



JAMDA

journal homepage: www.jamda.com

Original Study

Does Public Reporting of Staffing Ratios and Nursing Home Compare Ratings Matter?



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A B S T R A C T

Keywords:
Reporting
staffing
nursing homes

Objective: Public reporting is a policy to improve quality and increase data transparency. The objective was to examine the association between publicly available staffing ratios and the Five-Star Quality Ratings from Nursing Home Compare over time.

Design: Panel data analysis.

Setting and Participants: About 146 nursing homes with complete quarterly data in New Jersey between January 1, 2012, and December 31, 2019.

Methods: Using data from the State of New Jersey Department of Health and Nursing Home Compare, staff-to-resident ratios were trended for registered nurses, licensed practical nurses, and certified nursing assistants by shift and over time. Panel data analysis was used to test the association between the ratios and the ratings.

Results: Compared to 2012, staffing ratios improved slightly for licensed practical nurses but not for registered nurses or certified nursing assistants in 2019 ($P < .001$). The number of residents assigned doubled at night for all personnel. During the day and evening shifts, registered nurse staffing was significantly associated with the Nursing Home Compare staffing rating ($P < .01$) but not the overall rating.

Conclusions and Implications: Decreasing the number of residents assigned to a registered nurse in NHs results in an increase in staffing ratings. Mandatory public reporting holds nursing homes accountable for quality outcomes but does not improve staffing ratios. Quality resident care is the cumulative result of multiple measures inclusive of staffing; therefore, administrators should continue to focus on improving quality in NHs, which may improve staffing ratios across shifts.

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Consumers and policy makers have increasingly relied on staffing ratios as a critical measure of quality in nursing homes (NHs).¹ Over the last decade and especially during the COVID-19 pandemic, the value of public reporting has been emphasized as a means to improve quality measures and increase data transparency. Public reporting also enables patients and families to make informed decisions about the

care they seek.² The Nursing Home Compare Five-Star Quality Rating System uses a rating system that equips consumers with the means for comparison shopping as they make decisions for vulnerable elderly family members.³ In the United States, NHs that receive reimbursement from the Centers for Medicare & Medicaid Services (CMS) are required to publicly report quality, safety, and compliance indicators.

In 1987, to improve quality in NHs, the Nursing Home Reform Act, part of the Omnibus Budget Reconciliation Act, was enacted.⁴ Building on these federal initiatives, the CMS introduced Nursing Home Compare, a national repository for NH “report card” data in 1998. Subsequently in 2003, CMS added quality measures that included health inspection and staffing data. Mandating reporting of quality outcome data is based on the rationale that decreased quality of care in NH is likely related to lack of consumer information and choice of providers.⁵ In 2008, CMS developed the Nursing Home Compare Five-

This work was supported by the Agency for Healthcare Research and Quality (AHRQ; grant number 1K08HS024339-01A1) Mentored Clinical Scientist Research Career Development Award. The findings are those of the author(s), who are responsible for its content, and do not necessarily represent the views of AHRQ. No statement in this report should be construed as an official position of AHRQ or of the US Department of Health and Human Services.

The authors declare no conflicts of interest.

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<https://doi.org/10.1016/j.jamda.2021.03.011>

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Star Quality Rating System to increase the usability of data and select any of the 15,000 Medicare and Medicaid NHs nationwide.⁶

The public reporting of staffing ratios highlights the importance staffing plays in delivering safe quality resident.⁷ Nationwide, NHs report their CMS quality indicator data through the Minimum Data Set (MDS). Some NHs, including those in New Jersey (NJ), are also required to report monthly staffing ratios to their respective Departments of Health (DOHs), which are then computed into quarterly data as per statutory requirement.⁸ NJ is also one of only 5 states that requires NHs to provide the public with staff-to-resident ratios for registered nurses (RNs), licensed practical nurses (LPNs), and certified nursing assistants (CNAs) by shift. RNs, LPNs, and CNAs provide direct patient care, each serving overlapping but distinct roles. Examining this relationship between publicly available data such as Nursing Home Compare to state DOH staffing ratio data may provide medical directors and NH care administrators the empirical evidence to make informed staffing decisions.

