Characteristics of U.S. Nursing Homes with COVID-19 Cases

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BACKGROUND/OBJECTIVES: The 2019 coronavirus disease (COVID-19) has been documented in a large share of nursing homes throughout the United States, leading to high rates of mortality for residents. To understand how to prevent and mitigate future outbreaks, it is imperative that we understand which nursing homes are more likely to experience COVID-19 cases. Our aim was to examine the characteristics of nursing homes with documented COVID-19 cases in the 30 states reporting the individual facilities affected.

DESIGN: We constructed a database of nursing homes with verified COVID-19 cases as of May 11, 2020, via correspondence with and publicly available reports from state departments of health. We linked this information to nursing home characteristics and used regression analysis to examine the association between these characteristics and the likelihood of having a documented COVID-19 case.

SETTING: All nursing homes from 30 states that reported COVID-19 cases at the facility-level.

PARTICIPANTS: Nursing home residents in states reporting data.

MEASUREMENTS: Whether a nursing home had a reported COVID-19 case (yes/no), and conditional on having a case, the number of cases at a nursing home.

RESULTS: Of 9,395 nursing homes in our sample, 2,949 (31.4%) had a documented COVID-19 case. Larger facility size, urban location, greater percentage of African American residents, non-chain status, and state were significantly ($P < .05$) related to the increased probability of having a COVID-19 case. Five-star rating, prior infection violation, Medicaid dependency, and ownership were not significantly related.

CONCLUSION: COVID-19 cases in nursing homes are related to facility location and size and not traditional quality metrics such as star rating and prior infection control citations. **J Am Geriatr Soc 68:1653-1656, 2020.**

Keywords: nursing homes; COVID-19; long-term care

COVID-19 has been documented in many U.S. nursing homes leading to a high number of deaths among residents.[1] As of May 21, 2020, at least 35,000 deaths were reported from nursing homes or other long-term care facilities in the United States.[2] These deaths represent 42% of deaths due to COVID-19 in the 38 states that are reporting this information. Because of the major health risks associated with COVID-19 in nursing homes, we sought to examine the characteristics of nursing homes with documented COVID-19 cases in 30 states reporting the individual facilities affected.

METHODS

We constructed a database of nursing homes with verified COVID-19 cases as of May 11, 2020, via correspondence with and publicly available reports from state departments of health. We linked these data to Nursing Home Compare from the Centers for Medicare & Medicaid Services Long-term Care: Facts on Care in the United States and the Area Resource File to identify characteristics of nursing homes with COVID-19 cases.[3] We examined size (<50 beds, 50 to 150 beds, >150 beds), ownership (for profit, nonprofit, or government), chain membership, high Medicaid share (>85%), high percentage of African American residents (>25%), urban location, CMS overall five-star rating, prior infection violation, and state.

We used logistic regression to estimate the odds ratio of each characteristic on the likelihood of having a documented COVID-19 case. We used linear regression from a subsample of 21 states reporting case counts to estimate the relationship between the characteristics of facilities and outbreak size, as a share of beds. Robust standard errors were calculated.

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Table 1 Characteristics of Nursing Homes with Reported Cases of COVID-19

