Differences in staffing for non-nursing occupations across U.S. skilled nursing facilities during 2018-2023

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KEY FINDINGS

This study examined variability in non-nursing occupations (e.g., respiratory, pharmacy, social work) staffing levels and contract staffing across U.S. skilled nursing facilities (SNFs) from January 2018 through June 2023 with a goal of identifying workforce gaps that might reflect potential inequities in access to care. Specifically, we estimated relationships between facility factors (e.g., region, profit status, quality, urban/rural location, payer mix) and community factors (e.g., racial/ethnic composition, social deprivation) with staffing minutes per patient-day (MPPD) and percent contractors for all non-nursing healthcare occupations in SNFs.

Key findings include:

- We found higher MPPD for all non-nursing occupations when nursing staffing was also higher. This result may assuage concerns that new SNF nursing minimum staffing standards could cause SNFs to reduce other healthcare staff to maintain margins.
- Lower MPPD for most non-nursing occupations occurred in rural and lower-quality SNFs versus urban and higher-quality SNFs. Conversely, higher MPPD for leadership occupations (i.e., administrators and medical directors) occurred in rural and low-quality SNFs. These results underscore concerns about rural staffing shortages and the importance of workforce policies that support non-nursing staffing, in addition to nursing, in SNFs to maintain quality of care.
- Facility factors generally had larger associations with MPPD and percent contractors compared to community factors. There was no consistent pattern of higher or lower staffing for specific occupations based on community racial/ethnic composition or social deprivation indices.
- Non-nursing contract staffing was typically higher in SNFs with higher nursing staffing levels, suggesting that well-staffed SNFs utilize contractors to maintain staffing for all occupations, not just nursing. Contract staffing was also generally higher in non-profit SNFs, but lower in chain SNFs. Because contract staff are more expensive than in-house staff, higher contractor employment may be related to non-profits having more tolerance for spending on direct care costs.

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INTRODUCTION

Skilled nursing facilities (SNFs) provide post-acute care services to short-stay patients and long-term care for permanent residents. Staffing in SNFs has received significant national attention with recent efforts to improve the quality of patient care after the COVID-19 pandemic.[1,2] Research and policy discussions have focused on staffing for nursing occupations (i.e., registered nurses, licensed practical nurses, and certified nursing assistants), and many states have established minimum staffing standards for nursing occupations in SNFs.[3] The Centers for Medicare & Medicaid Services (CMS) includes nursing staffing in public quality ratings for SNFs and introduced a nursing staffing measure to the SNF value-based purchasing program, whereby, starting in 2026, facilities will incur financial penalties or bonus payments based on nursing staffing.[4] Further, CMS recently implemented minimum nursing staffing standards for all SNFs nationally.[1,5] While nursing staffing is important for quality of care,[6,7] SNFs across the U.S. also employ hundreds of thousands of employees in non-nursing occupations, accounting for about twenty percent of all healthcare worker staffing hours.[8] These occupations, such as dietitians, pharmacists, social workers, recreation staff, therapists, and leadership, provide a range of important services for short-stay patients and long-stay residents in SNFs.[9]

Compared to extensive research on nursing staff,[6,7,10,11] less is known about the variability in staffing of non-nursing occupations, including the use of non-nursing contractors, across different types of SNFs. Understanding staffing variability across SNFs with different characteristics, like profit status, quality, or geographic location, is important when targeting policy recommendations that aim to support the entire healthcare workforce or reduce disparities in access to care.[12] Examining the use of non-nursing contractors in SNFs is valuable given the high expense of contractors in an already high-cost setting. Rates of contract staffing for non-nursing occupations are high compared to nursing,[9] however, little is known about the conditions under which SNFs employ non-nursing contract staff.[13]

Research suggests staffing of non-nursing occupations is inconsistent across SNFs and with variable effect on quality of care, but much of the research has been focused on rehabilitation. Staffing of physical and occupational therapists and therapy assistants varies by facility characteristics, with higher licensed therapy staffing in non-profit SNFs with more Medicare patients, and higher assistant staffing in rural facilities.[14,15] Higher licensed therapy staffing, and even ratios of therapists versus assistants, are associated with higher quality on certain measures.[15–17] Higher licensed therapy contract staffing is associated with more low-value therapy provision.[13] Beyond rehabilitation therapy occupations, smaller-scale local studies suggest that social worker staffing varies by facility characteristics and may not be adequate to meet resident needs,[18,19] and staffing levels for dieticians and speech-language pathologists may impact feeding-related quality measures.[20,21] High turnover of SNF administrators has been associated with worse quality outcomes,[22,23] but less is known about administrator staffing levels and variability across SNFs. Ultimately, there is no comprehensive understanding of how national staffing patterns vary across SNFs that is inclusive of contract staffing and all non-nursing healthcare occupations.

This study examines variability in non-nursing staffing levels and contract staffing in SNFs. To inform policies targeting the non-nursing workforce in SNFs, we aim to identify workforce gaps for non-nursing occupations as they relate to SNF facility and community characteristics, which may indicate potential disparities in access to services.

METHODS

Data Sources

We used publicly available Payroll-Based Journal (PBJ) data from January 2018 through June 2023, which includes patient census and total, contractor, and in-house employee hours for the following non-nursing occupations in daily reporting: administrators, medical directors, other physicians, physician assistants, nurse practitioners, clinical nurse specialists, pharmacists, dieticians, feeding assistants, occupational therapists (OT), occupational therapy assistants (OTA), occupational therapy aides, physical therapists (PT), physical therapist assistants (PTA), physical therapy aides, respiratory therapists, respiratory therapy technicians, speech-language pathologists (SLPs), therapeutic recreation specialists, qualified activities professionals, other activities staff, qualified social workers, other social workers, and mental health service workers. More information on each occupation is provided by CMS[24] and in previous research.[9]

We merged multiple publicly available sources for facility and community characteristics. From CMS Provider of Services files, we used indicators for SNF location in one of ten regions and location in an urban versus rural county. From 2018-2021 Long Term Care Focus files,[25] we included chain affiliation and payer mix variables reflecting the percentage of residents whose primary payer was 1) Medicaid and 2) Medicare. From 2018-2023 Nursing Home Compare (NHC) files, we used indicators of facility ownership (non-profit, for-profit, or government), location in a hospital versus freestanding, and bed count. To reflect quality throughout the study period, we used NHC files to calculate quarterly averages from the monthly overall 5-star ratings for each SNF. An average quarterly score of 4 or 5 was considered 'high' quality.[26,27] Then, we calculated the percentage of quarters that each SNF had 'high' 5-star ratings.

Several measures were included to describe characteristics of the community in which each SNF operates. We included the social deprivation index (SDI) score for the ZIP Code Tabulation Area, a U.S. Census-defined geographic boundary, of each SNF.[28] The SDI includes measures of deprivation in education, housing, income, and transportation from the American Community Survey. SDI scores range from 0 to 100, with higher scores indicating more socioeconomically disadvantaged areas. From the 2018 CMS Geographic Variation Public Use File, we included county-level percentages of dual Medicare/Medicaid eligible beneficiaries to reflect rates of low socioeconomic status for Medicare beneficiaries at the community level. Due to high levels of missingness on beneficiary race and ethnicity at the SNF level in publicly available data, we included 2018 U.S. Census estimates on county-level race and ethnicity populations for the following groups: Black/African American, American Indian and Alaska Native, Native Hawaiian and Other Pacific Islander, Asian, and Hispanic (of any race). To capture market regulation, we included indicators for whether each SNF was located in a state with a Certificate of Need (CON) Law and/or Moratoria on opening a new SNF.[29] Finally, as a measure of local COVID-19 impact, we merged county-level COVID-19 cases per 10,000 people from USAFacts.[30]

Analysis

We grouped related occupations into categories to reduce the number of separate models and to examine occupations that SNFs may use interchangeably to fill similar patient care and administrative needs. We combined administrators and medical directors into a leadership category. Medical staff included non-director physicians, physician assistants, clinical nurse specialists, and nurse practitioners. Pharmacists were examined as a separate category. Respiratory occupations included respiratory therapists and respiratory technicians. Licensed rehabilitation therapy occupations included PT, OT, PTAs, OTAs, and SLPs. Therapy aides included PT aides and OT aides. Recreation staff included therapeutic recreation specialists and other activities staff. The social work category included qualified social workers, other social workers, and mental health service workers. We modeled two outcomes at the facility level for each occupation category: 1) average paid staffing minutes per patient-day (MPPD) using daily patient census from the PBJ and 2) percent contractors of all paid staff.

