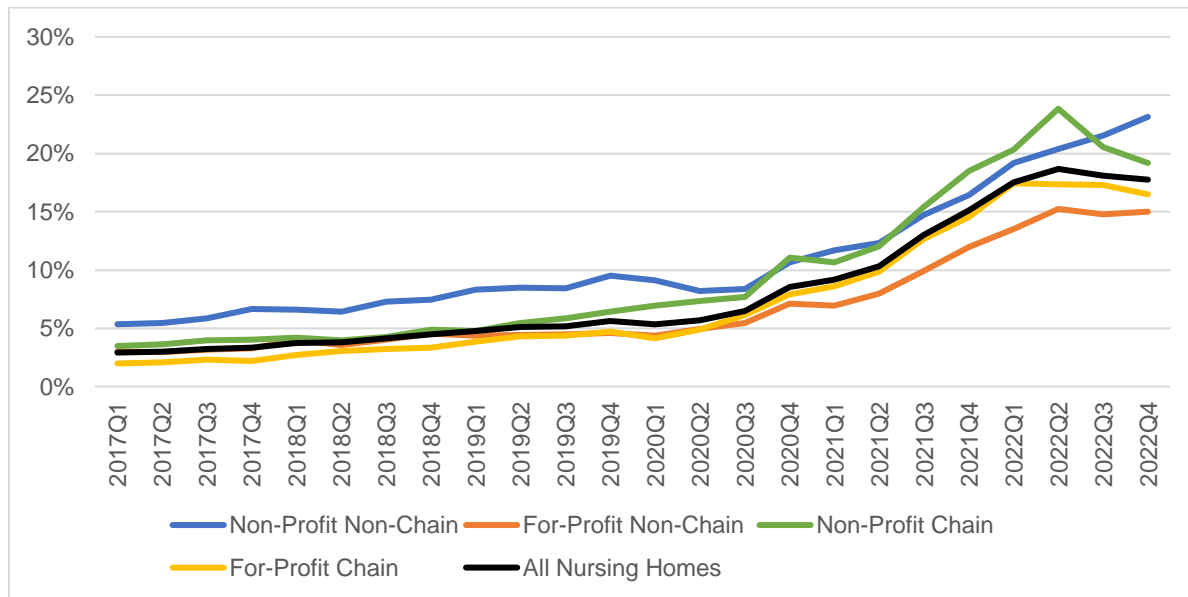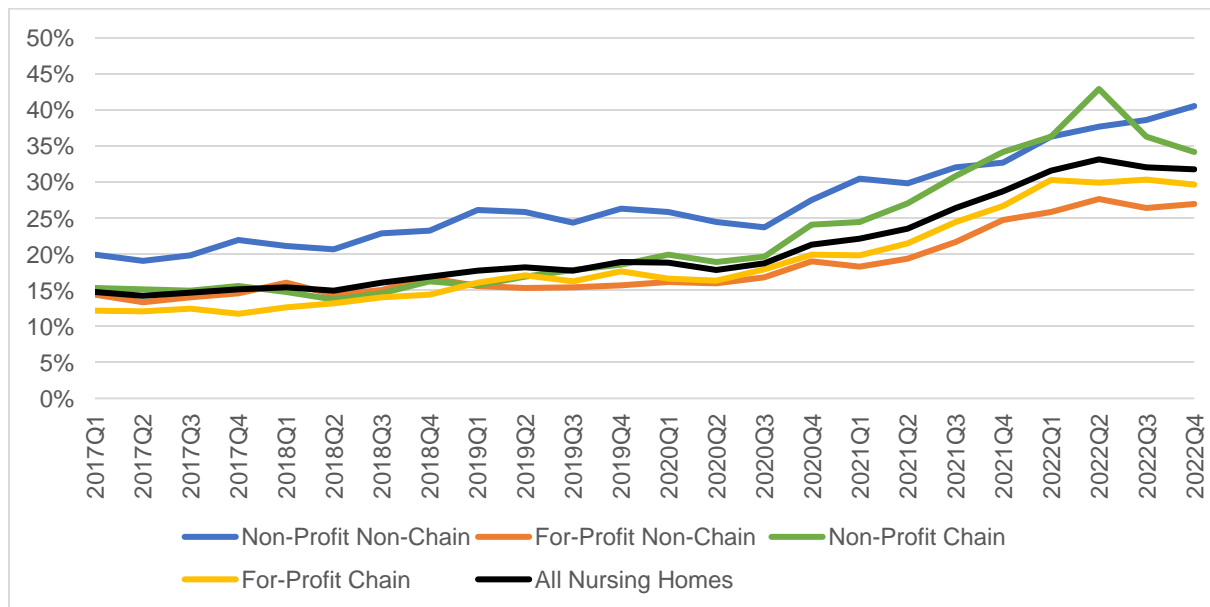

Sources: PBJ Daily Nurse Staffing Files, CMS, 2017-2022; LTCFocus data, Brown University and the National Institute on Aging; CMS Nursing Homes Data Archive.

Contract CNA Staffing and Care Quality Outcomes

Finally, this research found that higher contract CNA staffing levels—defined as the percentage of total CNA HPRD filled by contract CNAs—were associated with lower care quality for nursing home residents. This relationship between contract CNA staffing and care quality outcomes holds true when controlling for chain and profit status, acuity index (case mix), market share (HHI), resident demographics (proportion of residents of color), and state unemployment and COVID-19 case rates.

First, higher levels of contract CNA staffing were statistically significantly associated with lower CMS 5-Star quality ratings, on average. We found that an increase in contract CNA staffing was associated with a decrease in the 5-Star rating across years, holding constant the full set of controls listed above. See tables in Appendix B for more details.

Higher contract CNA staffing levels were also associated with worse outcomes for several individual care quality measures.[28] Specifically, higher contract CNA staffing was associated with higher percentages of long-stay residents with catheters inserted and left in, with UTIs, and with pressure ulcers, and with a lower percentage of short-stay residents making improvements in function. These relationships remained statistically significant when we held constant the full set of controls listed above.

The direction and significance of the relationships between contract CNA staffing and individual quality measures remained consistent when we examined the binary independent variable of any contract CNA staffing versus no contract CNA staffing. In other words, the use of any contract CNA staffing was significantly associated with higher percentages of catheters inserted and left in, UTIs, pressure ulcers, and fewer residents with improvements in function.