While empowering consumers, potential residents and families are more likely to choose NHs with higher scores from public reporting and more effective in motivating NHs to maintain quality standards.^{9–12} Although there are many studies that have examined the relationship between staffing and quality, very few, if any, research teams have merged publicly reported state-level staffing data to Nursing Home Compare. Determining whether mandated state-level public reporting of staffing ratios is associated with Nursing Home Compare ratings may help in the evaluation of public reporting as a policy.¹³ Therefore, the objective of this study was to examine the association between publicly available staffing ratios and the Five-Star Quality Ratings from Nursing Home Compare over an 8-year period.

Methods

We conducted a trend analysis inclusive of longitudinal, publicly available staffing data from all NHs in NJ spanning from January 1, 2012, through December 31, 2019. We obtained staffing ratio data from the NJ DOH Nursing Home Staffing Reports and the Five-Star Quality Ratings from Nursing Home Compare on the CMS website. Data sets were collected by third parties for the purpose of public reporting. The Institutional Review Board of Rutgers University approved this exempt study in May 2020 (IRB Number Pro2020001116).

The Five-Star Quality Rating System rates NHs based on 1 to 5 stars for 3 types of performance measures and a fourth, overall rating. For each of the 4 categories, 5 stars indicate “much above average” quality and 1 star indicates “much below average” quality.¹⁴ Rating categories include (1) state health inspections, (2) staffing (levels reported at the time of the state health inspection), and (3) quality based on the CMS MDS. For quality, the CMS MDS assesses residents at regular intervals to determine resident health, physical functioning, and general well-being.³ We obtained these ratings from the annual file and provider info data sets in Nursing Home Compare that are available in quarterly or monthly files.

State-level staffing ratio data that are reported monthly via a web-based system are computed into quarterly data as per statutory requirement.⁸ These ratio data are unique in that they are reported by shift and are more intuitive for consumer usability. Concurrently, NJ NHs also report their quality indicator data to CMS through the MDS. As of June 2020, there were 371 NHs listed on the NJ DOH website.⁸ To be included in the study, we required that every NH provide complete Nursing Home Compare and staffing data for each quarter for a total of 32 quarters. This decision excluded NHs that opened, closed, or failed to provide complete staffing data. According to the statute P.L.1971, c.136 (C.26:2H-13 and C.26:2H-16), “non-complying NHs will be penalized for not submitting data.” However, the financial penalty is not specified, nor is there a formal process on enforcing the

penalty should an NH fail to report for 1 quarter.¹⁵ Therefore, an NH could have paid the fine and started reporting the following quarter. This strict inclusion criteria enabled a rigorous approach using panel data to produce accurate trends over time inclusive of 146 NHs.

NJ DOH data present the quarterly average resident population and averages of RN-to-resident, LPN-to-resident, and CNA-to-resident ratios broken down by day, evening, and night shifts. We matched the NHs in the NJ DOH data set to Nursing Home Compare using the variable *provnum* for each year. In 2013, CMS made changes to Nursing Home Compare, so for data to be consistent across all years (2012–2019), we transformed the 2012 ten-digit interval to a 5-star rating. Additionally, for the years 2015 and 2019, ratings were presented monthly rather than quarterly, requiring us to collapse the monthly data into quarters.