For each occupation category and each outcome, we used separate mixed effects linear regression models to estimate variability in the staffing outcomes by region, facility characteristics, and community characteristics detailed above. Models included a

random facility intercept to account for repeated measures, plus year and quarter fixed effects to adjust for differences over time and account for large policy shocks such as the COVID-19 pandemic and the October 2019 Patient Driven Payment Model that impacted nursing home staffing, and to address potential seasonality.[31] Finally, we included total staffing hours per patient day for all nursing occupations from the PBJ and quarterly county-level COVID-19 case rates to further account for the varying impacts of the pandemic.

RESULTS

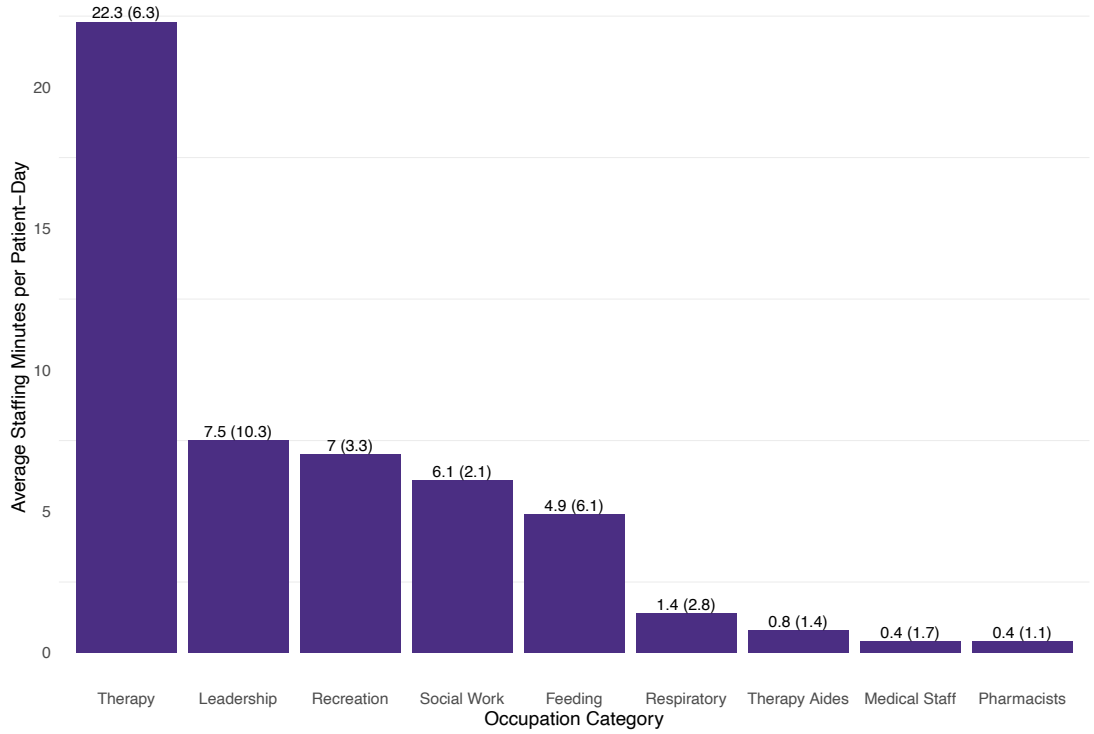
Of the 15,850 SNFs in the PBJ from January 2018 to June 2023, 15,324 (96.7%) were included because they reported staffing data for at least one quarter and had complete facility and community characteristics. All quarters included at least 14,050 SNFs except for Q1 2020 which only includes 11,927 SNFs because CMS waived PBJ reporting requirements during the early pandemic (**Appendix Figure 1**). Descriptive statistics for facility and community characteristics for the national sample of SNFs are in **Table 1. Figure 1** shows MPPD by occupation category. **Table 2** summarizes the MPPD staffing model results for each statistically significant facility and community characteristic at alpha <0.05. The full set of coefficients is in the **Appendix Tables 1** and **2**.

Table 1.
Descriptive statistics for 15,324 U.S. skilled nursing facilities (SNF) that submitted staffing data to the Payroll Based Journal between January 2018 – June 2023

Facility Characteristic	Mean (SD) or N (%)
Nursing Hours per Patient-Day	3.88 (0.34)
For-Profit Ownership	10,770 (70.28%)
Non-Profit Ownership	3,552 (23.18%)
Government Ownership	1,002 (6.54%)
Rural Location	4,306 (28.10%)
Chain Affiliation	9,048 (59.04%)
In-Hospital Location	647 (4.22%)
Percent High-Quality Quarters*	44.16 (37.44)
Percent Medicare Patients	13.73 (13.83)
Percent Medicaid Patients	59.16 (24.11)
Medicare Certified Bed Count	106.33 (60.22)
Community Characteristics	**Mean (SD) or N (%)**
ZIP Code-level Social Deprivation Index (SDI) Score	52.08 (26.74)
County-Level Percent Dual Eligible Residents	20.69 (8.77)
County-Level Percent Asian American Residents	4.97 (6.50)
County-Level Percent Black/African American Residents	11.81 (12.94)
County-Level Percent American Indian or Alaska Native Residents	1.28 (3.49)
County-Level Percent Native Hawaiian or Pacific Islander Residents	0.36 (1.50)
County-Level Percent Hispanic Residents	13.88 (15.31)
County-Level COVID-19 Cases per 10,000 Residents	931.37 (310.03)
State with Certificate of Need Law or Moratoria	11,037 (72.02%)
Region 1 (Boston)	890 (5.81%)
Region 2 (New York)	972 (6.34%)
Region 3 (Philadelphia)	1,359 (8.87%)
Region 4 (Atlanta)	2,668 (17.41%)
Region 5 (Chicago)	3,427 (22.36%)
Region 6 (Dallas)	2,020 (13.18%)
Region 7 (Kansas City)	1,499 (9.78%)
Region 8 (Denver)	625 (4.08%)
Region 9 (San Francisco)	1,438 (9.38%)
Region 10 (Seattle)	426 (2.78%)

*The percentage of quarters between January 2018 and June 2023 that each SNF had an overall 5-star quality rating of 4 or 5 out of 5.

Figure 1. Average staffing minutes per patient-day (MPPD) for non-nursing occupations in 15,324 U.S. skilled nursing facilities (SNF) from January 2018 through June 2023. Means and standard deviations are displayed above the bar for each occupation.



Staffing Minutes Per Patient-Day

Facility Characteristics

Higher nursing staffing was associated with higher MPPD for all non-nursing occupation categories. One additional hour of nursing staffing per patient day was associated with between 0.1 and 3.1 additional MPPD per non-nursing occupation (**Appendix Table 1**). Compared to SNFs with fewer beds, larger SNFs had higher medical staff MPPD, but lower MPPD for leadership, respiratory, licensed therapy, and recreation occupations. Compared to for-profit SNFs, non-profit SNFs had higher MPPD for medical staff, pharmacists, and recreation occupations but lower MPPD for leadership, feeding, and licensed therapy. Compared to for-profits, government SNFs had higher MPPD for medical staff, recreation, and social work occupations but lower MPPD for respiratory and licensed therapy.

Compared to urban SNFs, rural SNFs had lower MPPD for medical staff, respiratory, licensed therapy, and social work occupations, but higher leadership MPPD. Compared to independent SNFs, chain SNFs had higher MPPD for leadership, licensed therapy, and social work occupations but lower MPPD for feeding, recreation, and therapy aides. Hospital-based SNFs had higher MPPD for medical staff, pharmacists, respiratory occupations, and therapy aides but lower MPPD for leadership, feeding occupations, licensed therapy occupations, recreation, and social work.

More quarters with high 5-star ratings were associated with higher MPPD for medical staff, respiratory, licensed therapy, recreation, and social work occupations. Conversely, SNFs with consistently higher quality had lower MPPD for leadership. Larger proportions of Medicare patients were associated with higher MPPD for medical staff, pharmacists, licensed therapy, therapy aides, and social work, but lower MPPD for recreation occupations. More Medicaid patients were associated with higher MPPD for leadership, pharmacists, and respiratory occupations but lower MPPD for licensed therapy, recreation, and social work occupations.

Table 2.

