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Brief Report

Characteristics of Nursing Homes by COVID-19 Cases Among Staff: March to August 2020

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A B S T R A C T

Objective: To measure the association between nursing home (NH) characteristics and Coronavirus Disease 2019 (COVID-19) prevalence among NH staff.
Design: Retrospective cross-sectional study.
Setting and Participants: Centers for Disease Control and Prevention COVID-19 database for US NHs between March and August 2020, linked to NH facility characteristics (LTCFocus database) and local COVID-19 prevalence (USA Facts).
Methods: We estimated the associations between NH characteristics, local infection rates, and other regional characteristics and COVID-19 cases among NH staff (nursing staff, clinical staff, aides, and other facility personnel) measured per 100 beds, controlling for the hospital referral regions in which NHs were located to account for local infection control practices and other unobserved characteristics.
Results: Of the 11,858 NHs in our sample, 78.6% reported at least 1 staff case of COVID-19. After accounting for local COVID-19 prevalence, NHs in the highest quartile of confirmed resident cases (413.5 to 920.0 cases per 1000 residents) reported 18.9 more staff cases per 100 beds compared with NHs that had no resident cases. Large NHs (150 or more beds) reported 2.6 fewer staff cases per 100 beds compared with small NHs (<50 beds) and for-profit NHs reported 0.8 fewer staff cases per 100 beds compared with nonprofit NHs. Higher occupancy and more direct-care hours per day were associated with more staff cases (0.4 more cases per 100 beds for a 10% increase in occupancy, and 0.7 more cases per 100 beds for an increase in direct-care staffing of 1 hour per resident day, respectively). Estimates associated with resident demographics, payer mix, or regional socioeconomic characteristics were not statistically significant.
Conclusions and Implications: These findings highlight the urgent need to support facilities with emergency resources such as back-up staff and protocols to reduce resident density within the facility, which may help stem outbreaks.

Since the start of the Coronavirus Disease 2019 (COVID-19) outbreak in early 2020, almost 21 million cases have been reported in the United States.[1] Among the hardest hit have been residents of nursing homes (NHs), who comprise less than 1% of the US population but account for more than 40% of deaths attributed to COVID-19.[2] NHs were particularly vulnerable to the outbreak due to a number of longstanding structural deficiencies, including inadequate supply and access to personal protective equipment (PPE) and staffing shortages.[3] Anecdotal reports from early days of the pandemic documented the severe impact of these deficiencies on the mental health of NH staff as a result of stress and fatigue.[4] To combat these issues and support nursing home staff, some states have implemented policies that modify licensure laws[5] and increase compensation and paid leave for NH health care workers.[6,7] However, properly understanding the

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impact of COVID-19 on NH staff has been difficult because reliable reporting on NH staff cases and deaths has been lacking.[8,9]

This study presents the first national description of COVID-19 cases among NH staff reported to the Centers for Disease Control (CDC) COVID-19 NH reporting database. The database uses systematic quality assurance to identify instances where facilities may have entered incorrect data.[10] We also identify facility- and community-level factors associated with NH staff cases. Understanding these relationships is an integral step toward the further development of policies and strategies to improve the safety of NH staff, address NH staffing shortages, and improve the care quality for NH residents. Specifically, our objectives were to (1) measure the prevalence of COVID-19 among NH staff during the first wave of the pandemic (from March to August 2020), and (2) identify facility- and community-level factors associated with COVID-19 prevalence among NH staff.