For both the binary measure of any contract CNA staffing and the continuous measure of the percentage of total CNA HPRD filled by contract CNA staffing, three other care quality measures were not statistically significant: the percentage of long-stay residents with depressive symptoms and the two separate measures of the percentages of long-stay residents and of short-stay residents receiving new antipsychotic medications. See Appendix B for more details.

Table 1. Significance and Direction of the Association Between Percentage of Contract CNA HPRD and Quality Outcome Measures

Quality Outcome Measure	Significance	Direction
CMS 5-Star Rating	Significant (p<.001)	Negative
Long-stay residents with catheter inserted and left in	Significant (p<.001)	Negative
Long-stay residents with UTIs	Significant (p<.001)	Negative
High-risk long-stay residents with pressure ulcers	Significant (p<.001)	Negative
Short-stay residents making improvements in function	Significant (p<.01)	Positive
Long-stay residents with depressive symptoms	Not Significant (p>.05)	
Long-stay residents receiving anti-anxiety or hypnotic medications	Not Significant (p>.05)	
Short-stay residents receiving new antipsychotic medications	Not Significant (p>.05)	

Discussion and Conclusion

The findings from this study build on recent research showing that contract staffing in nursing homes increased for all nursing staff in the early years of the COVID-19 pandemic.[29] Our examination of data from 2017 to 2022 reveals that contract CNA staffing in U.S. nursing homes was already increasing for several years prior to the onset of the COVID-19 pandemic, increased dramatically in late 2020 and early 2021, then largely leveled off at high rates of contract staffing. The increase in contract CNA staffing was observable both as a proportion of all nursing homes using *any* contract CNA staffing—which rose from 22% to 66%—and as the percentage of total CNA hours that were filled by contract CNAs across nursing homes—which rose from 2% to 11%. The dramatic increase in contract CNA HPRD slowed somewhat in 2022 for all nursing homes except for non-profit non-chains. Still, overall use of contract CNA staffing remained high across the sector.