Summarized results for mixed effects models estimating associations between skilled nursing facility (SNF) and community characteristics and staffing minutes per patient-day (MPPD) for non-nursing occupations in 15,324 U.S. SNFs between January 2018 - June 2023

	Non-Nursing Occupation Category								
Facility Characteristic	**Leadership**	**Medical Staff**	**Pharmacists**	**Feeding**	**Respiratory**	**Licensed Therapy**	**Therapy Aides**	**Recreation**	**Social Work**
Nursing Hours per Patient-Day	MPPD ↑*	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑
Non-Profit Ownership (Compared to For-Profit)	MPPD ↓	MPPD ↑	MPPD ↑	MPPD ↓	MPPD --	MPPD ↓	MPPD --	MPPD ↑	MPPD --
Government Ownership (Compared to For-Profit)	MPPD --	MPPD ↑	MPPD --	MPPD --	MPPD ↓	MPPD ↓	MPPD --	MPPD ↑	MPPD ↑
Rural Location	MPPD ↑	MPPD ↓	MPPD --	MPPD --	MPPD ↓	MPPD ↓	MPPD ↓	MPPD --	MPPD ↓
Chain Affiliation	MPPD ↑	MPPD --	MPPD --	MPPD ↓	MPPD --	MPPD ↑	MPPD ↓	MPPD ↓	MPPD ↑
In-Hospital Location	MPPD ↓	MPPD ↑	MPPD ↑	MPPD ↓	MPPD ↑	MPPD ↓	MPPD ↑	MPPD ↓	MPPD ↓
Percent High Quality Quarters	MPPD ↓	MPPD --	MPPD ↑	MPPD --	MPPD ↑	MPPD ↑	MPPD --	MPPD ↑	MPPD ↑
Percent Medicare Patients	MPPD --	MPPD ↑	MPPD ↑	MPPD --	MPPD --	MPPD ↑	MPPD ↑	MPPD ↓	MPPD ↑
Percent Medicaid Patients	MPPD ↑	MPPD --	MPPD ↑	MPPD --	MPPD ↑	MPPD ↓	MPPD ↓	MPPD ↓	MPPD ↓
Medicare Certified Bed Count	MPPD ↓	MPPD ↑	MPPD --	MPPD --	MPPD ↓	MPPD ↓	MPPD --	MPPD ↓	MPPD --
Community Characteristic									
ZIP-Code Level Social Deprivation Index (SDI) Score	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD --
County-Level Percent Dual Eligible Residents	MPPD ↓	MPPD --	MPPD --	MPPD ↑	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD --
County-Level Percent Asian American Residents	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↑	MPPD ↓	MPPD --	MPPD --	MPPD --
County-Level Percent Black/African American Residents	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↑	MPPD --	MPPD ↑	MPPD ↓	MPPD --
County-Level Percent American Indian or Alaska Native Residents	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD --	MPPD ↑	MPPD --
County-Level Percent Native Hawaiian or Pacific Islander Residents	MPPD ↑	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD ↑	MPPD --	MPPD ↑	MPPD --
County-Level Percent Hispanic Residents	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD ↑	MPPD --	MPPD --	MPPD ↑	MPPD --
State with Certificate of Need (CON) Law or Moratoria	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD ↓	MPPD --	MPPD ↓
Region 2 (Compared to Region 1)	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↑	MPPD --
Region 3 (Compared to Region 1)	MPPD --	MPPD ↓	MPPD --	MPPD --	MPPD ↑	MPPD ↑	MPPD --	MPPD --	MPPD --
Region 4 (Compared to Region 1)	MPPD ↓	MPPD ↓	MPPD --	MPPD --	MPPD --	MPPD ↑	MPPD --	MPPD ↓	MPPD ↓
Region 5 (Compared to Region 1)	MPPD ↑	MPPD ↓	MPPD --	MPPD ↑	MPPD ↑	MPPD ↑	MPPD ↓	MPPD --	MPPD ↑
Region 6 (Compared to Region 1)	MPPD --	MPPD ↓	MPPD --	MPPD ↑	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD ↓
Region 7 (Compared to Region 1)	MPPD ↑	MPPD ↓	MPPD --	MPPD ↑	MPPD --	MPPD ↓	MPPD --	MPPD ↓	MPPD ↑
Region 8 (Compared to Region 1)	MPPD ↑	MPPD ↓	MPPD --	MPPD ↑	MPPD --	MPPD ↓	MPPD --	MPPD ↓	MPPD ↑
Region 9 (Compared to Region 1)	MPPD ↓	MPPD ↓	MPPD --	MPPD --	MPPD ↑	MPPD ↓	MPPD ↓	MPPD ↓	MPPD --
Region 10 (Compared to Region 1)	MPPD --	MPPD ↓	MPPD --	MPPD --	MPPD --	MPPD --	MPPD --	MPPD ↓	MPPD ↑

*Symbols reflect relationships between each facility or community characteristic and MPPD for each non-nursing occupation. Green ↑ signifies statistically significant increases in staffing, Red ↓ signifies statistically significant decreases in staffing, and Beige -- signifies no statistically significant relationship between staffing and the facility or community characteristic. Models are adjusted for all facility and community characteristics as well as year and quarter fixed effects and county-level COVID-19 rates. See **Appendix Tables 1** and **2** for related coefficients.

Community Characteristics

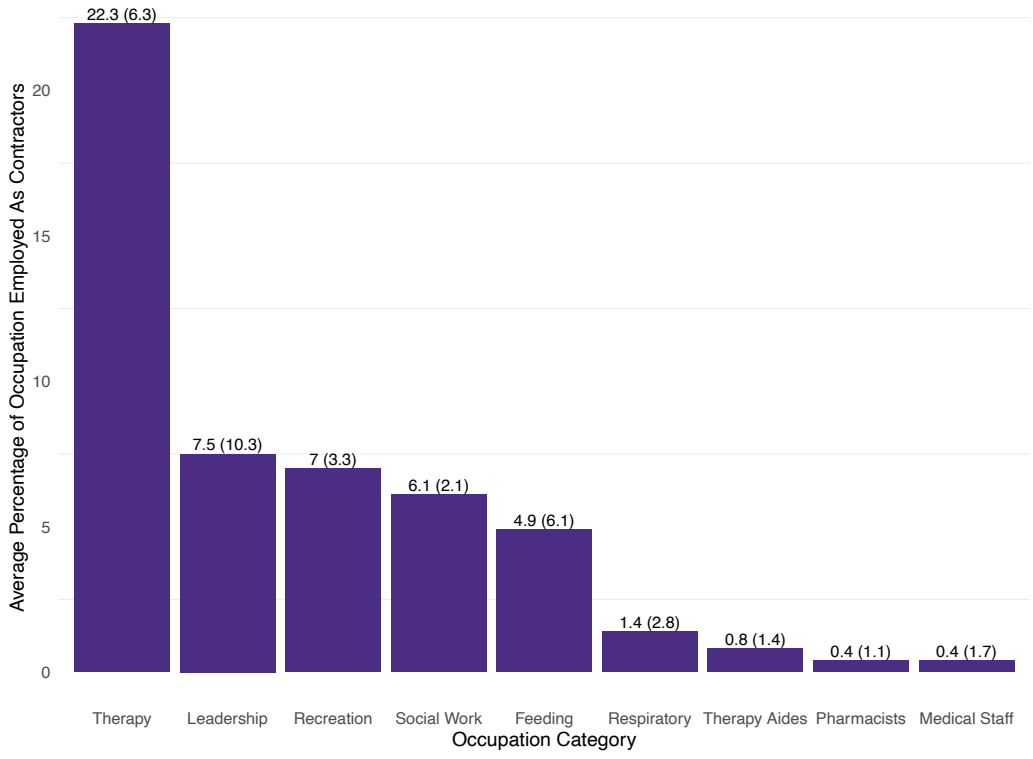
Community characteristics generally had few significant associations with MPPD (**Appendix Table 2**). Staffing levels did vary by region, with some regions having variability in staffing across more occupations than others. State CON laws or moratoria were associated only with lower MPPD for licensed therapy, therapy aides, and social work, and were not associated with higher MPPD for any occupation. SDI contributed minimally to MPPD with slightly lower staffing of recreation occupations in SNFs in areas with higher deprivation. Higher percentages of dual-eligible beneficiaries were associated with lower MPPD for leadership and recreation but slightly higher MPPD for feeding occupations. Community-level racial/ethnic composition had relatively few statistically significant associations with MPPD across occupations, with no consistent patterns of higher or lower staffing.

Percent Contractors

Facility Characteristics

Figure 2 shows contractor staffing by occupation category. **Table 3** summarizes the percent contractor staffing model results for each statistically significant facility and community characteristic at alpha <0.05. Higher nursing staffing was typically associated with higher percentages of contractors across most non-nursing occupations (**Appendix Table 3**). Compared to for-profits, non-profit SNFs had higher percent contractors for leadership, pharmacy, feeding, licensed therapy, and aides, but lower percent contractors for medical staff. Compared to for-profits, government SNFs had more leadership, medical, recreation, and social work contractors and fewer pharmacist contractors.

Figure 2. Average percentage of contractor staffing for non-nursing occupations in 15,324 U.S. skilled nursing facilities (SNF) from January 2018 through June 2023. Means and standard deviations are displayed above the bar for each occupation.