Methods

In this cross-sectional retrospective study of US NHs, we linked the CDC NH COVID-19 database (https://data.cms.gov/stories/s/COVID-19-Nursing-Home-Data/bkwz-xpvg/?) to facility characteristics from the LTCFocus database (http://ltcfocus.org/, Long-Term Care: Facts on Care in the US, Brown University, RI) and the USA Facts dataset (https://usafacts.org/visualizations/coronavirus-covid-19-spread-map/). The CDC NH COVID-19 database contains NH-reported resident and staff cases, mortality, and other COVID-19–related data as part of a federal mandate. We used data from March to August 2020. Because the database was updated weekly starting on May 24, 2020, cases before that week were reported in cumulative. Therefore, the CDC has advised against longitudinal analyses using this database.[10] LTCFocus contains NH facility characteristics (such as size, occupancy, ownership, payer mix) aggregated from a number of primary and secondary sources, including Medicare claims and the Minimum Data Set, which includes assessments for all residents of Medicare- or Medicaid-certified NHs. The USA Facts COVID-19 dataset was used to obtain county-level COVID-19 prevalence rates for the same time period.

Our outcome was the cumulative number of confirmed COVID-19 cases among staff during the study period, measured per 100 NH beds to account for facility size (cases reported as suspected COVID-19 were excluded). NHs with data flagged by the CDC as incomplete or suspected reporting error were excluded from the analysis (n = 955). To further avoid outliers from skewing our findings, the data were winsorized so that NHs that reported staff case counts in the top 1% of the distribution of staff case counts were assigned the value of the next highest observation (n = 380). Our final sample included 11,585 NHs.

NH characteristics included resident demographics (average age of residents in the facility, percentage of residents who were female, percentage who were white), case mix [percentage of patients insured by Medicare and Medicaid, respectively, and average functional status measured using the activities of daily living (ADL) score], and facility factors (size, ownership, occupancy, part of multifacility chain, direct-care staff hours per patient day, presence of advanced practitioners on staff, and presence of a Alzheimer specialty unit).[11–13] We also collected information on PPE shortages reported by the NHs in the CDC COVID-19 database. NHs reported whether they had sufficient supplies of different classes of PPE over the past 7 days. PPE classes included N95 masks, surgical masks, eye protective equipment, gowns, disposable gloves, and hand sanitizer. Facilities that did not have sufficient supply to last 7 days were considered to be experiencing a shortage of the PPE. Community characteristics measured at the county level included rural versus urban location, median household income, percentage of population older than 75 years, prevalence of COVID-19 cases among NH residents (measured in cases per 1000 residents), and community prevalence of COVID-19 cases (measured in cases per 1000 residents). Cases among NH staff and NH residents were subtracted from the number of cases measured at the county level to avoid double counting. In addition, we included an indicator of whether a state had a NH visitation ban during the study period.

Analyses were performed at the NH level. For the descriptive analyses, facilities were stratified into 4 categories of COVID-19 cases among staff (no cases, more than 0 and fewer than 5 cases, 5 or more and fewer than 15 cases, and 15 or more cases per 100 beds). One-way analysis of variance for continuous variables and χ^2 tests for

