RESEARCH LETTER

Point Prevalence Testing of Residents for SARS-CoV-2 in a Subset of Connecticut Nursing Homes

The first case of coronavirus disease 2019 (COVID-19) in Connecticut was reported in a nursing home (NH) on March 15, 2020. Within the next 2 months, 80.0% of Connecticut's 215 NHs reported at least 1 case of COVID-19, accounting for 61.6% of COVID-19 deaths in the state.[1] Residents were initially tested for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) only if symptomatic, as per recommendations from the Centers for Disease Control and Prevention. In early May, NHs were prioritized and selected for point prevalence surveys to provide a baseline for residents not previously identified as infected. We describe the results of these surveys in a targeted subset of Connecticut NHs between May 2 and 19, 2020.

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Supplemental content

Methods | We prioritized NHs in which establishment of baseline resident SARS-CoV-2 status would improve control measures, such as cohorting of individuals, based on a low proportion of previously infected residents (but at least 1 case), a high number of residents with unknown SARS-CoV-2 status, and evidence of at least 1 newly identified case in the previous 7 days. NHs with data verified by authors and completing surveys by May 19 were included. Several lower-priority NHs that had executed testing independently or expressed interest in surveys were also included.

Nasopharyngeal swabs were tested via polymerase chain reaction–based methods for detection of SARS-CoV-2 using 6 platforms in 8 laboratories (eMethods in the Supplement). Verbal consent and specimen collection were obtained by NH staff for residents without a prior confirmed SARS-CoV-2–positive test result. Symptoms were assessed by NH staff on the day of the survey, including atypical presentations in elderly individuals, and for 14 days after testing, following guidelines from the Centers for Disease Control and Prevention.

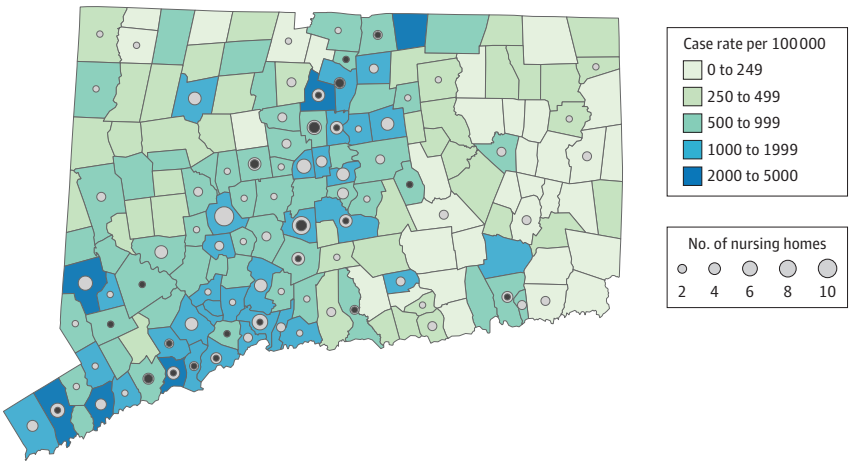
NH quality rating and number of licensed beds were obtained from the Nursing Home Compare database and case rates and location from the state.

The surveys were conducted as part of the state's public health response for outbreak control and, therefore, were exempt from the need for institutional review board approval.

Results | Point prevalence surveys were conducted in 33 NHs across Connecticut, representing 15.3% of NHs statewide (n = 215). The geographic distribution of included and remaining NHs is shown in the **Figure**. Included NHs had a quality rating of 3.58 stars (vs 3.93 stars in the remaining NHs; $P = .24$) and 135 beds (vs 127 beds; $P = .23$), and the case rate in the towns in which they were located was 617 cases/100 000 individuals (vs 1263/100 000; $P < .001$).