This study also found statistically significant relationships between contract CNA staffing levels and nursing home resident care quality. Again, these findings build on prior research using data from two decades ago, which found that, while increasing regularly employed CNA staffing levels leads to improved care quality outcomes, the same positive association is not observable with increased contract CNA staffing levels.[30] These findings confirm how crucial CNAs are for care quality.[31] As CNAs provide the overwhelming majority of direct care hours for nursing home residents,[32] and CNA retention beyond a year is associated with better care quality outcomes,[33] contract CNA staffing is likely to disrupt continuity and quality of care. As nursing homes consider how to meet minimum staffing standard requirements,[34] it will be crucial to consider how to improve job quality and support recruitment and retention of regularly employed CNAs and to better support contract CNAs and regularly employed CNAs in workplaces with a mix of employee types.

Recommendations for Policy

As contract staffing agencies grow in this sector, nursing homes will increasingly compete with these agencies for employees—or create their own staffing agencies—with ongoing implications for total labor costs, CNA staffing levels, access to labor protections and union coverage for contract CNAs, job quality for all CNAs, and resident care. Indeed, nursing home administrators have raised concerns about increasing competition for contract staff and rising labor costs.[35] Considering the concerns about continuity of care and care quality, as well as the relatively higher costs of contract staffing,[36] other mechanisms for improving job quality and increasing and stabilizing CNA staffing should be implemented. Raising the wages of regularly employed full-time CNAs is associated with higher staffing levels[37] and can earn a return on investment for nursing home providers and payers through improved retention, productivity, and care quality.[38] Policy measures to strengthen training standards, build workforce pipelines, and enhance career development opportunities are also necessary to improve recruitment and retention of regularly employed CNAs.[39]

Policy changes are also needed to improve nursing home financial transparency. Obscured ownership structures and financial relationships have been linked to worse care quality.[40] Transparency regulations and related requirements could help reduce the likelihood of nursing homes investing public dollars in their own staffing agencies through related party transactions.[41] These policies could also be leveraged to ensure that the higher rates commanded by contract agencies are passed on to workers—both by external contract agencies and by nursing homes that operate their own contract staffing agencies. Additional financing regulations could ensure that wage rates for regularly employed staff are competitive with those offered to contract staff.

Recommendations for Practice

Nursing homes also have a role to play in mitigating the potential negative effects of CNA contract staffing on care quality and job quality. Considering the impacts on care quality, nursing homes should ensure the provision of tailored training for these shorter-term workers. These provisions could help strengthen care continuity and reduce the burden for regularly employed CNAs of training and supporting more temporary colleagues, on top of their regular duties. To improve staff retention, nursing homes should also invest in training and support for frontline supervisors on how to integrate contract staff into their workforce and how to support teams that include regularly employed and contract staff. Nursing homes could also consider how to support contract staff who express interest in transitioning to fully employed positions and improve work hours and scheduling, as having stable work hours and consistent coworkers is associated with lower rates of turnover.[42]

Limitations and Future Research

Data limitations for this study include the smaller sample size for the individual quality outcome measures, due to inconsistent reporting and missing data, particularly when combined with the multiple control variables. We therefore restricted our analysis of these variables to 2022, though we checked for any systematic differences in the missing cases. Future research could examine changes in these outcomes over time. Another data limitation is that the LTCFocus dataset was only available through 2020 at the time of this study. We merged and triangulated LTCFocus data with CMS data to ensure nursing home characteristics matched, however, and found that the small number of cases that did not match were not systematically different.

Future research could also examine the relationships between contract CNA staffing and other nursing home variables, including ownership, turnover, and closure; consider more detailed geography; and explore additional care quality outcomes, such as care deficiencies. Another line of research inquiry could look at the job trajectories of both regularly employed and contract staff to identify motivations for choosing either employment model, and explore any potential workforce pipeline opportunities (e.g., converting contract CNAs to fully employed roles). Further, mixed methods studies could examine the lived experiences of regularly employed and contract CNAs by identifying and analyzing mechanisms underlying the relationships between employment types, contract and employed CNAs' interactions with each other and with residents, care quality, and staff retention. This research could help inform policy and practice interventions that aim to improve job quality for both regularly employed and contract CNAs and to mitigate the negative effects on care quality.