Table 1
Characteristics of Nursing Homes in the Study Sample

Characteristic	All (n = 11,858)	No. Staff Cases (n = 2544)	0 < Cases < 5 (n = 3808)	5 ≤ Cases <15 (n = 3147)	15 ≤ Cases (n = 2359)	*P* Value
NH resident confirmed COVID-19 cases per 1000 residents (SD)	145.7 (235.5)	7.7 (51.1)	34.0 (87.3)	172.8 (206.6)	438.6 (281.5)	<.001
Community COVID-19 cases per 1000 population (SD)	13.4 (9.0)	7.7 (6.6)	11.9 (8.4)	16.2 (8.7)	18.3 (8.8)	<.001
Average patient age, y, mean (SD)	79.4 (6.7)	79.9 (6.5)	79.3 (6.7)	79.3 (6.8)	79.2 (6.9)	.001
Percentage of patients who are female, mean (SD)	66.2 (11.8)	67.3 (11.2)	66.2 (11.6)	65.7 (12.3)	65.7 (12.0)	<.001
Percentage of patients who are White, mean (SD)	79.1 (22.8)	89.2 (16.4)	81.2 (21.4)	74.00 (24.0)	71.5 (24.7)	<.001
ADL score, mean (SD)	16.7 (2.6)	15.8 (2.7)	16.5 (2.5)	17.00 (2.5)	17.4 (2.4)	<.001
Percentage of patients covered by Medicaid, mean (SD)	60.4 (21.9)	61.7 (19.6)	61.0 (20.8)	59.0 (23.7)	59.9 (23.2)	<.0001
Percentage of patients covered by Medicare, mean (SD)	13.4 (11.5)	11.3 (9.6)	12.9 (10.6)	14.5 (12.3)	15.3 (13.0)	<.001
Number of beds, mean (SD)	110.3 (58.2)	80.6 (35.9)	112.7 (52.8)	122.8 (65.6)	121.8 (63.7)	<.001
For-profit ownership status, %	72.9	71.00	72.5	72.6	75.8	.001
Direct-care hours per patient day, mean (SD)	3.6 (0.9)	3.4 (0.8)	3.5 (0.8)	3.7 (0.9)	3.8 (0.9)	<.001
Have a nurse practitioner or physician's assistant, %	56.1	45.6	57.3	59.7	60.7	<.001
Have an Alzheimer specialty unit, %	15.0	13.6	17.4	14.9	12.8	<.001
Occupancy, %	72.6	73.8	73.0	72.4	71.1	<.001
Part of a multifacility chain, %	60.5	62.4	61.2	60.00	57.7	.005
Rural location, %	24.2	45.2	26.1	14.3	11.7	<.001
One-wk supply of N95 masks, %	82.3	81.4	80.7	83.0	84.7	<.001
One-wk supply of surgical masks, %	90.1	89.2	89.1	90.9	91.5	.003
One-wk supply of eye protection, %	90.5	90.2	89.7	91.2	91.1	.111
One-wk supply of gowns, %	87.6	87.8	87.0	87.4	88.7	.277
One-wk supply of gloves, %	95.0	94.8	95.6	94.8	94.7	.308
One-wk supply of hand sanitizer, %	95.8	96.2	96.0	95.7	95.0	.178
County median household income, $	54,498	50,663	54,119	56,606	56,434	<.001
Percentage of population of county older than 75, mean (SD)	6.9 (2.0)	7.7 (2.0)	6.9 (1.9)	6.5 (2.0)	6.5 (2.0)	<.001
Located in a state with a NH visitation ban, %	64.5	57.3	62.8	68.4	69.7	<.001

categorical variables were used to compare facility characteristics across the 4 categories. To measure the association between facility- and county-level characteristics, we used linear regression to estimate the number of COVID-19 cases among NH staff per 100 beds as a function of NH-, county-, and state-level factors. We included hospital referral region fixed effects to account for unobserved regional factors that may play a role in COVID-19 spread among NH staff. To address the skewness of our data, we performed negative binomial regression in a sensitivity analysis. For ease of interpretation, we report the results from our linear regression models throughout. Standard errors were adjusted for clustering at the level of the state.[14,15]

Statistical analyses were performed using Stata/IC Version 16.0 and Tableau Public 2020.3. The study did not meet the definition of human subjects research per [the University of Pennsylvania] institutional review board.

Results

For the average NH in the sample, the mean patient age was 79.4 [standard deviation (SD) 6.7], 66.2% of patients were women, 79.1% were white, and 60.4% were covered by Medicaid. The average ADL score was 16.7 (of 28 possible points, with a higher score indicating more functional needs). Average facility size was 110.3 beds (SD 58.2), 72.9% were for-profit, 56.1% had advanced practitioners on staff, and 15% had an Alzheimer specialty unit. The mean direct-care hours per patient were 3.6 (SD 0.9), and 60.5% of facilities were part of a chain. Occupancy was 72.6% on average. Approximately a quarter (24.2%) of the facilities were located in rural settings. The median household income in counties with NHs in the sample was $54,498 and the average percentage of population older than 75 years was 6.9%. Facilities with more staff cases had a smaller proportion of white patients (89.2% of patients were white in NHs with no staff cases vs 71.5% of patients in NHs with 15 or more staff cases, $P < .001$) and were less likely to be in a rural location (45.2% of NHs with no staff cases vs 11.7% of NHs with 15 or more staff cases, $P < .001$) (Table 1).