Overall, 2117 residents were tested (median per NH, 51; range, 14-242) and 601 (28.3%) were positive. Of the 601 positive residents, 530 (88.2%) were asymptomatic when sampled; 11.7% (62/530) developed symptoms within 14 days (presymptomatic). All SARS-CoV-2–positive residents were asymptomatic or presymptomatic at the time of testing in 45.5% of NHs (**Table**). The median time from the first case to the survey was 37 days (range, 6-54). Nineteen facilities had at least 50% of

Figure. Map of Coronavirus Disease 2019 Case Rates per 100 000 People in Towns or County Subdivisions in Connecticut Scaled by Color as of May 26, 2020



Point prevalence surveys were conducted in 33 of 215 nursing homes across Connecticut. Nursing homes included in this analysis are represented by black dots placed in the midpoint of their respective town, with the size of the dot corresponding to the number of nursing homes included in each town. Nursing homes not included in this analysis are represented by open dots. Data on state case counts were obtained from https://portal.ct.gov/Coronavirus.

Table. Summary of Point Prevalence Results From Molecular Testing of Nasopharyngeal Swabs for SARS-CoV-2 in Nursing Homes in Connecticut (N = 33), May 2 to May 19, 2020

Nursing home	Days from first case to PPS[a]	Census at time of PPS[b]	No. tested at PPS[c]	No. (%)		
				SARS-CoV-2–positive residents[d]	Positive residents without symptoms at the time of PPS[e]	Presymptomatic residents[f]
1	6	98	97	14 (16)	14 (100)	0
2	7	46	27	21 (78)	18 (86)	17 (94)
3	11	122	101	13 (13)	6 (46)	3 (50)
4	12	41	20	16 (80)	13 (81)	4 (31)[g]
5	15	111	83	37 (47)	33 (89)	0
6	17	119	104	38 (39)	36 (95)	16 (44)
7	19	101	23	17 (74)	7 (41)	4 (57)
8	22	81	62	0	NA	NA
9	22	98	91	0	NA	NA
10	27	95	83	8 (10)	5 (63)	3 (60)
11	29	38	35	26 (74)	26 (100)	0
12	30	94	20	6 (32)	3 (50)	3 (100)
13	33	49	38	15 (39)	7 (47)	0
14	33	157	135	46 (34)	46 (100)	0
15	34	64	36	19 (53)	15 (79)	3 (20)
16	37	65	17	6 (35)	5 (83)	0
17	37	46	46	23 (51)	23 (100)	0
18	38	99	85	27 (32)	10 (37)	2 (2)
19	39	184	153	4 (3)	4 (100)	1 (25)
20	41	42	32	17 (53)	17 (100)	1 (6)
21	42	93	32	11 (34)	11 (100)	0
22	44	85	36	14 (39)	14 (100)	0
23	45	90	14	2 (14)	2 (100)	0
24	45	80	66	18 (27)	18 (100)	0
25	47	89	28	13 (46)	12 (92)	0
26	47	123	78	6 (8)	6 (100)	0
27	48	245	242	54 (23)	52 (96)	9 (17)
28	49	114	51	40 (78)	40 (100)	0
29	49	128	69	31 (45)	31 (100)	0
30	49	96	43	13 (30)	10 (77)	0
31	53	35	25	0	NA	NA
32	54	84	82	23 (28)	23 (100)	0
33	54	98	63	23 (37)	23 (100)	0
Total		3110	2117	601 (28)	530 (88)	62 (12)
Median (range)	37 (6-54)	94 (35-245)	51 (14-242)	16 (0-54)[h]		

Abbreviations: NA, not applicable; PPS, point prevalence survey; SARS-CoV-2, severe acute respiratory syndrome coronavirus 2.

[a] Days from the first positive SARS-CoV-2 sample in a facility to the date that the PPS was initiated.

[b] Approximate (5-day average) census of the facility at the time PPS was initiated.

[c] The number of individuals tested at the time of PPS who were not known previously confirmed as SARS-CoV-2 positive at any point in the past and who did not refuse testing (n = 22). The median time from PPS to receipt of results was 2 days (range, 0-5).

[d] Inconclusive test results (n = 29) were removed from the denominator when calculating the number and percentage positive.

[e] Denotes the number of asymptomatic or presymptomatic residents at the time of PPS.