Acronyms Used in this Report

CNA: Certified Nursing Assistant
HPRD: Hours per Resident Day
PBJ: Payroll Based Journal
CMS: Centers for Medicare and Medicaid Services
LTC: Long-Term Care

Appendix A: Methods

We calculated all estimates by quarter (24 quarters total) and collapsed on year. We dropped a small number of nursing homes with insufficient and inconsistent reporting from the sample, comparing them to those remaining in the sample by nursing home characteristics and key variables of interest to ensure that there were not significant differences. The remaining sample included all nursing homes that had consistent reporting during the years they were in operation including: those that had been in operation, but closed down during the study period; those that opened during the study period; and those that did not report staffing levels during Q1 of 2020, when CMS gave an emergency blanket waiver of reporting requirements. In merging the datasets, we matched on provider number and dropped a small number of cases that were not present in the PBJ and CMS datasets. We performed similar checks to ensure the dropped cases did not significantly vary from those retained in the sample.

We tested multiple models, including ordinal logistic regressions (ologit), panel ordinal logistic regressions (xtologit), ordinary least squares regression, and with year, state, and chain and profit status as regular control variables and as instrumental control variables. For our analysis of the 2017 to 2022 5-Star quality measure, we ultimately selected the panel ordinal logistic regression, and for our analyses of the individual 2022 care quality measures, we used ordinary least squares regression. Due to the distributions of the specific quality measures, we used the natural log of each specific quality measure as our outcome variables in those models.

Based on previous literature and our knowledge of the field, we selected seven specific care quality measures and tested their relationships with our primary independent variable of interest, the percentage of total CNA HPRD filled by contract CNA staffing. We selected this primary independent variable of interest because it accounts for both resident census through HPRD and for overall CNA staffing levels. We also examined the relationship between these care quality outcome measures and the binary variable of any contract CNA staffing versus none. We conducted t-tests and plotted the relationships between each variable as well as their residuals. In each model for the specific quality outcome measures that we examined, three of the seven (the percentage of long-stay residents with depressive symptoms and the percentages of long-stay residents receiving anti-anxiety or hypnotic medications and of short-stay residents receiving new antipsychotic medications were consistently insignificant at the $p<.05$ level. We therefore do not include these outcome measures in our final regression results tables below.

For our control variables, we constructed quartile measures of residents of color and quartile measures of the resident acuity index for each nursing home and tested them against the continuous variables for those measures, as well as against a binary variable indicating if the nursing home fell in the upper, fourth quartile for the measure, to account for nursing homes that had higher proportions of residents of color and those that had overall higher acuity levels. For the specific quality measure models, which are continuous variables, we used the quartile measures of people of color and acuity index and for the CMS 5-Star rating measure, which is an ordinal variable, we controlled just for the fourth quartile of each. We controlled for state-level COVID-19 infection rates by population (per 10,000 people), as staffing levels and turnover are associated with lower rates of infection.[43] We also controlled for state-level

unemployment. We follow the nursing home staffing literature and use the Herfindahl-Hirschman Index (HHI) as a measure of market concentration.[44] The HHI is calculated by dividing the total number of beds in a given nursing home by the total number of nursing home beds in each county, then squaring and summing the proportions for each nursing home to generate an index with 0 representing less concentration (more competition) and 1 representing more concentration (less competition). While the HHI index was statistically significant in some of the models, it had a negligible effect on the coefficient of our primary independent variable of interest measuring contract CNA staffing.

Appendix B: Descriptive Statistics and Regression Results Tables

Table 2 details the descriptive statistics for each measure that we examined for the CMS 5-Star quality rating outcome measure. These data include merged datasets collapsed on quarter and year, resulting in a greater number of observations per variable than the observations per group. In Table 2, below, we include the number of total observations that include data available across all the variables analyzed in the regression model and the number of groups, or nursing homes analyzed. For this analysis, we had 14,065 nursing homes with data across the variables examined. This means that for some variables we have multiple observations across years. For example, for the CMS 5-Star quality rating we have 88,589 observations across six years for 14,764 different groups, or nursing homes. As discussed above, we checked for any systematic differences in the nursing homes that did not have sufficient data across all the variables. There is wide variation in the state COVID-19 case rates, though this variable did not have any notable effect on our primary relationship of interest.