Of the NHs in the sample, 2544 (21.5%) had no confirmed COVID-19 staff cases and 9314 (78.6%) had at least 1 case. Overall, a small but considerable number of facilities reported having less than a week's supply of PPE. One (17.7%) in 5 facilities reported a shortage of N95 masks, 1 (9.9%) in 10 reported a shortage of surgical masks or eye protection equipment (9.5%), approximately 12% reported a shortage of gowns, and approximately 5.0% reported a shortage of disposable gloves or hand sanitizer (4.2%).

Multivariable Regression Results

After adjusting for facility and county-level characteristics, NHs with more resident cases were more likely to report staff cases. Compared with NHs without any resident cases, NHs in the lowest

Table 2
Adjusted Associations Between NH Staff COVID-19 Cases Per 100 NH Beds and Facility and Regional Characteristics

Characteristic	Categories	Staff Cases Per 100 Beds	95% Confidence Interval	*P* Value
NH resident confirmed COVID cases per 1000 residents (ref. no cases)	Q1 (1.7–36.9)	1.6	1.3 to 1.9	<.001
	Q2 (37.0–145.4)	4.5	4.1 to 4.9	<.001
	Q3 (145.5–413.4)	10.2	9.6 to 10.9	<.001
	Q4 (413.5–920.0)	18.9	17.6 to 20.1	<.001
Community confirmed cases per 1000 persons (ref. no cases)	Q1 (0.1–6.8)	3.2	2.1 to 4.2	<.001
	Q2 (6.9–11.2)	4	2.9 to 5.0	<.001
	Q3 (11.3–18.7)	4	2.8 to 5.2	<.001
	Q4 (18.8–140.2)	5.3	4.0 to 6.6	<.001
Average NH resident age		0.03	0.0 to 0.1	.14
Percentage of female patients		−0.01	−0.02 to 0.01	.44
Percentage of residents who are white (ref. Q1<67.4%)	Q2 (67.4–88.0)	−0.02	−0.5 to 0.5	.93
	Q3 (88.1–96.8)	0.2	−0.5 to 0.9	.65
	Q4 (96.9–100.0)	0.4	−0.4 to 1.1	.33
Average ADL score		0.03	−0.03 to 0.10	.32
NH size	Medium NH (50 ≤ beds<150)	−1.1	−1.8 to −0.4	.002
(ref. small; <50 beds)	Large NH (≥150 beds)	−2.6	−3.6 to −1.7	<.001
Bed occupancy (10 percentage points)		0.4	0.2 to 0.5	<.001
For-profit (ref. nonprofit)		−0.8	−1.2 to −0.4	<.001
Part of multifacility chain (ref. non-multifacility chain)		−0.2	−0.4 to 0.1	.21
Direct-care staffing in hours per patient day		0.7	0.5 to 0.9	<.001
Presence of an NP or PA (ref. absence of an NP or PA)		−0.03	−0.3 to 0.3	.84
Alzheimer specialty unit (ref. absence of the specialty unit)		−0.3	−0.7 to 0.1	.16
Percentage of residents covered by Medicaid (ref. Q1 <50%)	Q2 (50.0–64.2)	−0.2	−0.5 to 0.2	.34
	Q3 (64.3–76.0)	−0.5	−0.8 to −0.1	.01
	Q4 (76.1–100.0)	−0.2	−0.7 to 0.3	.46
Percentage of residents covered by Medicare (ref. Q1 <6.3%)	Q2 (6.3–10.7)	−0.1	−0.5 to 0.3	.55
	Q3 (10.8–17.1)	−0.1	−0.4 to 0.2	.53
	Q4 (17.2–100.0)	0.4	−0.1 to 0.8	.10
One-wk supply of N95 masks (ref. not enough for 1 wk)*		0.3	−0.1 to 0.7	.19
One-wk supply of surgical masks (ref. not enough for 1 wk)		0.8	0.1 to 1.5	.02
One-wk supply of eye protection (ref. not enough for 1 wk)		−0.1	−0.6 to 0.5	.83
One-wk supply of gowns (ref. not enough for 1 wk)		−0.3	−0.9 to 0.4	.44
One-wk supply of gloves (ref. not enough for 1 wk)		−0.03	−0.8 to 0.8	.94
One-wk supply of hand sanitizer (ref. not enough for 1 wk)		−0.4	−1.3 to 0.4	.27
Median household income (ref. Q1 <$44,965)	Q2 ($44,965–$51,562)	−0.1	−0.4 to 0.2	.59
	Q3 ($51,564–$60,179)	0.3	−0.1 to 0.6	.18
	Q4 ($60,219 or more)	−0.1	−0.7 to 0.4	.57
Percentage of county population aged over 75		−0.1	−0.3 to 0.0	.01
Rural location (ref: urban)		−0.2	−0.6 to 0.3	.48
State visitation ban (ref: not implemented)		−0.1	−1.1 to 0.8	.79
Constant		−5.6	−9.1 to −2.1	.002