We created a panel data set for each quarter of the 8 years representing 4672 observations for 146 NHs. We first trended the RN, LPN, and CNA ratios and ratings and used analysis of variance to test changes by year. We then examined the associations between the ratios and the Nursing Home Compare ratings with the assumption that the ratios and ratings are associated over time but are independent across individual NHs. A priori, we used pooled ordinary least squares to estimate the coefficients for each ratio from each shift (day, evening, and night) for each year of the panel data and found that the years were associated resulting in use employing random and fixed effect models. Hausman tests indicated significant differences between the coefficients in the random and fixed effects models and, therefore, we decided to use fixed effects because this modeling accounted for variation over 8 years (within) and across 146 NHs (between) used fixed effects regression to test the association between staffing ratios and Nursing Home Compare ratings and time-invariant conditions. Analyses were performed using the R 4.0.3 package PLM and ggplot2.¹⁶

Results

For the RN, LPN, and CNA ratios, we found significant changes in the numbers of residents assigned from 2012 to 2019, except for the CNA night shift ($P = .87$) (Table 1). For the day and evening shifts, the numbers of residents assigned to an RN increased slightly, whereas the number of residents assigned to the RN at night increased (69 residents in 2012 to 85 residents) representing an increase of 13.8 percentage points ($P < .001$). For all 3 shifts, the number of residents assigned to an LPN decreased, with the greatest change (20.5%, $P < .001$) occurring on night shift (64 residents in 2012 to 50 residents in 2019). For the CNAs, there was no variability in trend of the staffing ratio, the number of residents assigned for each shift. The numbers of residents assigned to RNs, LPNs, and CNAs more than doubled at night than compared to during the day.

On average, 3 of 4 Nursing Home Compare ratings show significant changes over the 8 years ($P < .001$), except for health inspections ($P = .56$). The overall rating score increased by 12 percentage points from 3.4 in 2012 to 3.8 in 2019, whereas the health inspection rating increased by only 3 percentage points from 3.0 to 3.1 and the staffing rating only increased by 2 percentage points from 3.4 to 3.5 (Figure 1). The greatest increase was from the quality rating that increased by 32 percentage points from 3.3 to 4.4. This was not a linear trend; rather, it peaked at the beginning of 2015, decreased sharply, and then increased steadily to 2019.

In Table 2, we present the estimated results of the relationship between the Nursing Home Compare Overall rating to RN, LPN, and CNA staffing over time. Over the 8 years, the fixed effects models suggest that there are very few statistically significant coefficients for each nursing personnel, with only the CNA evening ratio and LPN night shift ratio, in which each additional year of CNA evening shift ratio lowers the average for NHs leads to 0.3% higher overall rating

Table 1
Ratios by Shift and the Nursing Home Compare Five-Star Quality Rating System in New Jersey Nursing Homes (2012–2019)