Rural SNFs staffed more contractors compared to urban SNFs for pharmacists, feeding, and licensed therapy occupations, but fewer contractors for leadership, medical staff, and therapy aides. Compared to independent SNFs, chain affiliation was associated with lower contractors for six of nine occupation categories. Compared to freestanding SNFs, in-hospital SNF contractor staffing was much lower for medical staff, pharmacists, feeding, licensed therapy, and therapy aides.

Higher quality SNFs had lower percentages of contract staff for leadership occupations but more contractors for medical staff, pharmacists, and recreation occupations. For payer mix, SNFs with more Medicare patients had lower percent contractors for most occupations except for therapy aides. SNF size had mixed associations with contract staffing across occupations; SNFs with more beds had more contractors for medical staff, pharmacists, respiratory, therapy aides, and recreation occupations but fewer contractors for leadership, feeding, and social work occupations.

Table 3.

Summarized results for mixed effects models estimating associations between skilled nursing facility (SNF) and community characteristics and percent contractor (PC) staffing for non-nursing occupations in 15,324 U.S. SNFs between January 2018 - June 2023

	Non-Nursing Occupation Category								
Facility Characteristic	**Leadership**	**Medical Staff**	**Pharmacists**	**Feeding**	**Respiratory**	**Licensed Therapy**	**Therapy Aides**	**Recreation**	**Social Work**
Nursing Hours per Patient-Day	PC --*	PC ↑	PC ↑	PC ↑	PC ↑	PC ↑	PC --	PC --	PC --
Non-Profit Ownership (Compared to For-Profit)	PC ↑	PC ↓	PC ↑	PC ↑	PC --	PC ↑	PC ↑	PC --	PC --
Government Ownership (Compared to For-Profit)	PC ↑	PC ↑	PC ↓	PC --	PC --	PC --	PC --	PC ↑	PC ↑
Rural Location	PC ↓	PC ↓	PC ↑	PC ↑	PC --	PC ↑	PC ↓	PC --	PC --
Chain Affiliation	PC ↓	PC ↓	PC ↑	PC --	PC ↑	PC ↓	PC ↓	PC ↓	PC ↓
In-Hospital Location	PC --	PC ↓	PC ↓	PC ↓	PC --	PC ↓	PC ↓	PC --	PC --
Percent High Quality Quarters	PC ↓	PC ↑	PC ↑	PC --	PC --	PC --	PC --	PC ↑	PC --
Percent Medicare Patients	PC ↓	PC --	PC ↓	PC ↓	PC --	PC ↓	PC ↑	PC --	PC ↓
Percent Medicaid Patients	PC ↓	PC --	PC --	PC ↑	PC --	PC --	PC ↓	PC ↑	PC --
Medicare Certified Bed Count	PC ↓	PC ↑	PC ↑	PC ↓	PC ↑	PC --	PC ↑	PC ↑	PC ↓
Community Characteristic									
ZIP-Code Level Social Deprivation Index (SDI) Score	PC --	PC ↑	PC ↓	PC --	PC --	PC --	PC --	PC ↑	PC --
County-Level Percent Dual Eligible Residents	PC ↑	PC --	PC ↑	PC --	PC ↓	PC ↑	PC ↑	PC ↑	PC ↓
County-Level Percent Asian American Residents	PC --	PC ↓	PC ↓	PC ↓	PC ↑	PC --	PC ↑	PC ↑	PC ↑
County-Level Percent Black/African American Residents	PC ↑	PC --	PC ↓	PC --	PC --	PC ↑	PC ↑	PC --	PC ↑
County-Level Percent American Indian or Alaska Native Residents	PC --	PC --	PC ↓	PC ↓	PC ↑	PC ↓	PC --	PC --	PC --
County-Level Percent Native Hawaiian or Pacific Islander Residents	PC --	PC --	PC ↑	PC --	PC ↓	PC --	PC ↓	PC ↓	PC --
County-Level Percent Hispanic Residents	PC --	PC ↓	PC --	PC --	PC ↑	PC ↓	PC --	PC --	PC ↑
State with Certificate of Need (CON) Law or Moratoria	PC --	PC --	PC ↑	PC --	PC ↑	PC ↑	PC ↑	PC ↓	PC ↓
Region 2 (Compared to Region 1)	PC --	PC ↓	PC ↓	PC ↓	PC ↑	PC --	PC ↑	PC ↑	PC ↓
Region 3 (Compared to Region 1)	PC --	PC ↓	PC --	PC --	PC ↑	PC ↑	PC --	PC --	PC ↓
Region 4 (Compared to Region 1)	PC ↓	PC ↓	PC --	PC ↑	PC ↑	PC ↑	PC ↑	PC --	PC ↓
Region 5 (Compared to Region 1)	PC ↓	PC ↓	PC ↓	PC ↓	PC --	PC ↑	PC ↑	PC --	PC ↓
Region 6 (Compared to Region 1)	PC ↓	PC ↓	PC ↑	PC ↑	PC ↓	PC ↑	PC ↑	PC --	PC ↓
Region 7 (Compared to Region 1)	PC ↓	PC ↓	PC --	PC ↑	PC ↓	PC ↑	PC --	PC ↑	PC ↓
Region 8 (Compared to Region 1)	PC --	PC ↓	PC ↓	PC ↓	PC ↓	PC ↑	PC --	PC ↑	PC ↓
Region 9 (Compared to Region 1)	PC ↓	PC --	PC ↓	PC --	PC ↓	PC ↑	PC ↑	PC ↓	PC ↓
Region 10 (Compared to Region 1)	PC ↓	PC --	PC ↓	PC --	PC ↓	PC ↑	PC --	PC --	PC ↓

*Symbols reflect relationships between each facility or community characteristic and PC for each non-nursing occupation. Green ↑ signifies statistically significant increases in staffing, Red ↓ signifies statistically significant decreases in staffing, and Beige -- signifies no statistically significant relationship between staffing and the facility or community characteristic. Models are adjusted for all facility and community characteristics as well as year and quarter fixed effects and county-level COVID-19 rates. See **Appendix Tables 3** and **4** for related coefficients.

Community Characteristics

Similar to MPPD, community characteristics had smaller associations with percent contractors compared to facility characteristics (**Appendix Table 4**). Across occupations, geographic region had many of the largest magnitude associations with differences in contract staffing, but differences were mixed, with no consistent pattern of higher or lower contractor staffing by region. CON laws and moratoria were associated with higher contract staffing for pharmacists, respiratory, and licensed therapy occupations but lower contract staffing for recreation and social work. SDI was associated with some small differences in contract staffing, with higher contract staffing for medical staff and recreation occupations and lower pharmacist contractors in areas with higher SDI scores. Counties with more dual-eligible residents had more contractors for five occupation categories (leadership, pharmacists, licensed therapy, therapy aides, and recreation) and fewer contractors for respiratory and social work. There was no consistent pattern of higher or lower contract staffing for a specific occupation based on community racial/ethnic composition.

DISCUSSION

This exploratory analysis of variability in non-nursing staffing in SNFs based on facility and community characteristics aimed to identify workforce gaps that might reflect inequities in access to care. We found that nursing staffing levels were the only facility characteristic that was statistically significantly associated with higher staffing across all other occupations, suggesting SNFs with strong staffing practices have the capacity to maintain staffing levels across all job categories. The finding that overall staffing levels for nurses and non-nurses seem to go hand in hand may assuage concerns that proposed nursing minimum staffing standards could cause SNFs to reduce other healthcare staff to maintain margins.[32] Similarly, non-nursing contract staffing was also typically higher in SNFs with higher nursing staffing levels, suggesting that well-staffed SNFs utilize contractors to maintain staffing for all occupations, not just nursing.[33,34]

Higher quality SNFs had higher MPPD for most occupations with statistically significant associations, except for leadership, where an inverse relationship with quality was found. Higher staffing of nursing and licensed therapy in high-quality SNFs is consistent with multiple studies.[11,35–37] Our results demonstrating higher social work and recreation staffing in higher-quality SNFs are consistent with research reporting that increasing activities and social services staffing was an effective investment for improving quality measures.[38] This is the first study to our knowledge to show similar relationships for pharmacists and respiratory occupations. Quality was associated with relatively small, and mixed, differences in contract staffing for just four occupation categories, suggesting that contract staffing alone may have a weaker relationship with quality versus MPPD, consistent with previous research which found mixed results for relationships between licensed therapy contract staffing and patient outcomes.[13,17]

We found lower staffing for the following occupations in rural SNFs: medical staff, respiratory, licensed therapy, therapy aides, and social work occupations. These results are consistent with prior work on lower nursing and licensed therapy staffing in rural SNFs.[3,39,40] Rural SNFs were particularly impacted by nursing staffing challenges during the COVID-19 pandemic,[40,41] and our results suggest that staffing challenges in rural SNFs may extend to other occupations. Results for contractors in rural SNFs were more mixed; rural SNFs did staff more contractors for occupations that had higher contract staffing nationwide, such as licensed therapy, pharmacy, and feeding occupations, which may be occupations for which rural SNFs can more easily find contractors to fill jobs. Occupations with lower contract staffing which also have lower MPPD may reflect a lack of contractor availability to fill workforce gaps in rural areas.[39]

Leadership MPPD had opposite associations compared to other occupations. We found higher leadership MPPD in lower-quality, rural, and chain SNFs. Most previous work on SNF leadership staffing examined administrator turnover, not census-adjusted staffing hours, finding that higher administrator turnover was associated with lower quality.[22,37,42] Beyond turnover, our finding differs from one study which found higher administrative staffing in nursing homes with better patient outcomes.[43] However, that study used data from 1995-1996 before accurate data on staffing hours were available through the PBJ. The 5-star quality

measures used in this study reflect deficiencies, nursing staffing, and quality of care domains that may be more impacted by effective leadership styles or administrator experience rather than just hours worked.[44] To our knowledge, the finding that there was higher leadership MPPD in rural versus urban SNFs is novel and cannot be explained by smaller facilities in rural areas, as we accounted for census and bed count.