NP, nurse practitioner; PA, physician assistant.

*PPE supply was reported by NHs to the Centers for Medicare and Medicaid Services. The query asked "Do you have enough for 1 wk?" by PPE type and answers were collected in a binary Yes/No format.

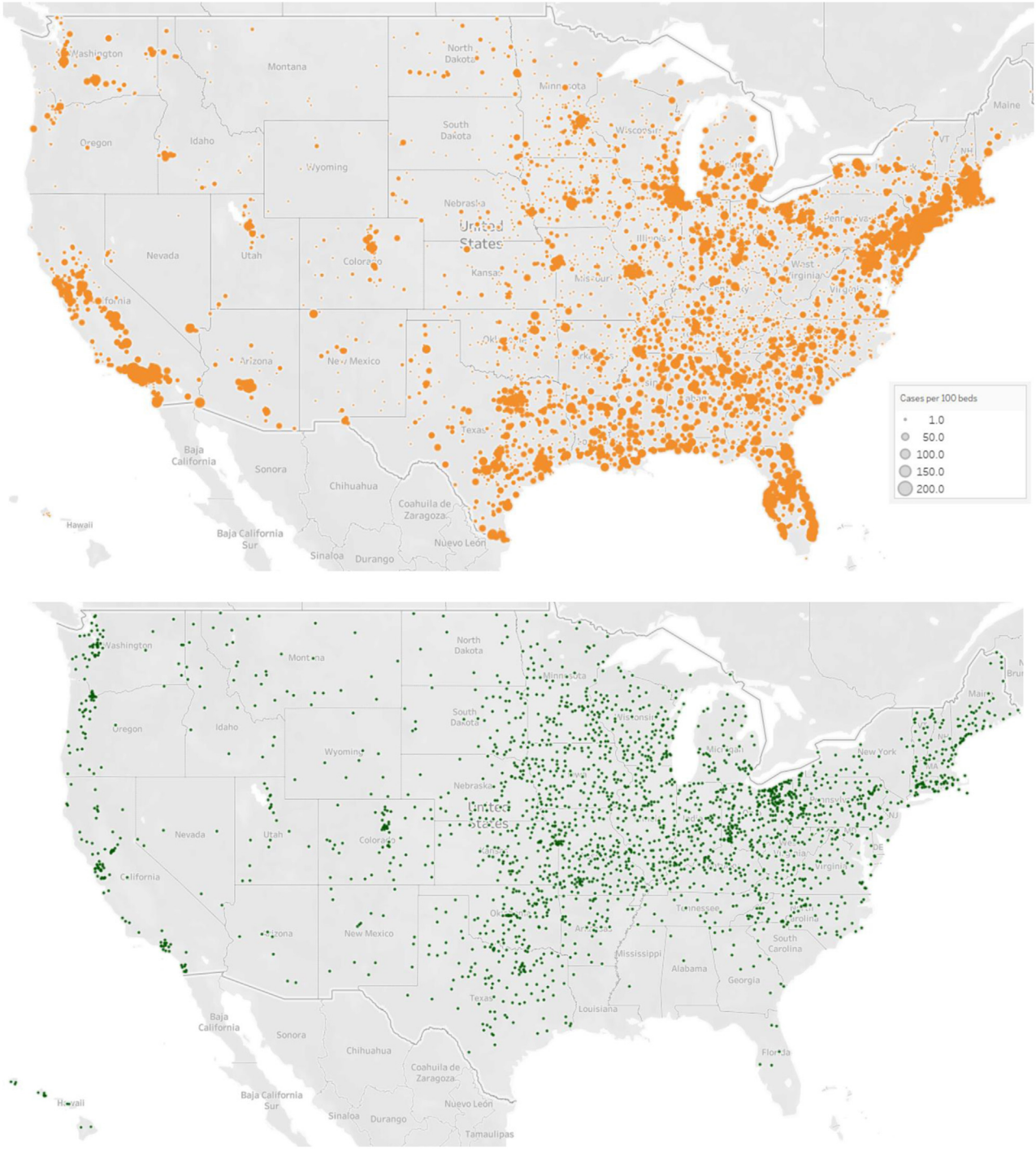

Fig. 1. Geographic distribution of NH staff COVID-19 cases: March to August 2020. Staff cases measured per 100 NH beds. The top map displays widespread distribution of COVID-19 cases among NH staff reported between March and August 2020. The bottom map shows NHs that reported no COVID-19 cases among staff. Alaska was excluded from the analysis (no data).

quartile of COVID-19 prevalence among residents (up to 36.9 cases per 1000 residents) had 1.6 more staff cases per 100 beds [95% confidence interval (CI) 1.3–1.9, $P < .001$]; NHs in the second quartile (37.0 to 145.4 resident cases) had 4.5 more staff cases per 100 beds (95% CI 4.1–4.9, $P < .001$), NHs in the third quartile (145.5–413.4 cases per 1000 residents) had 10.2 more staff cases (95% CI 9.6–10.9; $P < .001$); and NHs in the highest quartile of COVID-19 prevalence among residents (≥413.5 cases per 1000 residents) had 18.9 more staff cases per 100 beds (95% CI 17.6–20.1; $P < .001$) (Table 2).