Variable	2012, Mean (SD)	2013, Mean (SD)	2014, Mean (SD)	2015, Mean (SD)	2016, Mean (SD)	2017, Mean (SD)	2018, Mean (SD)	2019, Mean (SD)	P
RN day	32.2 (18.2)	30.1 (15.4)	31.1 (17.2)	32.7 (21.0)	34.1 (26.3)	33.9 (21.3)	34.4 (21.6)	35.2 (20.9)	<.001
LPN day	28.8 (14.0)	29.4 (14.3)	29.9 (15.6)	28.7 (15.7)	27.1 (13.1)	26.1 (13.0)	25.6 (13.2)	25.3 (14.0)	<.001
CNA day	8.1 (1.3)	8.7 (1.2)	8.3 (1.3)	8.3 (1.3)	8.5 (1.6)	8.5 (1.3)	8.7 (1.5)	8.9 (1.6)	<.001
RN evening	46.5 (29.2)	44.6 (28.4)	43.5 (26.8)	44.2 (26.4)	48.6 (32.9)	49.1 (34.3)	50.4 (34.7)	54.5 (57.3)	<.001
LPN evening	35.0 (16.1)	36.4 (19.5)	37.4 (23.5)	35.0 (16.2)	33.8 (19.6)	32.1 (23.3)	31.2 (22.6)	31.0 (30.6)	<.001
CNA evening	10.1 (1.6)	10.0 (1.5)	10.0 (1.5)	9.9 (1.5)	10.0 (2.5)	9.9 (1.6)	10.1 (1.8)	10.2 (1.9)	.03
RN night	69.1 (49.0)	67.8 (48.4)	70.2 (68.4)	71.0 (68.5)	78.3 (128.6)	76.5 (105.5)	82.2 (118.7)	86.0 (118.5)	.01
LPN night	64.6 (48.1)	63.1 (40.2)	63.3 (35.1)	61.2 (36.7)	60.2 (46.7)	56.7 (39.6)	53.9 (40.6)	50.2 (34.6)	<.001
CNA night	17.2 (3.6)	17.3 (4.1)	17.1 (3.4)	17.1 (3.3)	17.0 (3.5)	17.1 (3.4)	17.0 (3.3)	17.0 (3.5)	.87
Overall rating	3.3 (1.2)	3.6 (1.2)	3.7 (1.3)	3.5 (1.2)	3.6 (1.3)	3.8 (1.3)	3.9 (1.2)	3.8 (1.2)	<.001
Staffing rating	3.3 (1.0)	3.2 (1.0)	3.3 (1.0)	3.4 (1.0)	3.5 (1.0)	3.5 (1.0)	3.5 (0.9)	3.4 (0.9)	<.001
Health rating	3.0 (1.2)	3.1 (1.2)	3.0 (1.2)	3.0 (1.3)	2.9 (1.3)	2.0 (1.3)	3.0 (1.3)	3.1 (1.2)	.56
Quality rating	3.5 (1.1)	4.0 (0.9)	4.3 (0.8)	3.9 (1.1)	4.1 (1.1)	4.5 (0.9)	4.7 (0.6)	4.5 (0.8)	<.001

($P < .01$). For each additional year, where the number of residents assigned to an LPN decreases, the overall Nursing Home Compare rating increases by 0.1% ($P < .1$).

In Table 3, we present the estimated results of the relationship between the Nursing Home Compare Staffing rating to RN, LPN, and CNA staffing over time. The fixed effects results suggest that RN staffing during the day and evening were significantly associated with the Nursing Home Compare staffing rating ($P < .01$ and $P < .01$, respectively). Additionally, the CNA staffing during the day, evening, and night shifts were all significantly associated with the Nursing Home Compare staffing rating ($P < .01$, $P < .001$, and $P < .001$, respectively). The pattern of coefficients for the shift ratio suggests that decreasing the number of residents assigned to staff led to an increase in the Nursing Home Compare staffing rating over the 8 years.

Discussion

Over an 8-year period of mandated state-level public reporting, the staffing ratios in NHs in NJ were relatively stable for RNs and CNAs, and slightly improved for LPNs. When testing the association between the staffing ratios and the Nursing Home Compare overall rating, there were very few significant relationships. The lack of an association between ratios and ratings may highlight the limitations to the effectiveness of mandatory public reporting as a policy to improve staffing. When examining the Nursing Home Compare staffing rating, we found that when RN and CNA staffing increased on different shifts, the rating improved. Therefore, administrators should be aware that decreasing the number of residents assigned to staff may lead to an increase in the Nursing Home Compare staffing rating.

Other major findings indicate that RN and LPN-to-resident ratios were significantly higher at night than during the day. For example, converting the ratios into the actual time each resident received during an 8-hour day shift reflected that the RN-to-resident ratio of 1:37 equated to approximately 13 minutes of care in the day compared with only 6 minutes of care at night. This is not entirely unexpected given that licensing regulations in NJAC 8:39-25.2(h) (i) stipulate “that there shall be at least one RN on duty in the facility during all day shifts, and at least one RN on duty or on call during all evening and night shifts.”¹⁷ Similarly, federal requirements mandate that every US NH have at least 1 RN present on site for at least 8 hours a day. Unfortunately, decreased staffing ratios at night can negatively impact quality and safety.¹⁸ It is a common misconception that residents sleep continually during the night shift, justifying the need for fewer staff. The majority of NH residents have some sort of cognitive impairment or dementia, leading to fragmented sleep and sleep disturbances that have been associated with greater risk of falls and higher mortality.¹⁹ Older adults with dementia experience interrupted sleep, causing