	Nursing homes		Probability of any case	Outbreak size
Nursing home characteristics	Without COVID-19 n = 6,446 (68.6%) No. (%)	With COVID-19 n = 2,949 (31.4%) No. (%)	n = 9,395 Odds ratio	n = 2,575 Percentage point change
Size				
Small (<50 beds)	869 (86.9)	131 (13.1)	Reference	Reference
Medium (50–150 beds)	4,777 (70.9)	1960 (29.1)	2.63***	−10.80***
Large (>150 beds)	800 (48.3)	858 (51.7)	6.52***	−15.88***
Ownership				
For profit	4,651 (67.6)	2,227 (32.4)	1.07	1.88*
Nonprofit	1,534 (70.4)	644 (29.6)	Reference	Reference
Government	261 (77.0)	78 (23.0)	.84	−2.58
Non-chain	2,779 (67.9)	1,312 (32.1)	Reference	Reference
Chain	3,667 (69.1)	1,637 (30.9)	.89*	1.39
Resident characteristics				
Low Medicaid share	5,827 (69.0)	2,623 (31.0)	Reference	Reference
High Medicaid share	619 (65.5)	326 (34.5)	.97	−.79
Low black resident share	5,570 (71.7)	2,201 (28.3)	Reference	Reference
High black resident share	876 (53.9)	748 (46.1)	2.05***	1.44
Rural	2001 (89.7)	229 (10.3)	Reference	Reference
Urban	4,445 (62.0)	2,720 (37.9)	3.22***	1.28
Overall five-star rating				
1	1,109 (69.5)	486 (30.5)	Reference	Reference
2	1,259 (66.9)	622 (33.1)	1.07	.20
3	1,162 (67.6)	557 (32.4)	1.23*	.34
4	1,394 (69.8)	602 (30.2)	1.07	−.09
5	1,522 (69.1)	682 (30.9)	1.18	1.07
No infection violation	3,614 (69.5)	1,584 (30.5)	Reference	Reference
Prior infection violation	2,832 (67.5)	1,365 (32.5)	.99	−.58
State				
CA	802 (69.3)	356 (30.7)	.51***	Reference
CO	133 (66.5)	67 (33.5)	.81	19.65***
CT	68 (31.9)	145 (68.1)	2.62***	13.54***
DE	29 (65.9)	15 (34.1)	.54	N/A
FL	385 (58.3)	275 (41.7)	.73	−4.51***
GA	132 (38.9)	207 (61.1)	1.98***	3.53
IA	383 (93.4)	27 (6.6)	.19***	24.61***
IL	446 (64.2)	249 (35.8)	.67*	4.86***
KY	258 (96.3)	10 (3.7)	.07***	N/A
LA	240 (89.5)	28 (10.5)	.10***	N/A
MA	81 (22.0)	288 (78.0)	4.36***	9.06***
MD	79 (36.1)	140 (63.9)	1.57*	10.28***
ME	89 (96.7)	3 (3.3)	.08***	N/A
MI	270 (66.3)	137 (33.7)	.69	4.80***
MN	278 (79.7)	71 (20.3)	.54**	N/A
NC	355 (88.5)	46 (11.5)	.14***	14.06***
ND	57 (73.1)	21 (26.9)	1.32	−7.31***
NJ	39 (11.4)	303 (88.6)	7.16***	28.37***
NM	50 (79.4)	13 (20.6)	.55	N/A
NV	26 (53.1)	23 (46.9)	1.30	8.80
NY	512 (85.6)	86 (14.4)	.10***	N/A
OH	712 (80.9)	168 (19.1)	.33***	3.59
OK	233 (84.1)	44 (15.9)	.37***	7.25
OR	112 (91.1)	11 (8.9)	.15***	N/A
RI	37 (50.0)	37 (50.0)	1.13	15.01***
SC	129 (72.9)	48 (27.1)	.40***	−1.77
TN	265 (91.1)	26 (8.9)	.12***	3.00

(Continues)

Table 1 (Contd.)

Nursing home characteristics	Nursing homes: Without COVID-19 n = 6,446 (68.6%) No. (%)	Nursing homes: With COVID-19 n = 2,949 (31.4%) No. (%)	Probability of any case n = 9,395 Odds ratio	Outbreak size n = 2,575 Percentage point change
VT	29 (87.9)	4 (12.1)	.43	18.88
WA	119 (60.1)	79 (39.9)	Reference	N/A
WV	98 (81.7)	22 (18.3)	.46**	2.10

Note: N/A: State does not report case counts. Outbreak size is the number of reported cases divided by the number of beds, multiplied by 100. Data were collected through May 11, 2020.

*$P < .05$.