[f] Facilities were called 9 to 14 days after the PPS was conducted to determine the number of SARS-CoV-2–positive residents who had since developed symptoms. These individuals were considered to have been presymptomatic at the time of PPS. The denominator is the total number of positive residents without symptoms at the time of PPS.

[g] Four residents died in the period between the PPS and the day of presymptomatic call back.

[h] Median and range presented for the number of SARS-CoV-2–positive residents of those tested.

residents testing positive (range, 50%-94%), with testing occurring a median of 37 days (range, 7-54) from detection of the first facility case.

Discussion | In a sample of NHs in Connecticut with at least 1 COVID-19 case in the week preceding point prevalence surveys, 28% of residents tested positive, of which 78% remained

asymptomatic and 10% were presymptomatic. The proportion of asymptomatic residents is higher than in previous smaller survey studies of long-term care facilities, which found percentages of 50% to 55%.[2-4]

The study limitations include sampling of selected NHs in 1 state and no staff testing. The high proportion of asymptomatic patients may be overestimated due to challenges in ascertaining symptoms in elderly individuals with atypical or mild presentations, exclusion of symptomatic patients who previously tested positive, or the possibility of symptom resolution before testing. In addition, COVID-19 rates in surrounding communities were not factored into NH prioritization and repeat testing was not performed.

NHs house particularly vulnerable populations because of their age, rates of comorbidities, and clustering.[5] Point prevalence surveys may be necessary to limit spread in NHs, with a prioritized rollout in situations with limited control and testing capacity. Repeated testing in NHs may also be useful.[4,6]

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Association of Nursing Home Ratings on Health Inspections, Quality of Care, and Nurse Staffing With COVID-19 Cases

In the US, approximately 27% of deaths due to coronavirus disease 2019 (COVID-19) have occurred among residents of nursing homes (NHs).[1] However, why some facilities have been more successful at limiting the spread of infection than others is unclear. For example, those with greater staffing or higher performance on quality measures may be better at containing the spread of COVID-19 among staff and residents.

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We evaluated whether NHs rated highly by the Centers for Medicare & Medicaid Services (CMS) across 3 unique domains—health inspections, quality measures, and nurse staffing—had lower COVID-19 cases than facilities with lower ratings.

Methods | We used data from 8 state health departments (California, Connecticut, Florida, Illinois, Maryland, Massachusetts, New Jersey, and Pennsylvania) to determine the total number of COVID-19 cases occurring in NHs between January 1, 2020, and June 30, 2020. We linked these data with CMS *Nursing Home Compare*, which includes star ratings (range, 1 [low] to 5 [high]) that characterize performance across the 3 domains.[2] The health inspection rating is based on the number of deficiencies identified in the 3 most recent state surveys across several areas, including staff-resident interactions and adequate infection control protocols. The quality measures rating is based on the weighted mean of performance across 15 quality measures (eg, avoidable hospitalizations, pressure ulcers, urinary tract infections). The nurse staffing domain is based on the mean staffing hours per resident by qualified nursing staff.

Given how COVID-19 data are publicly reported across some states, we were limited to grouping NHs into 3 categories: those with 10 or fewer, 11 to 30, or more than 30 COVID-19 cases. We performed 3 separate ordinal logistic regression models to assess the odds of high-performing facilities (4- or 5-star facilities) having more than 30 cases vs 11 to 30 cases vs 10 cases

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Table 1. Characteristics of High-Performing vs Low-Performing Nursing Homes Across 3 CMS Performance Domains[a]