Table 2. Descriptive Statistics for Variables Included in Regression Model for 5-Star Quality Rating, 2017-2022

Variable	Observations	Mean	Standard Deviation	Min	Max
CMS 5-Star Quality Rating	88,589	3.77	1.236	1	5
Percentage of total CNA HPRD filled by contract CNA staffing	89,542	0.079	0.212	0.00	10.350
Non-Profit Non-Chain	14,327 (16%)	--	--	--	--
Non-Profit Chain	19,699 (22%)	--	--	--	--
For-Profit Non-Chain	12,536 (14%)	--	--	--	--
For-Profit Chain	42,980 (48%)	--	--	--	--
Percentage residents of color	83,530	21.395	22.588	0	100
Acuity Index	68,059	12.172	1.653	0	23.680
Herfindahl-Hirschman Index	89,542	4.396	10.664	0.00	92.286
State COVID-19 Case Rate (per 10,000)	89,530	439.515	561.847	0	2054.519
State Unemployment Rate	89,542	5.042	2.499	1.950	23.167

Sources: PBJ Daily Nurse Staffing Files, CMS; LTCFocus data, Brown University and the National Institute on Aging; CMS Nursing Homes Data Archive, 2022.

Table 3 shows the regression results for the panel ordinal logistic regression on the CMS 5-Star quality rating from 2017-2022. The primary independent variable of interest, the percentage of total CNA HPRD filled by contract CNA staffing, is statistically significantly associated with worse CMS 5-Star quality rates. The majority of the control variables are also statistically significantly associated with the 5-Star rating outcome, but their inclusion in the model had no effect on the direction and minimal effect on the magnitude of the effect of contract CNA staffing levels. While contract CNA staffing increased dramatically in 2021, the instrumental control for year is not statistically significant for 2021. The effect of this instrumental control is relatively small for 2021 as well.

Table 3. Regression Results for Panel Ordinal Logistic Regression on CMS 5-Star Quality Rating, 2017-2022

Percentage of total CNA HPRD filled by contract CNA staffing	-0.561***
	(0.057)
Profit & Chain Status (Reference: Non-Profit Non-Chain)	
Non-Profit Chain	-0.390***
	(.053)
For-Profit Non-Chain	-0.168**
	(0.056)
For-Profit Chain	-0.520***
	(0.048)
Percentage Residents of Color (4th Quartile)	0.001
	(0.001)
Acuity Index (4th Quartile)	-0.001***
	(0.001)
Herfindahl-Hirschman Index (HHI)	-0.034***
	(0.002)
State COVID-19 Case Rate (per 10,000)	-0.001***
	(0.000)
State Unemployment Rate	0.039***
	(0.011)
Year	
2018	0.292***
	(0.025)
2019	-0.644***
	(0.025)
2020	-0.367***
	(0.084)
2021	0.098
	(0.120)
2022	0.566**
	(0.203)
Number of groups	14,065
Observations per group	Min: 1, Max: 6, Average: 4.7
Standard errors in parentheses. ***p<.001, **p<.01, *p<.05	

Table 4 details the descriptive statistics for each variable included in the regression models for the specific care quality measures that had a statistically significant relationship with contract CNA staffing. Notably, due to reporting inconsistencies, the observations vary. As discussed above, we examined multiple years, but found that, due to these data limitations across variables, analyzing a multiyear panel

dataset resulted in even fewer observations. Therefore, we included our analysis of the effects of contract staffing on specific care quality measures for the most recent year of analysis, 2022.

Table 4. Descriptive Statistics for All Variables Included in Regression Models for Natural Log of Specific Care Quality Measures, 2022

Variable	Observations	Mean	Std. dev.	Min	Max
Percentage of long-stay residents with catheter inserted and left in	9,278	0.337	0.874	-2.58	3.16
Percentage of long-stay residents with UTIs	9,985	0.608	0.916	-2.50	3.28
Percentage of high-risk long-stay residents with pressure ulcers	10,080	1.956	0.604	-1.160	3.980
Percentage of short-stay residents making improvements in function	6,378	4.307	0.203	-0.230	4.610
Percentage of total CNA HPRD filled by contract CNA staffing	14,769	0.173	0.305	0.00	5.890
Non-Profit Non-Chain	2,441 (16.53%)	--	--	--	--
Non-Profit Chain	2,882 (19.51%)	--	--	--	--
For-Profit Non-Chain	2,795 (18.92%)	--	--	--	--
For-Profit Chain	6,651 (45.03%)	--	--	--	--
Residents of color 1st Quartile	3,449	1.270	1.321	0	3.850
Residents of color 2nd Quartile	3,448	8.140	2.794	3.880	13.570
Residents of color 3rd Quartile	3,448	22.840	5.961	13.580	34.520
Residents of color 4th Quartile	3,447	56.230	15.746	34.530	100
Acuity Index 1st Quartile	3,693	33.960	9.360	1.520	47.310
Acuity Index 2nd Quartile	3,692	58.800	6.853	47.310	70.890
Acuity Index 3rd Quartile	3,692	83.650	7.451	70.900	97.220
Acuity Index 4th Quartile	3,692	137.790	52.590	97.230	694.880
Herfindahl-Hirschman Index	14,769	4.371	10.578	0.00	92.286
State COVID-19 Case Rate	14,765	1493.779	155.282	1069.190	2054.519
State Unemployment Rate	14,769	3.551	0.671	1.95	6.019