**$P < .01$.

***$P < .001$.

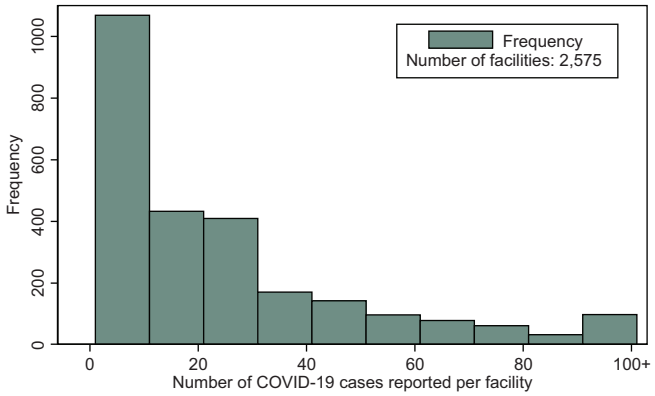

Figure 1 Frequency distribution of number of COVID-19 cases in 2,575 nursing homes with one or more cases.

RESULTS

Results are shown in Table 1. Of 9,395 nursing homes in our sample, 2,949 (31.4%) had a documented COVID-19 case. Among facilities with a positive COVID-19 case, the average number of cases was 19.8. New Jersey (88.6%) and Massachusetts (78.0%) had the greatest share of affected facilities.

Larger facility size, urban location, greater percentage of African American residents, non-chain status, and state were significantly ($P < .05$) related to the probability of having a COVID-19 case. Five-star rating, prior infection violation, Medicaid dependency, and ownership were not significantly related. Outbreak size was significantly associated with facility size, for-profit status, and state but not with other studied characteristics. The number of reported COVID-19 cases at a facility ranged from 1 to 256 cases (Figure 1).

DISCUSSION

Our findings suggest that nursing home COVID-19 outbreaks are more related to facility size and location than traditional quality metrics such as star rating and prior infection control citation, reflecting the unique infection control needs of COVID-19. Our finding that facilities with a high percentage of African American residents are more likely to have COVID-19 cases echoes disparities in the pandemic at large and indicates a critical health disparity to be addressed in the response to COVID-19 nursing home outbreaks.[4]

State-by-state differences may reflect the evolving epidemiology of COVID-19 in each area and state-level variation in testing and reporting. These data nationally are limited by current tracking and reporting capacity, as well as the lack of a national system for reporting nursing home COVID-19 cases.[5] Widespread variation in reporting format, case definitions, and update frequency may present a barrier to further longitudinal and national analyses. State grouping of staff and resident cases may limit the study of policies related to infections and infectivity among staff.[6] New York State only identified the names of the 86 facilities that had at least five COVID-19 related fatalities, whereas state officials have acknowledged that more than 300 New York facilities have at least one case.[7] Similarly, Delaware only provided names of facilities with a COVID-19 fatality. Washington, Maryland, and Minnesota restricted provision of data on facilities below an undisclosed size (Washington) or 10 beds, whereas other states (Colorado, Delaware, Kentucky, Massachusetts, North Carolina, Rhode Island, Tennessee, and Vermont) did not include facilities with single cases or below a certain case count.

Although the federal government will soon begin reporting national nursing home data on COVID-19 cases and deaths, facilities are not required to report cases and fatalities that occurred before May. Thus given this optional reporting for March and April, the federal data will largely miss the important early period in which COVID-19 emerged in U.S. nursing homes. By documenting COVID-19 cases in 30 states through mid-May, our data provide an important complement to the national data.

The negative relationship between outbreak and facility size indicates that while smaller facilities are less likely to have outbreaks, outbreaks at small facilities affect more patients per bed. This finding may reflect a number of features of small facilities, such as higher patient turnover and the possibility that isolating COVID-positive residents is more challenging for small facilities. However,

interpretation is limited by the need for richer data covering larger samples, case tracking for facilities over time, and greater detail on case characteristics.

The rapid evolution and mortality of nursing home outbreaks of COVID-19 reflect the need for continued community-facility contact restrictions, increased testing of residents and staff, and heightened infection control including more access to personal protective equipment for staff.[8,9] As the COVID-19 crisis continues, nursing homes are in critical need of these resources to protect their vulnerable populations.

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