COVID-19 prevalence in the community was also associated with cases among NH staff. Compared with counties without any COVID-19 cases, NHs in counties in the lowest quartile of COVID-19 prevalence (0.1 to 6.8 cases per 1000 residents) had 3.2 more staff cases per 100 beds (95% CI 2.1–4.2), whereas the NHs in counties in the top quartile of COVID-19 prevalence (18.8 or more cases per 1000 residents) had 5.3 more staff cases per 100 beds (95% CI 4.0–6.6). Compared with small NHs (fewer than 50 beds), medium-size NHs had 1.1 fewer staff cases per 100 beds (95% CI −1.8 to −0.4; $P = .002$) and large NHs had

2.6 fewer staff cases per 100 beds (95% CI −3.6 to −1.7; $P < .001$). For-profit NHs reported 0.8 fewer staff cases per 100 beds compared with nonprofit NHs (95% CI −1.2 to −0.4; $P < .001$). Higher occupancy and more direct-care hours per day were associated with more staff cases per 100 beds [0.4 staff cases per 100 beds for 10% increase in occupancy (95% CI 0.2–0.5; $P < .001$), and 0.7 staff cases per 100 beds for an increase in direct-care staffing of 1 hour per resident day (95% CI 0.5–0.9; $P < .001$), respectively]. Supplies of PPE were not associated with staff cases, with the exception of surgical masks (having at least a week's supply of surgical masks was associated with 0.8 additional staff cases per 100 beds; 95% CI 0.1–1.5; $P = .02$). Higher percentage of county population older than 75 was associated with slightly fewer staff cases (0.1 fewer cases per 100 beds; 95% CI −0.3 to 0.0; $P = .01$). Estimates associated with NH resident demographics, county median household income, rural location, and state visitation bans were not statistically significant.