Staffing levels associated with SNF ownership varied by occupation. Compared to for-profit SNFs, non-profits had lower MPPD for leaders, feeding, and licensed therapy occupations, but higher MPPD for recreation, pharmacists, and medical staff. These findings are inconsistent with research demonstrating higher staffing for nursing and licensed therapy occupations in non-profits SNFs.[16,35,45,46] Inconsistent results on licensed therapy staffing based on profit status across studies may be due to different data sources or because we combined all licensed therapies into one category and adjusted for additional facility and community characteristics. To our knowledge, this is the first study to identify differences in MPPD based on profit status for leadership, medical staff, feeding, respiratory, pharmacy, and recreation occupations.

Contract staffing was typically higher in non-profit and government SNFs compared to for-profits. Because contract staff are more expensive than in-house staff, higher contractor employment may be related to non-profits having more tolerance for spending on direct care costs.[12,47] Previous research has found that SNFs with lower margins also spend larger shares of revenues on nursing staffing costs,[48] but more research is needed to determine why non-profit SNFs utilize expensive contractors at higher rates.[33,34]

Similar to previous research,[3,52] we found mixed associations between chain affiliation and MPPD depending on the occupation. Higher leadership, licensed therapy, and social work MPPD in chain SNFs may be related to sharing staff across buildings. Conversely, lower MPPD for feeding, therapy aides, and recreation occupations might indicate less sharing of lower-skilled, and lower-paid, occupations amongst buildings owned by the same chain. Relatively large coefficients for differences in MPPD for hospital-based compared to freestanding SNFs are consistent with the unique operational structures of hospital-based SNFs, which may more easily float staff between post-acute and hospital units, but also may prioritize hospital patients when distributing staff time for certain occupations.[10]

SNFs with more Medicare patients had higher staffing of medical, pharmacy, licensed therapy, and social work occupations, possibly because short-stay patients have more medical and therapy needs and require social workers to coordinate discharges home, compared to Medicaid patients who often live in the building long-term.[3,12,19] For SNFs with more Medicaid patients, however, lower social work staffing may indicate disparities in access to social services for long-stay residents, and lower recreation staffing may indicate that facilities with lower margins from lower-paying Medicaid patients provide fewer opportunities for resident activities.[12,18,38]

For community characteristics, licensed therapy, therapy aide, and social work disciplines had lower staffing MPPD in states with CON Laws or Moratoria. These laws have been previously associated with lower nursing staffing and higher staffing of lower-skilled professions within the same discipline (i.e., therapy assistants versus therapists and CNAs versus LPNs).[14,49] Our results support concerns that such laws reduce competition and quality, as SNFs with less competition may not be incentivized to improve staffing and quality of care.[2,50] There were fewer statistically significant relationships between MPPD and variables such as racial/ethnic composition or SDI, which could indicate that SNFs may not be adequately considering local community characteristics when staffing up. We did not detect a consistent pattern of dependence on contractors based on community factors. Similar to MPPD, contract staffing varied by region, which may indicate that the availability of contract staff to address staffing shortages varies geographically.

Limitations: Results of this exploratory analysis do not imply causality. While we used all SNFs with complete characteristics data that reported staffing hours each quarter to estimate national averages, there was some slight variability in the sample composition (**Appendix Figure 1**). However, year and quarter fixed effects should account for some variability in which SNFs were included over time. And while we did not include specific indicators for policy shocks such as CMS reimbursement policy, our year and

quarter fixed effects should also account for differences in staffing due to policy changes and the COVID-19 pandemic over time. As the emphasis was on identifying possible workforce gaps or differences in staffing that might indicate inequities in access to care, we did not include potential explanatory factors for staffing differences such as wages, educational programs, market penetration, or local competition for employees.[14,39,51] Future work focusing on potential avenues for addressing workforce gaps should include market factors.

While the PBJ is reliable in capturing daily paid staff hours,[52] it is still subject to some limitations due to different interpretations of PBJ requirements by reporting staff. Specifically, accuracy of hours for staff who shift responsibilities throughout the day is subject to how well payroll employees understand which hours were worked under each job title. The PBJ also does not capture unpaid time, which may bias reporting for occupations that are salaried versus hourly, which may be more frequent for specific occupations such as leadership roles.

CONCLUSIONS AND POLICY IMPLICATIONS

This study of all non-nursing staffing in U.S. SNFs between January 2018 and June 2023 found higher levels of patient census-adjusted staffing levels for all non-nursing occupations in SNFs when nursing staffing was also higher, which may assuage concerns that new SNF nursing minimum staffing standards could cause SNFs to reduce other healthcare staff. Facility characteristics generally had stronger associations with staffing levels compared to community characteristics, however, staffing levels based on characteristics such as profit status, in-hospital location, chain affiliation, and payer mix varied across occupations. Except for leadership, lower staffing of non-nursing occupations occurred in rural SNFs compared to urban SNFs and in lower-quality SNFs compared to higher-quality SNFs. Contract staffing for non-nursing occupations is generally higher in SNFs with better staffing overall. This study underscores concerns about rural staffing shortages in SNFs beyond just nursing occupations. This work also reinforces the importance of workforce policies that support non-nursing staffing, in addition to nursing, to maintain quality of care.

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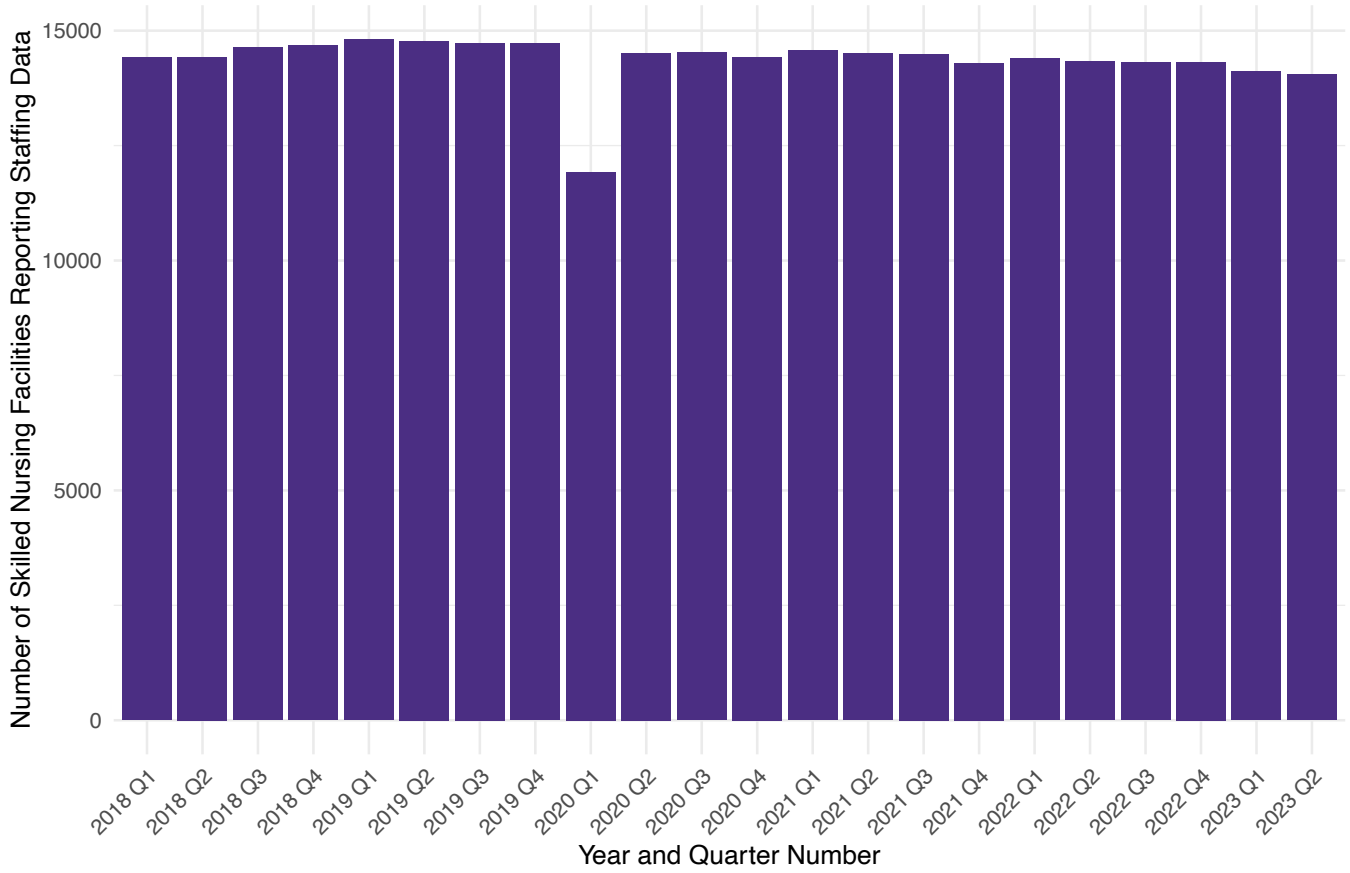
APPENDIX