Table 5 details the regression results for the OLS regression on the natural log of each of the specific quality outcome measures from 2022 that were statistically significantly associated with the measure of contract CNA staffing. As the distributions of the specific quality measures were skewed, the models use the natural log as an outcome variable for each. The effect of contract CNA staffing on the first three measures in the table below is positive, as higher levels of contract CNA staffing are significantly associated with higher percentages of long-stay residents with catheters

inserted and left in, with UTIs, and with pressure ulcers. In contrast, the effect of contract CNA staffing on the percentage of short-stay residents making improvements in function, is negative, as higher levels of contract CNA staffing are significantly associated with lower percentages of short-stay residents making improvements in function. While the majority of the control variables were statistically significant, the addition of these controls to the models had no effect on the direction and minimal effect on the magnitude of the effects of contract CNA staffing.

Table 5. Regression Results for Regressions on Specific Care Quality Measures 1-4, 2022

	Natural log of percentage of residents			
	With catheters inserted and left in	With UTIs	With pressure ulcers	Making improvements in function
Percentage of total CNA HPRD filled by contract CNA staffing	0.301*** (0.060)	0.299*** (0.057)	0.174*** (0.040)	-2.848** (1.150)
Profit and Chain Status (Reference: Non-Profit Non-Chain)				
Non-Profit Chain	-0.0778* (0.043)	-0.225*** (0.041)	0.147*** (0.027)	1.214* (0.705)
For-Profit Non-Chain	-0.101** (0.043)	-0.229*** (0.041)	-0.0350 (0.027)	-1.456** (0.718)
For-Profit Chain	-0.0930** (0.037)	-0.282*** (0.035)	0.145*** (0.023)	0.404 (0.622)
Percentage Residents of Color in Quartiles (Reference: 1st Quartile)				
2nd Quartile	-0.0979*** (0.037)	-0.133*** (0.035)	0.101*** (0.023)	-0.563 (0.611)
3rd Quartile	-0.181*** (0.037)	-0.290*** (0.035)	0.173*** (0.023)	-0.866 (0.609)
4th Quartile	-0.242*** (0.038)	-0.568*** (0.036)	0.268*** (0.023)	-1.135* (0.635)
Acuity Index Quartiles (Reference: 1st Quartile)				
2nd Quartile	-0.111*** (0.037)	0.047 (0.035)	0.046** (0.023)	-1.834*** (0.658)
3rd Quartile	-0.162*** (0.036)	-0.0290 (0.035)	0.0692*** (0.023)	-1.143* (0.648)
4th Quartile	-0.141*** (0.037)	0.0800** (0.036)	0.155*** (0.023)	-1.869*** (0.670)
Herfindahl-Hirschman Index (HHI)	0.00236* (0.001)	0.00757*** (0.001)	0.000155 (0.001)	-0.0708** (0.030)
State COVID-19 Case Rate (per 10,000)	-0.000218*** (7.66e-05)	0.000284*** (7.35e-05)	0.000333*** (4.73e-05)	0.00516*** (0.00120)
State Unemployment Rate	-0.129*** (0.019)	-0.142*** (0.019)	-0.00901 (0.012)	-0.676** (0.321)
Constant	1.285*** (0.142)	0.944*** (0.135)	1.178*** (0.090)	73.15*** (2.410)
Observations	5,182	5,541	5,583	3,439
R-squared	0.047	0.110	0.084	0.020
Adj. R^2	0.044	0.108	0.082	0.016
Standard errors in parentheses. ***p<.001, **p<.01, *p<.05				

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