Estimates of the sensitivity analysis using a negative binomial regression model were largely consistent with those from our primary analysis (Supplementary Table 1).

Figure 1 shows the geographic distribution of facilities by prevalence of COVID-19 among NH staff. The map displays widespread distribution of COVID-19 cases among NH staff reported between March and August 2020, particularly in California, the Northeast, Mid-Atlantic, and South of the United States. Notably, facilities without any staff cases were often located in the same regions with the exception of parts of the South (Figure 1).

Discussion

During the first 6 months of the COVID-19 pandemic, more than three-quarters of US NHs had confirmed COVID-19 cases among staff. As one would expect for an infectious disease transmitted from person to person via respiratory droplets, NH staff cases were correlated with facility and county characteristics generally associated with higher transmission risk. COVID-19 prevalence among NH residents and in the community, larger facility size, higher occupancy, and more direct-care staffing were associated with more COVID-19 cases among NH staff. Other characteristics associated with NH staff COVID-19 cases were surprising. For-profit status, not having a week's supply of surgical masks, and a higher percentage of county population older than 75 were associated with fewer cases among NH staff. After accounting for these factors, county socioeconomic characteristics and facility payer mix were not associated with COVID-19 cases among NH staff. Overall, these findings imply that COVID-19 infections among NH staff are largely explained by local transmission rates within the region where the NH is located and within the NH facility itself (eg, size, staffing, occupancy).

A considerable percentage of facilities reported shortages of PPE. However, after adjusting for facility and regional characteristics, the only statistically significant association between NH staff cases and PPE was a positive correlation between having a week's supply of surgical masks and staff cases. One possible explanation of this finding is that facilities with more NH staff cases might be more likely to receive additional PPE supplies *because* they experienced an outbreak. Another explanation is that more liberal use of surgical masks may be associated with both shortages and fewer COVID-19 cases among the staff. Overall, our findings highlight the urgent need to provide sufficient PPE to NH residents and staff.

This study has several limitations. First, the cross-sectional study design precludes conclusions about causality between NH or community factors and COVID-19 spread to NH staff. Second, NH-reported data in the CDC COVID-19 database is collected as part of a federal mandate. Although the CDC undertakes steps to ensure data accuracy, NHs may be incentivized to underreport COVID-19 cases among staff or overreport PPE shortages. Nevertheless, our findings are consistent with previous reports that demonstrate strong associations between NH cases and community-level factors (including county rates of COVID-19). For example, one study revealed that county-level COVID-19 rates and per-capita income were the most significant predictors of COVID-19 outbreaks within nursing homes.[16] Another study using a machine learning approach identified a nursing home's county infection rate as one of the strongest predictors of COVID-19 infection.[17] Third, NH cases are reported on a weekly basis and it is possible that some staff cases were counted more than once considering that COVID-19 symptoms can last several weeks.

Conclusions and Implications

This study presents the first national description of COVID-19 cases among NH staff in the United States. Our findings highlight the severe impact of the COVID-19 epidemic on NH staff and confirm anecdotal reports of PPE shortages. Outbreaks at the facility level among residents were strongly associated with high staff morbidity due to COVID-19, community-level transmission outside of the NH, as well as facility size, occupancy, and direct-care staffing. Efforts to make emergency resources such as extra staff available to NHs in areas with high rates of local transmission and/or to those facilities facing outbreaks could ameliorate the threat of COVID-19 to NH staff and may help reduce facility and local spread.