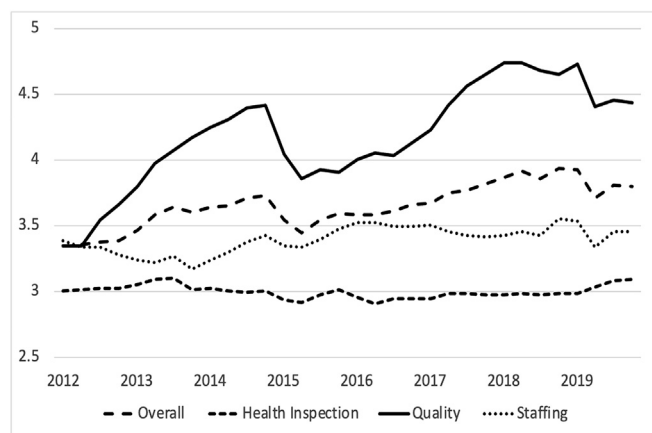


Fig. 1. Five-Star Quality Rating trends of NJ nursing homes over time.

them to require the same high level of care during the night as they would during the day.²⁰

For LPNs, a ratio of 27 residents during an 8-hour day shift equates to approximately 20 minutes of care for each resident compared with less than 10 minutes of care at night. Recognizing that LPN labor mostly drives the bedside direct care workforce in NHs, there was slight improvement in the LPN staffing ratios over time. However, when considering the quality of resident care, substituting LPN labor in exchange for RN labor may result in adverse resident outcomes. Nursing homes with higher RN clusters had significantly lower emergency department visits and rehospitalizations compared with those nursing homes that had a high LPN clusters.²¹ In fact, RNs are the only nursing providers licensed to assess, critically think, and develop a plan of care.

The number of residents assigned per CNA also doubled at night, at 17 residents. Recognizing that this number is unacceptable, especially during the COVID-19 pandemic, NJ governor Murphy signed a bill in 2020 that was expedited through the state legislature, NJ S2712 (20R), requiring that NHs have at least 1 CNA for every 8 residents during the day, 10 residents during the evening, and 14 residents at night.²² The 2020 CNA staffing ratio legislation in NJ may encourage policy makers to examine RN and LPN staffing as their roles and responsibilities are distinct. In addition, RNs are responsible for the delegation and supervision of CNAs, as well as managing conditions in order to avoid resident hospitalizations.²³

Contrary to expectations, our study found that at night, if the number of residents assigned to an LPN decreases, the overall Nursing Home Compare rating will increase. This is an interesting finding, especially as it pertains to the skill mix of the nursing staff. According

Table 2
Estimation Results of Nursing Home Compare Overall Rating With RN, LPN, and CNA Staffing

Overall Rating	FE Within (SE)	FE Between (SE)	First Differences (SE)	Hausman Test (P Value)
Model 1				<.001
RN day	−0.002 (0.001)	−0.018 (0.004) [‡]	0.0007 (0.001)	
LPN day	0.001 (0.002)	−0.004 (0.005)	0.006 (0.002) [‡]	
CNA day	−0.016 (0.017)	−0.233 (0.058) [‡]	−0.014 (0.011)	
R ²	0.001	0.250	0.004	
Model 2				<.001
RN evening	−0.0003 (0.0005)	−0.010 (0.523) [‡]	0.0009 (0.0003) [*]	
LPN evening	−0.001 (0.001)	0.0004 (0.004)	−0.0002 (0.0005)	
CNA evening	−0.036 (0.012) [‡]	−0.171 (0.049) [‡]	−0.012 (0.007)	
R ²	0.002	0.193	0.002	
Model 3				.045
RN night	−0.0002 (0.0002)	−0.002 (0.001)	0.0003 (0.0001)	
LPN night	−0.001 (0.001) [*]	0.003 (0.002)	0.0002 (0.0004)	
CNA night	−0.006 (0.007)	−0.051 (0.024) [*]	−0.004 (0.004)	
R ²	0.002	0.062	0.0005	

FE, fixed effects; SE, standard error.