Nursing home characteristics	Nursing homes with ratings						
		Health inspection[b]		Quality measures[c]		Nurse staffing[d]	
	All	High performing	Low performing	High performing	Low performing	High performing	Low performing
No. of nursing homes[e]	4254	1451	2803	2974	1267	1517	2708
COVID-19 cases, No. (%)							
≤10	2712 (63.8)	1013 (69.8)	1699 (60.6)	1900 (63.9)	801 (63.2)	1024 (67.5)	1668 (61.6)
11-30	246 (5.8)	90 (6.2)	156 (5.6)	177 (6.0)	69 (5.4)	111 (7.3)	133 (4.9)
>30	1296 (30.5)	348 (24.0)	948 (33.8)	897 (30.2)	397 (31.3)	382 (25.2)	907 (33.5)
Certified beds, median No.	116	91	120	111	120	100	120
States, %							
California	23.4	22.8	23.7	27.8	13.2	17.9	26.6
Connecticut	5.0	5.2	4.9	5.3	4.4	6.2	4.4
Florida	16.1	16.3	16.1	16.4	15.2	23.6	11.8
Illinois	16.7	16.3	16.9	12.3	27.0	13.5	18.1
Maryland	5.3	5.1	5.4	5.9	3.9	5.5	5.1
Massachusetts	8.8	8.4	9.0	7.2	12.5	10.3	8.0
New Jersey	8.5	9.4	8.0	10.3	4.3	10.0	7.8
Pennsylvania	16.2	16.4	16.1	14.9	19.5	13.1	18.2
County characteristics							
<High school education, %	60.6	58.3	61.8	63.1	54.4	55.2	63.6
Median income, $	58 212	59 296	57 650	59 135	56 142	60 673	56 841
White population, %	72.8	73.2	72.6	71.0	77.0	72.6	73.0

Abbreviations: CMS, Centers for Medicare & Medicaid Services; COVID-19, coronavirus disease 2019.

[a] CMS ratings are based on each domain. Higher-performing facilities rank 4 or 5 stars; lower-performing facilities, 1 to 3 stars.[2]

[b] Based on the number of deficiencies from 3 most recent standard surveys (or any complaint-triggered inspection) and assess such areas as staff-resident interactions, protection of residents from abuse, infection control, and food and medication storage and management.

[c] Rates for 15 equally weighted measures based on the percentage of long-stay patients whose need for help with activities of daily living has increased, whose ability to move independently worsened, who have pressure ulcers, who have had a catheter inserted and left in their bladder, who have a urinary tract infection, who have had 1 or more falls with major injury, and who received an antipsychotic medication and on the number of hospitalizations and outpatient emergency department visits per 1000 resident-days; and the percentage of short-stay residents whose function improved, who have new or worsened pressure ulcers, who newly received an antipsychotic medication, who were rehospitalized after nursing home admission, and who have had an outpatient emergency department visit and on the rate of successful return to home and community.

[d] Based on 2 case mix–adjusted measures: total nursing hours per resident day and registered nurse hours per resident day. Overall nurse staffing rating is the arithmetic average of the registered nurse and total nurse staffing rating.

[e] See the Results section of text for the overall No. (%) of star ratings among sample nursing homes. Across the 8 states, the sample included the following proportion of CMS-certified nursing homes in each state: 99.2% in Massachusetts, 99.4% in New Jersey, 99.5% in Connecticut, 83.3% in California, 99.3% in Pennsylvania, 97.6% in Florida, 99.1% in Maryland, and 97.8% in Illinois. Massachusetts, New Jersey, Pennsylvania, Florida, and Maryland counted both staff and residents who contracted COVID-19 at their facilities; the other states included resident cases only.

or fewer relative to low-performing facilities (1- to 3-star facilities), adjusting for the number of certified beds and including county fixed effects. The study was conducted using SAS version 9.4 (SAS Institute Inc). Two-sided *P* values were considered significant at the $P < .05$ level. The Harvard T. H. Chan School of Public Health Institutional Review Board waived the need for informed consent.