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Appendix

Supplementary Table 1
Negative Binomial Regression Estimates of the Associations Between NH and County Characteristics and NH Staff COVID-19 Cases Per 100 NH Beds

Characteristic	Categories	Staff Cases per 100 Beds (IRR)	95% Confidence Interval	*P* Value
NH resident confirmed COVID cases per 1000 residents (ref. no cases)	Q1 (1.7–36.9)	1.7	1.5–1.9	<.001
	Q2 (37.0–145.4)	2.8	2.5–3.2	<.001
	Q3 (145.5–413.4)	4.8	4.2–5.5	<.001
	Q4 (413.5–920.0)	8.3	7.1–9.5	<.001
Community confirmed cases per 1000 persons (ref. no cases)		1.0	1.0–1.0	<.001
Average NH resident age		1.0	1.0–1.0	.009
Percentage of female patients		1.0	1.0–1.0	.04
Percentage of residents who are white (ref. Q1<67.4%)	Q2 (67.4–88.0)	1.0	0.9–1.1	.60
	Q3 (88.1–96.8)	1.0	0.9–1.1	.46
	Q4 (96.9–100.0)	0.9	0.8–1.1	.32
Average ADL score		1.0	1.0–1.0	.90
NH size (ref. small; <50 beds)	Medium NH (50 ≤ beds<150)	0.9	0.8–1.0	.04
	Large NH (≥150 beds)	0.7	0.7–0.8	<.001
Bed occupancy		1.0	1.0–1.0	<.001
For-profit (ref. nonprofit)		0.9	0.8–0.9	<.001
Part of multifacility chain (ref. non-multifacility chain)		1.0	0.9–1.0	.10
Direct-care staffing in hours per patient day		1.1	1.1–1.2	<.001
Presence of an NP or PA (ref. absence of an NP or PA)		1.0	1.0–1.0	.91
Alzheimer's specialty unit (ref. absence of the specialty unit)		1.0	0.9–1.0	.42
Percentage residents covered by Medicaid (ref. Q1 <50%)	Q2 (50.0–64.2)	1.0	0.9–1.0	.17
	Q3 (64.3–76.0)	0.9	0.9–1.0	.005
	Q4 (76.1–100.0)	1.0	0.9–1.1	.57
Percentage of residents covered by Medicare (ref. Q1 <6.3%)	Q2 (6.3–10.7)	1.0	0.9–1.0	.16
	Q3 (10.8–17.1)	1.0	0.9–1.0	.34
	Q4 (17.2–100.0)	1.0	1.0–1.1	.52
One-wk supply of N95 masks (ref. not enough for 1 wk)		1.1	1.0–1.2	.02
One-wk supply of surgical masks (ref. not enough for 1 wk)		1.1	0.9–1.2	.30
One-wk supply of eye protection (ref. not enough for 1 wk)		1.0	0.9–1.1	.56
One-wk supply of gowns (ref. not enough for 1 wk)		0.9	0.8–1.0	.22
One-wk supply of gloves (ref. not enough for 1 wk)		1.0	0.9–1.1	.89
One-wk supply of hand sanitizer (ref. not enough for 1 wk)		0.9	0.8–1.1	.45
Median household income (ref. Q1 <$44,965)	Q2 ($44,965–$51,562)	1.1	1.0–1.2	.11
	Q3 ($51,564–$60,179)	1.1	1.0–1.2	.003
	Q4 ($60,219 or more)	1.1	1.0–1.2	.03
Percentage of county population aged >75 y		1.0	0.9–1.0	.003
Rural location (ref: urban)		0.9	0.8–0.9	<.001
State visitation ban (ref: not implemented)		0.9	0.8–1.1	.52
Constant		1.3	0.7–2.5	.45

IRR, incidence rate ratio; NP, nurse practitioner; PA, physician assistant.