Appendix Figure 1. Number of U.S. Skilled Nursing Facilities reporting staffing data to the Payroll Based Journal and with complete data on facility characteristics per quarter



Appendix Table 1.

Results of mixed effects models examining variability of staffing levels based on facility characteristics

	Staffing Minutes per Patient Day Coefficient (95% Confidence Interval)										
Occupation	Non-Profit Ownership (Compared to For-Profit)	Government Ownership (Compared to For-Profit)	Rural Location	Chain Affiliation	In-Hospital Location	Percent High Quality Quarters (10% Increase)	Percent Medicare Patients (10% Increase)	Percent Medicaid Patients (10% Increase)	Medicare Certified Bed Count (10-Bed Increase)	Nursing Hours per Patient-Day	Time (Quarter)
Leadership	-3.509 (-3.855, -3.163)	-3.312 (-3.878, -2.746)	1.317 (0.961, 1.672)	0.948 (0.67, 1.226)	-7.155 (-7.845, -6.464)	-0.261 (-0.3, -0.222)	0.061 (-0.061, 0.184)	0.374 (0.299, 0.449)	-0.105 (-0.13, -0.08)	0.06 (0.049, 0.071)	-0.001 (-0.013, 0.011)
Medical Staff	0.188 (0.118, 0.258)	0.429 (0.314, 0.543)	-0.112 (-0.184, -0.041)	-0.023 (-0.079, 0.033)	0.606 (0.467, 0.745)	0.007 (-0.001, 0.015)	0.11 (0.085, 0.134)	-0.007 (-0.022, 0.008)	0.006 (0.001, 0.011)	0.085 (0.077, 0.093)	0 (-0.002, 0.002)
Pharmacists	0.296 (0.05, 0.541)	0.391 (-0.01, 0.792)	-0.003 (-0.255, 0.25)	-0.09 (-0.288, 0.108)	0.511 (0.025, 0.998)	0.008 (-0.02, 0.036)	0.299 (0.213, 0.386)	0.055 (0.001, 0.108)	-0.015 (-0.032, 0.003)	1.563 (1,516, 1.609)	0.001 (-0.001, 0.002)
Feeding Occupations	-1.864 (-2.321, -1,408)	0.304 (-0.443, 1.05)	-0.047 (-0.517, 0.423)	-0.326 (-0.693, 0.042)	-2.16 (-3.067, -1.253)	-0.016 (-0.068, 0.036)	0.141 (-0.021, 0.302)	-0.001 (-0.1, 0.098)	-0.024 (-0.057, 0.009)	0.303 (0.286, 0.321)	-0.121 (-0.129, -0.112)
Respiratory Occupations	-0.366 (-0.758, 0.027)	-1.01 (-1.652, -0.368)	-0.568 (-0.972, -0.163)	0.076 (-0.24, 0.393)	6.308 (5,529, 7.087)	0.054 (0.009, 0.098)	-0.051 (-0.19, 0.088)	0.304 (0.219, 0.389)	-0.032 (-0.06, -0.003)	3.05 (2,991, 3.11)	0.007 (0.004, 0.01)
Therapy Occupations	-2.003 (-2.475, -1.53)	-3.736 (-4.509, -2.964)	-3.656 (-4.142, -3.171)	2.591 (2.21, 2.971)	-1.56 (-2.499, -0.62)	0.1 (0.047, 0.154)	7.008 (6,841, 7.175)	-1.026 (-1.129, -0.924)	-0.064 (-0.098, -0.031)	0.108 (0.097, 0.119)	-0.333 (-0.344, -0.323)
Therapy Aides	0.051 (-0.041, 0.142)	-0.158 (-0.307, -0.008)	-0.104 (-0.198, -0.01)	-0.209 (-0.282, -0.135)	0.889 (0.707, 1.071)	0.006 (-0.005, 0.016)	0.226 (0.194, 0.258)	-0.06 (-0.08, -0.04)	0.005 (-0.002, 0.011)	1.343 (1,314, 1.372)	-0.033 (-0.035, -0.031)
Recreation Occupations	0.937 (0.673, 1.202)	1.016 (0.583, 1.449)	0.159 (-0.114, 0.431)	-0.995 (-1.208, -0.782)	-2.714 (-3.24, -2.187)	0.049 (0.019, 0.079)	-0.403 (-0.497, -0.309)	-0.091 (-0.149, -0.034)	-0.043 (-0.062, -0.024)	1.202 (1.183, 1.221)	-0.009 (-0.014, -0.004)
Social Work Occupations	0.021 (-0.15, 0.193)	0.555 (0.275, 0.835)	-0.328 (-0.504, -0.151)	0.213 (0.075, 0.351)	-0.833 (-1.173, -0.492)	0.074 (0.054, 0.093)	0.247 (0.186, 0.307)	-0.072 (-0.109, -0.035)	-0.012 (-0.024, 0)	1,124 (1,104, 1.143)	0.03 (0.026, 0.033)

Data from a national sample of skilled nursing facilities with complete covariate data reporting staffing data in the Payroll Based Journal between January 2018 and June 2023. Models are also adjusted for community characteristicsin Table 2 and year and quarter fixed effects

Appendix Table 2.

Results of mixed effects models examining variability of staffing levels based on community characteristics.