^{*}P < .05.

[†]P < .01.

[‡]P < .001.

Table 3
Estimation Results of Nursing Home Compare Staffing Rating With RN, LPN, and CNA Staffing

Staffing Rating	FE Within (SE)	FE Between (SE)	First Differences (SE)	Hausman Test (P Value)
Model 1				<.001
RN day	−0.002 (0.001) [*]	−0.025 (0.003) [†]	0.001 (0.001)	
LPN day	−0.0003 (0.001)	−0.001 (0.004)	0.0001 (0.001)	
CNA day	−0.033 (0.0047) [*]	−0.164 (0.043) [†]	0.018 (0.010)	
R ²	0.004	0.440	0.001	
Model 2				<.001
RN evening	−0.001 (0.0004) [*]	−0.015 (0.002) [†]	−4.367 (3.597)	
LPN evening	−0.001 (0.001)	−0.004 (0.003)	4.774 (5.176)	
CNA evening	−0.036 (0.009) [†]	−0.242 (0.031) [†]	−7.549 (6.565)	
R ²	0.007	0.563	0.0002	
Model 3				<.001
RN night	6.364 (1.442)	−0.004 (0.001) [†]	0.001 (0.0002) [*]	
LPN night	1.016 (3.503)	0.0002 (0.002)	0.0001 (0.0003)	
CNA night	−1.967 (5.129) [†]	−0.110 (0.017) [†]	−0.003 (0.004)	
R ²	0.003	0.365	0.002	

FE, fixed effects; SE, standard error.

^{*}P < .01.

[†]P < .001.

to the NJ Board of Nursing, RNs are solely responsible for the assessment, formulation, modification, and evaluation of resident plan of care and these roles cannot be delegated.²⁴ Whereas the LPN is vital to providing more basic nursing care and is responsible for the comfort of residents, it may be the perception of an RN being present in an NH that drives the change in the overall rating. Resident surveillance, patient and family teaching, and care planning are incomplete if fewer RNs are working as these tasks must be completed under the guidance of an RN or by an RN.²⁵ Thus, the number of tasks that were previously being left incomplete would be further exacerbated by the decrease in RNs and increase in LPNs. Additionally, we found that when fewer residents were assigned to an RN during the day and evening, the Nursing Home Compare staffing rating improved.

Public reporting increases data transparency, and our findings show relationships between staffing ratios and Nursing Home

Compare. Further, federal agencies have found that the reported staffing levels in NHs raise concerns.²⁶ For example, in 2018, according to CMS, among 12,862 NHs, 7% reported 30 or more days in which staffing was below at least 1 required staffing level and another 7% reported between 16 and 29 days with staffing below required federal levels.²⁶ Despite these staffing levels and to improve the accuracy of reporting, CMS changed the staffing reporting system to a Payroll Based Journal where NHs submit staffing hours and resident census directly through the payroll. This change improved the reporting system in that when comparing the older system, known as CASPER, to the payroll system, researchers found that for RN, LPNs, and CNAs, the mean reported hours per resident day were lower in the payroll-based system than those reported in CASPER.²⁷ Therefore, using payroll-based reporting improves the accuracy of the reporting staffing.

Public reporting is a policy that requires national and international attention because it reflects the quality of care delivered to a vulnerable population residing in NHs. Although public reporting of NH quality has been in place for several decades, the significance of the policy was highlighted by COVID-19 as a means for holding NHs accountable for infection rates. The public are made aware of adverse outcomes, who in turn can influence their legislators to make changes to improve the quality of care in NHs. In particular, our study findings may be extrapolated to other areas where there are varying levels of population density. Additionally, other states can examine NJ as a case study for improving the public reporting of staffing data. Although NJ has attempted to standardize data collection processes, there are differences in the methods used by individual NHs to report staffing data, resulting in large amounts of missing data.