Results | Of the 4254 NHs across the 8 states, 4254 (100%) had star ratings for health inspection; 4241 (99.7%), quality measures; and 4225 (99.3%), nurse staffing domains. Within each domain, 1451 (34.1%) were considered high performing for health inspection; 2974 (70.1%) for quality measures; and 1517 (35.9%) for nurse staffing (**Table 1**). High-performing NHs were less likely to have had more than 30 COVID-19 cases than were low-performing facilities across each domain (health inspections, 348 [24.0%] vs 948 [33.8%]; quality measures, 897 [30.2%] vs 397 [31.3%]; nurse staffing, 382 [25.2%] vs 907 [33.5%]). High-performing NHs had a lower median number of certified beds. After adjustment, NHs with high ratings on nurse staffing were less likely to have more than 30 COVID-19 cases vs facilities with 11 to 30 and vs facilities with 10 or fewer cases than were low-performing NHs (OR, 0.82; 95% CI, 0.70-0.95; $P = .01$) (**Table 2**). There was no significant association between high- vs low-performing NHs in the health inspections or quality measures domains with COVID-19 cases.

Discussion | Across 8 states, high-performing NHs for nurse staffing had fewer COVID-19 cases than low-performing NHs. In contrast, there was no significant difference in the burden of COVID-19 cases between high- vs low-performing NHs for health inspection or quality measure ratings. These findings suggest that poorly resourced NHs with nurse staffing shortages may be more susceptible to the spread of COVID-19.[3,4] Although guidance on best practices on infection control are important, which has been the primary strategy used by CMS to

Table 2. Association Between Nursing Home Ratings on Health Inspections, Quality Measures, and Nurse Staffing Domains With COVID-19 Cases

High-performing vs low-performing nursing homes across CMS domains	Ordinal odds ratio of a nursing home having >30 cases vs 11 to 30 cases vs ≤10 cases[a]	*P* value
Health inspection	0.91 (0.78-1.07)	.25
Quality measures	1.05 (0.90-1.23)	.52
Nurse staffing	0.82 (0.70-0.95)	.01

Abbreviations: CMS, Centers for Medicare & Medicaid Services; COVID-19, coronavirus disease 2019.

[a] Separate ordinal logistic regression models across each rating category were used to calculate the likelihood of high-performing nursing homes (those rated 4 or 5 stars) vs low-performing nursing homes (those rated 1 to 3 stars) having more than 30 COVID-19 cases vs 11 to 30 cases vs no more than 10 cases. All models were adjusted for certified beds of each nursing home and included county fixed effects.

date, policies that provide immediate staffing support may be more effective at mitigating the spread of COVID-19.[5,6]

This study has limitations. It included data from only 8 states; however, these states rank among those with the highest COVID-19 burden. The state-reported data used are also more reliable than the national COVID-19 data set recently released by CMS, which reports suggest is incomplete and inaccurate. In addition, high-performing NHs may have greater capacity to test and diagnose cases, which may lead to an underestimate of the association between low performance on the staffing domain and higher COVID-19 cases.

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Policies Among US Pediatricians for Dismissing Patients for Delaying or Refusing Vaccination

In January 2019, the World Health Organization declared vaccine hesitancy one of the top 10 threats to global health.[1] Some US pediatricians dismiss children from their practice whose parents refuse vaccination.[2] However, little is known about the current prevalence of this practice.

Methods | We conducted a survey from April to July 2019 among US pediatricians using a physician survey network. Physicians were recruited to fill sampling quotas representative of American Academy of Pediatrics membership with respect to region, practice location, and practice setting and asked to complete 2 to 4 surveys each year.[3]

The survey assessed pediatricians' current practices, experiences, and office policies regarding dismissal of families who refuse or ask to "spread out" either vaccines in the primary series or any vaccines using a series of 4-point Likert scales (never, rarely, sometimes, often/always) and yes-or-no questions. The survey was pilot tested in national samples of pediatricians. The survey was administered via mail or internet (Vovici) using Dillman's tailored approach.

We compared respondents with nonrespondents using *t* test and χ^2 analyses. We conducted a multivariable analysis with the dependent variable of having an office policy to dismiss families for vaccine refusal of 1 or more vaccines in the primary vaccine series. Independent variables included practice characteristics, presence of a state philosophical exemption, and state's degree of difficulty in obtaining an exemption (easy vs medium/difficult).[4] We used log-binomial regression to obtain risk ratios and 95% CIs. *P* values were 2-sided and $P < .05$ was considered significant. Analyses were performed using SAS software, version 9.4 (SAS Institute Inc).