	Staffing Minutes per Patient Day Coefficient (95% Confidence Interval)																	
Occupation	Certificate of Need Law or Moratoria	County Social Deprivation Index Score	County-Level Percent Dual Eligible Residents (10% Increase)	County-Level Percent Asian American Residents (10% Increase)	County-Level Percent Black Residents (10% Increase)	County-Level Percent American Indian or Alaska Native Residents (10% Increase)	County-Level Percent Native Hawaiian or Pacific Islander Residents (10% Increase)	County-Level Percent Hispanic Residents (10% Increase)	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Leadership	-0.308 (-0.851, 0.235)	0.005 (-0.001, 0.012)	-0.797 (-1.013, -0.58)	-0.141 (-0.497, 0.214)	0.061 (-0.081, 0.202)	0.081 (-0.375, 0.537)	1.44 (0.205, 2.674)	0.135 (-0.005, 0.274)	Ref.	1.309 (0.432, 2.186)	-0.408 (-1.25, 0.434)	-1.095 (-1.866, -0.323)	2.677 (1,972, 3.383)	-0.222 (-1.07, 0.625)	3.047 {2.22, 3.874)	2.287 {1.2, 3.375)	-3.424 (-4.422, -2.426)	-0.335 (-1.43, 0.76)
Medical Staff	0.031 (-0.062, 0.124)	0.001 (0, 0.002)	0.035 (-0.002, 0.072)	0.021 (-0.04, 0.081)	0.01 (-0.014, 0.034)	0.022 (-0.056, 0.099)	-0.045 (-0.256, 0.165)	-0.02 (-0.044, 0.003)	Ref.	0.134 (-0.016, 0.284)	-0.165 (-0.309, -0.022)	-0.272 (-0.404, -0.14)	-0.3 (-0.42, -0.18)	-0.293 (-0.438, -0.149)	-0.35 (-0.491, -0.209)	-0.307 (-0.492, -0.121)	-0.295 (-0.465, -0.124)	-0.254 (-0.441, -0.068)
Pharmacists	-0.01 (-0.078, 0.059)	0 (-0.001, 0.001)	0.019 (-0.008, 0.047)	0.016 (-0.028, 0.061)	0.006 (-0.012, 0.023)	0.03 (-0.027, 0.088)	-0.058 (-0.212, 0.096)	-0.017 (-0.034, 0.001)	Ref.	0.026 (-0.085, 0.137)	0.109 (0.003, 0.215)	0.065 (-0.032, 0.163)	0.062 (-0.027, 0.151)	0.106 (-0.001, 0.213)	0.14 (0.036, 0.244)	0.03 (-0.107, 0.167)	-0.004 (-0.129, 0.122)	0 (-0.138, 0.138)
Feeding Occupations	-0.082 (-0.703, 0.538)	-0.003 (-0.011, 0.004)	0.222 (-0.025, 0.468)	0.156 (-0.248, 0.56)	-0.061 (-0.221, 0.099)	0.208 (-0.311, 0.727)	-0.573 (-1.976, 0.829)	-0.269 (-0.427, -0.11)	Ref.	2.163 (1.161, 3.166)	0.082 (-0.88, 1.044)	-0.234 (-1.114, 0.647)	2.259 (1.453, 3.064)	1.788 (0.821, 2.756)	3.436 (2.491, 4.38)	1.376 (0.133, 2.618)	-0.785 (-1.924, 0.354)	-0.011 (-1.261, 1.239)
Respiratory Occupations	0.23 (-0.278, 0.739)	-0.002 (-0.008, 0.005)	0.011 (-0.184, 0.207)	0.568 (0.244, 0.892)	0.082 (-0.041, 0.204)	-0.288 (-0.714, 0.138)	-1.583 (-2.723, -0.442)	0.267 (0.14, 0.393)	Ref.	1.143 (0.319, 1.966)	1.312 (0.523, 2.101)	0.682 (-0.039, 1.403)	1.05 (0.389, 1.712)	0.403 (-0.391, 1.197)	0.749 (-0.026, 1.524)	0.542 (-0.48, 1.563)	3.416 (2.482, 4.351)	0.261 (-0.766, 1.288)
Therapy Occupations	-2.888 (-3.53, -2.246)	-0.003 (-0.01, 0.005)	0.05 (-0.205, 0.306)	-0.302 (-0.721, 0.117)	-0.072 (-0.238, 0.095)	-1.101 (-1.639, -0.564)	2.126 (0.672, 3.581)	0.004 (-0.161, 0.168)	Ref.	3.376 (2.339, 4.414)	1.669 (0.673, 2.665)	1.821 (0.909, 2.733)	1.826 (0.992, 2.66)	-0.629 (-1.631, 0.373)	-3.19 (-4.168, -2.212)	-3.806 (-5.093, -2.52)	-4.862 (-6.042, -3.682)	-0.102 (-1.396, 1.192)
Therapy Aides	-0.237 (-0.373, -0.102)	0.001 (-0.001, 0.002)	-0.028 (-0.082, 0.026)	0.068 (-0.02, 0.157)	0.055 (0.02, 0.09)	0.111 (-0.002, 0.224)	-0.044 (-0.349, 0.262)	-0.015 (-0.05, 0.02)	Ref.	0.318 (0.099, 0.536)	-0.111 (-0.321, 0.098)	-0.074 (-0.266, 0.118)	-0.236 (-0.412, -0.061)	0.007 (-0.204, 0.218)	-0.088 (-0.294, 0.118)	-0.097 (-0.368, 0.173)	-0.304 (-0.553, -0.056)	-0.269 (-0.542, 0.003)
Recreation Occupations	-0.288 (-0.658, 0.081)	-0.006 (-0.01, -0.001)	-0.231 (-0.378, -0.084)	-0.132 (-0.373, 0.109)	-0.127 (-0.222, -0.032)	0.724 (0.415, 1.033)	2.17 (1.334, 3.005)	0.211 (0.116, 0.305)	Ref.	2.049 (1.452, 2.647)	-0.475 (-1.048, 0.098)	-4.301 (-4.826, -3.777)	-0.587 (-1.067, -0.108)	-6.407 (-6.984, -5.831)	-4.334 (-4.896, -3.771)	-1.749 (-2.489, -1.008)	-2.055 (-2.733, -1.376)	-3.307 (-4.051, -2.562)
Social Work Occupations	-0.402 (-0.645, -0.159)	0.003 (0, 0.006)	0.065 (-0.032, 0.161)	0.002 (-0.156, 0.16)	-0.036 (-0.098, 0.027)	-0.036 (-0.24, 0.167)	-0.226 (-0.775, 0.324)	0.027 (-0.035, 0.09)	Ref.	-0.107 (-0.5, 0.286)	-0.318 (-0.695, 0.059)	-0.431 (-0.776, -0.086)	0.872 (0.557, 1.188)	-1.739 (-2.118, -1.36)	0.805 (0.435, 1.175)	1.344 (0.857, 1.831)	0.072 (-0.375, 0.518)	1.508 {1,018, 1.998)

Data from a national sample of skilled nursing facilities with complete covariate data reporting staffing data in the Payroll Based Journal between January 2018 and June 2023. Models are also adjusted for facility characteristics in Table 1, year and quarter fixed effects, and county-level per capita COVID-19 case rates.

Appendix Table 3.

Results of mixed effects models examining variability of contractor staffing based on facility characteristics.

	Percent Contractor Staffing Coefficient (95% Confidence Interval)										
Occupation	Non-Profit Ownership (Compared to For-Profit)	Government Ownership (Compared to For-Profit)	Rural Location	Chain Affiliation	In-Hospital Location	Percent High Quality Quarters (10% Increase)	Percent Medicare Patients (10% Increase)	Percent Medicaid Patients (10% Increase)	Medicare Certified Bed Count (10-Bed Increase)	Nursing Hours per Patient-Day	Time (Quarter)
Leadership	2.767 (2,105, 3.429)	2.967 (1,884, 4.05)	-0.96 (-1.641, -0.28)	-0.841 (-1.374, -0.309)	-0.66 (-1.979, 0.659)	-0.105 (-0.18, -0.03)	-0.306 (-0.541, -0.072)	-0.215 (-0.359, -0.071)	-0.136 (-0.184, -0.089)	-0.109 (-0.214, -0.003)	0.003 (0.002, 0.004)
Medical Staff	-1.352 (-2.455, -0.25)	1.929 (0.126, 3.732)	-2.552 (-3.686, -1.419)	-3.129 (-4.016, -2.242)	-8.611 (-10.805, -6.417)	0.129 (0.004, 0.254)	-0.012 (-0.402, 0.378)	0.109 (-0.13, 0.348)	0.133 (0.054, 0.211)	0.612 (0.456, 0.767)	0.011 (0.009, 0.012)
Pharmacists	3.079 (1,469, 4.689)	-3.171 (-5.804, -0.537)	1.982 (0.327, 3.638)	3.607 (2,311, 4.903)	-29.213 (-32.416, -26.01)	0.815 (0.633,	-2.17	-0.062 (-0.411, 0.287)	0.151 (0.036,	1.52 (1.307, 1.732)	0.002 (0, 0.004)
Feeding Occupations	6.894 (5.327, 8.46)	-0.158 (-2.72, 2.404)	4.148 (2.538, 5.759)	-0.49 (-1.75, 0.771)	-22.454 (-25.57, -19.338)	-0.113 (-0.29,	-1.131 (-1.685, -0.577)	0.355 (0.015,	-0.469 (-0.581, -0.357)	0.565 (0.359, 0.771)	0.007 (0.005, 0.009)
Respiratory Occupations	-0.199 (-0.812, 0.413)	-0.021 (-1.023, 0.981)	-0.559 (-1.189, 0.071)	0.992 (0.499, 1.485)	-0.75 (-1.969, 0.469)	0.006 (-0.063, 0.075)	0.025 (-0.192, 0.242)	-0.05 (-0.183, 0.082)	0.241 (0.197, 0.285)	0.218 (0.134, 0.302)	0.001 (0, 0.002)
Therapy Occupations	6.703 (5.071, 8.334)	1.001 (-1.667, 3.669)	3.159 (1,482, 4.837)	-6.656 (-7.97, -5.343)	-40.109 (-43.351, -36.868)	-0.141 (-0.325, 0.044)	-2.506 (-3.083, -1.929)	-0.125 (-0.478, 0.229)	-0.049 (-0.166, 0.067)	0.431 (0.252, 0.61)	0 (-0.002, 0.001)
Therapy Aides	2.828 (1.832, 3.824)	-0.705 (-2.335 0.925)	-1.178 (-2.202, -0.154)	-2.373 (-3.175, -1.571)	-7.305 (-9.289, -5.321)	0.074 (-0.039, 0.187)	0.572 (0.219,	-0.388 (-0.604, -0.172)	0.464 (0.392,	-0.113 (-0.262, 0.036)	0.011 (0.01, 0.013)
Recreation Occupations	-0.177 (-0.408, 0.054)	0.639 (0.261, 1.017)	-0.062 (-0.3, 0.176)	-0.445 (-0.631, -0.259)	-0.315 (-0.776, 0.145)	0.05 (0.024, 0.076)	-0.003 (-0.084, 0.079)	0.051 (0.001, 0.101)	0.025 (0.008, 0.041)	-0.03 (-0.067, 0.007)	0.001 (0, 0.001)
Social Work Occupations	0.244 (-0.076, 0.565)	0.843 (0.319, 1.367)	0.116 (-0.213, 0.446)	-0.788 (-1.046, -0.53)	-0.041 (-0.68, 0.598)	0.004 (-0.033, 0.04)	-0.235 (-0.349, -0.122)	0.018 (-0.052, 0.087)	-0.107 (-0.13, -0.084)	-0.069 (-0.122, -0.017)	0.001 (0.001, 0.002)