Our findings should be placed in the context of other trends that were occurring during 2012 through 2019 that may explain why public reporting did not appear to change staffing levels but demonstrated an improvement in quality ratings. To begin with, the focus in NHs was more on overall quality rather than changing staffing levels, which is reflected in the improvement of the quality rating in Nursing Home Compare compared with the staffing rating. This may be explained by the fact that NHs were able to shift from delivering care using a task-centered to a more resident-centered approach that was focused on emotional needs and care preferences. Additionally, the incorporation of technology to improve quality and safety, such as the ubiquity of bed alarms and updated call light systems, may justify that NH administrators in NJ have reasonably invested their financial resources in updating quality systems rather than increasing the number of staff.²⁸

In the context of public reporting, the quality of care and staffing are related in that higher levels of RN staffing in NHs are correlated with better scores on outcome quality indicators.²⁹ Interestingly, in our study, although the staffing ratios and rating remained stable, the Nursing Home Compare quality rating improved by 32 percentage points. This may indicate that NH administrators are focusing on improving quality measures (eg, preventing readmission to hospitals, limiting antipsychotic administration, reducing pressure ulcers) rather than solely increasing the headcount of staff. Alternatively, it could be that NH administrators embraced the culture shift from skill-based care to resident-centered care to meet quality goals, which in turn resulted in stable staffing levels. These stable staffing ratios may reflect an efficient and effective management of human capital.

CMS reimbursement rates also incentivize certain quality indicators. This finding is congruent with existing research that regulation of staffing levels will not, by itself, achieve quality resident outcomes in NH, and that quality is the cumulative result of multiple measures.^{30,31} Although inadequate staffing may contribute to a poor quality of care,³² staffing levels alone do not appear to have a strong

association with the quality measures examined in Nursing Home Compare, and simply adding more staff may not improve the overall quality.³³

Although our findings indicated that staffing ratios were mostly stable over time, we were unable to determine the effect of public reporting because the state-level ratios were unavailable before implementation of the mandate. Given the limits of the state-level ratio data, we were unable to adjust for facility characteristics (ie, facility size, profit status, case mix adjustments), which may have influenced the relationship between staffing changes and ratings among different types of facilities. Changes in the ratings may have occurred independently of reporting and were the result of internal quality improvement initiatives.³⁰ With regard to staffing differences by shift, other researchers have found that staffing levels were stable during the weekdays but dropped on the weekends, especially for RNs.³³ However, we were unable to assess whether NJ NHs displayed a difference in weekday vs weekend staffing ratios. In preliminary analyses, we adjusted our ratios to account for the number of residents in each facility, and our findings were similar. We were unable to examine resident case mix because our purpose did not focus on resident outcomes. Future work should build on the impact on resident outcomes.

Conclusions and Implications

Public reporting empowers families to select NHs for their loved ones with the intention to hold NHs accountable for quality care. The importance of public reporting has been highlighted during the COVID-19 pandemic and points to the need to re-examine staffing in NHs. Early evidence supports that NHs with higher levels of staffing deliver higher levels of quality care and are better prepared to contain the spread of the virus.³⁴ For future research, to determine and evaluate the effectiveness of public reporting, an analysis of the relationship pre- and postimplementation of public reporting and staffing levels is necessary. The mandated reporting initiatives do not appear to improve NH staffing in that ratios did not appear to change over the 8 years examined. Therefore, NH administrators should continue to focus on improving quality measures in relation to staffing. High-quality evidence suggests the association between staffing and quality care; therefore, to improve staffing in NHs, other initiatives may be needed beyond mandated public reporting.

Acknowledgments

We acknowledge Arun Ravichandran, MS, for his input regarding creating the data set used in this article.

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