Data from a national sample of skilled nursing facilities with complete covariate data reporting staffing data in the Payroll Based Journal between January 2018 and June 2023. Models are also adjusted for community characteristics in Table 4 and year and quarter fixed effects

Appendix Table 4.

Results of mixed effects models examining variability of contractor staffing based on community characteristics.

	Percent Contractor Staffing Coefficient (95% Confidence Interval)																
Occupation	Certificate of Need Law or Moratoria	County Social Deprivation Index Score	County-Level Percent Dual Eligible Residents (10% Increase)	County-Level Percent Asian American Residents (10% Increase)	County-Level Percent Black Residents (10% Increase)	County-Level Percent American Indian or Alaska Native Residents (10% Increase)	County-Level Percent Native Hawaiian or Pacific Islander Residents (10% Increase)	County-Level Percent Hispanic Residents (10% Increase)	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Region 7	Region 8	Region 9	Region 10
Leadership	0.29 (-0.62, 1.201)	-0.005 (-0.016, 0.006)	0.738 (0.371, 1.105)	0.252 (-0.348, 0.852)	0.43 (0.189, 0.671)	-0.316 (-1.078, 0.446)	-1.195 (-3.247, 0.858)	-0.118 (-0.353, 0.116)	Ref.	0.59 (-0.911, 2.091)	-1.351 (-2.789, 0.086)	-3.274 (-4.589, -1.959)	-3.884 (-5.088, -2.681)	-3.717 (-5.16, -2.275)	-3.274 (-4.679, -1.869)	-1.493 (-3.325, 0.339)	-2.507 (-4.193, -0.821)	-3.655 (-5.509, -1.8)
Medical Staff	-0.348 (-1.865, 1.169)	0.023 (0.005, 0.042)	0.246 (-0.365, 0.858)	-1.686 (-2.685, -0.687)	0.077 (-0.323, 0.478)	-0.933 (-2.201, 0.335)	0.293 (-3.123, 3.709)	-0.706 (-1.097, -0.316)	Ref.	-2.778 (-5.278, -0.278)	-8.382 (-10.776, -5.988)	-5.054 (-7.244, -2.864)	-4.168 (-6.172, -2.164)	-7.181 {-9.583, -4.78)	-6.293 (-8.633, -3.953)	-6.819 (-9.871, -3.768)	0.974 (-1.835, 3.782)	1.216 (-1.872, 4.304)
Pharmacists	2.675 (0.459, 4.891)	-0.036 (-0.062, -0.009)	1.987 (1.094, 2.88)	-1.939 (-3.399, -0.479)	-1.489 (-2.075, -0.903)	-3.427 (-5.279, -1.575)	6.815 (1.828, 11.802)	-0.455 (-1.025, 0.115)	Ref.	-12.968 (-16.62, -9.316)	0.455 (-3.043, 3.953)	2.589 (-0.61, 5.788)	-3.982 (-6.909, -1.054)	5.071 (1.563, 8.58)	3.016 (-0.402, 6.434)	-12.543 (-17.001, -8.085)	-12.008 (-16.111, -7.905)	-7.103 {-11.613, -2.593)
Feeding Occupations	0.27 (-1.885, 2.426)	-0.003 (-0.029, 0.023)	0.342 (-0.527, 1.211)	-3.102 (-4.523, -1.682)	0.023 (-0.547, 0.592)	-2.695 (-4.496, -0.893)	-1.844 (-6.695, 3.008)	0.297 (-0.257, 0.852)	Ref.	-7.425 (-10.978, -3.872)	0.416 (-2.987, 3.819)	3.397 (0.285, 6.509)	-5.733 (-8.581, -2.886)	8.306 (4,893, 11.719)	8.975 (5.65, 12.301)	-7.236 (-11.573, -2.899)	3.749 (-0.242, 7.74)	0.467 (-3.921, 4.854)
Respiratory Occupations	0.93 (0.087, 1.773)	0.004 (-0.007, 0.014)	-1.225 (-1.565, -0.885)	1.334 (0.779, 1.89)	-0.216 (-0.439, 0.007)	0.729 (0.024, 1.434)	-2.38 (-4.278, -0.482)	0.43 (0.213, 0.647)	Ref.	1.574 (0.184, 2.963)	1.682 (0.351, 3.013)	1.895 (0.678, 3.112)	-0.736 (-1.85, 0.378)	-3.469 (-4.804, -2.134)	-3.515 (-4.815, -2.214)	-3.254 (-4.95, -1.558)	-4.359 (-5.92, -2.798)	-4.404 (-6.12, -2.688)
Therapy Occupations	8.933 (6,687, 11.179)	-0.002 (-0.029, 0.025)	2.295 (1,389, 3.2)	1.209 (-0.27, 2.689)	0.968 (0.374, 1.562)	-3.843 (-5.719, -1.967)	0.247 (-4.801, 5.295)	-1.799 (-2.376, -1.221)	Ref.	0.532 (-3.169, 4.234)	12.028 (8,483, 15.574)	10.497 (7.255, 13.738)	23.977 (21.011, 26.943)	23.657 (20.101, 27.213)	26.669 (23.205, 30.133)	9.666 (5.148, 14.185)	16.818 (12.66, 20.975)	18.739 (14.169, 23.308)
Therapy Aides	1.445 (0.075, 2.816)	0 (-0.016, 0.017)	0.874 (0.322, 1.427)	1.707 (0.804, 2.61)	0.474 (0.111, 0.836)	-0.835 (-1.981, 0.311)	-6.771 (-9.859, -3.683)	-0.039 (-0.391, 0.314)	Ref.	4.001 (1.742, 6.261)	1.943 (-0.22, 4.107)	7.001 (5,021, 8.98)	2.725 (0.913, 4.536)	3.714 (1.544, 5.885)	0.552 (-1.563, 2.667)	-0.977 (-3.735, 1.781)	6.424 (3,885, 8.962)	-0.928 (-3.719, 1.864)
Recreation Occupations	-0.381 (-0.699, -0.063)	0.007 (0.003, 0.011)	0.154 (0.026, 0.282)	1.018 (0.808, 1.227)	0.053 (-0.031, 0.137)	0.207 (-0.059, 0.473)	-0.887 (-1.604, -0.171)	0.069 (-0.013, 0.151)	Ref.	3.482 (2.958, 4.006)	0.344 (-0.158, 0.846)	0.436 (-0.023, 0.895)	0.244 (-0.176, 0.664)	0.453 (-0.05, 0.957)	0.686 (0.195, 1.176)	0.808 (0.168, 1.447)	-1.649 (-2.238, -1.06)	-0.202 (-0.85, 0.445)
Social Work Occupations	-0.661 (-1.102, -0.22)	0.005 (0, 0.01)	-0.231 (-0.409, -0.054)	0.291 (0.001, 0.582)	0.134 (0.017, 0.25)	-0.195 (-0.564, 0.174)	-0.475 (-1.469, 0.519)	0.251 (0.138, 0.364)	Ref.	-0.941 (-1.667, -0.214)	-2.775 (-3.471, -2.079)	-2.807 (-3.443, -2.17)	-2.152 (-2.735, -1.57)	-2.776 (-3.474, -2.077)	-2.194 (-2.875, -1.514)	-2.406 (-3.294, -1.519)	-3.567 (-4.384, -2.75)	-3.083 (-3.981, -2.185)

Data from a national sample of skilled nursing facilities with complete covariate data reporting staffing data in the Payroll Based Journal between January 2018 and June 2023. Models are also adjusted for facility characteristics in Table 3, year and quarter fixed effects, and county-level per capita COVID-19 case rates.