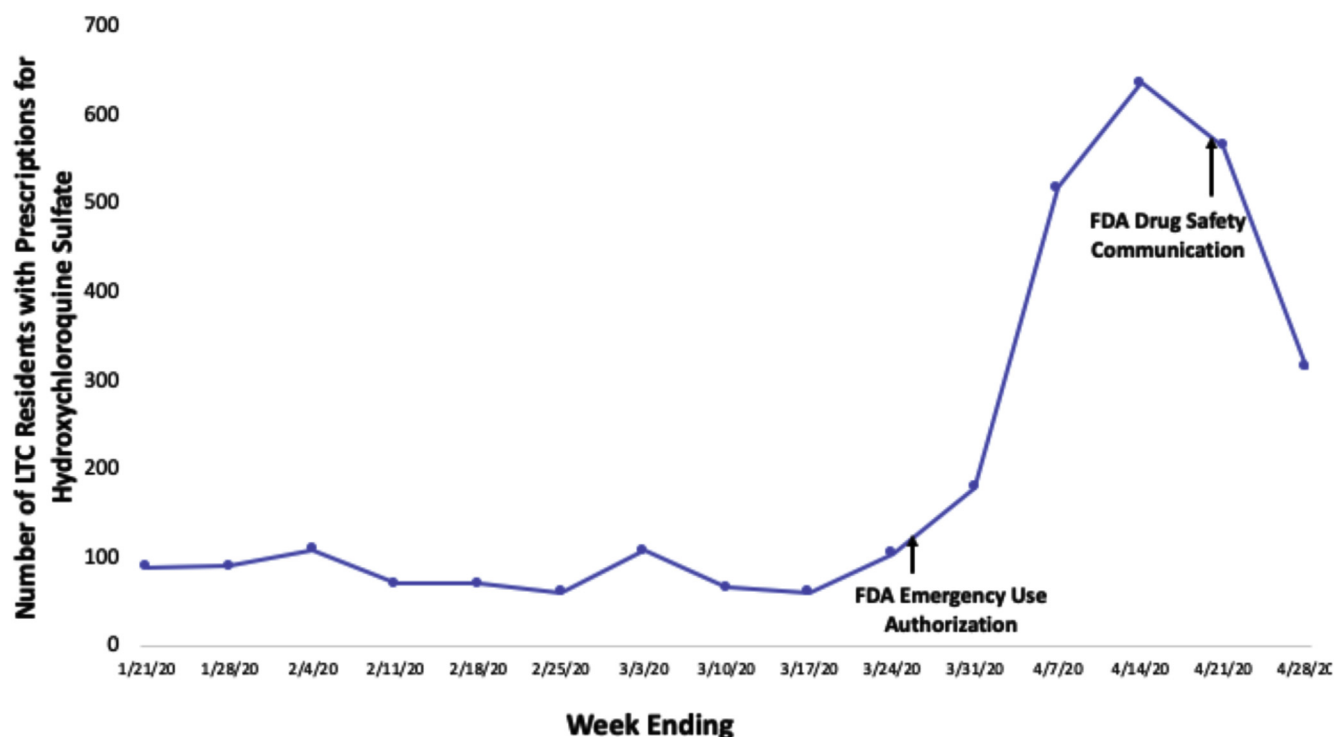**Fig. 1.** Number of residents in 2177 LTC facilities served by 1 health services organization who received prescriptions for hydroxychloroquine sulfate between January 20 and April 30, 2020.

implementing robust infection control measures can enable support of LTC facilities and their residents during a pandemic.

References

1. Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019. N Engl J Med 2020;382:727–733.
2. Dong E, Du H, Gardner L. An interactive web-based dashboard to track COVID-19 in real time. Lancet Infect Dis 2020;20:533–534.
3. Zimmerman S, Sloane PD, Katz PR, et al. The need to include assisted living in responding to the COVID-19 pandemic. J Am Med Dir Assoc 2020;21: 572–575.
4. McMichael TM, Currie DW, Pogosjans S, et al. Epidemiology of COVID-19 in a long term care facility in King County, Washington. N Engl J Med 2020;382:2005–2011.
5. McMichael TM, Clark S, Pogosjans S, et al. COVID-19 in a Long-Term Care Facility-King County, Washington, February 27-March 9, 2020. MMWR Morb Moral Wkly Rep 2020;69:339–342.
6. Thiruchelvam K, Hasan S, Wong PS, et al. Residential Aged care medication review to improve the quality of medication use: A systematic review. J Am Med Dir Assoc 2017;18:87.e1–87.e14.
7. Mills WR, Sender S, Lichtefeld J, et al. Supporting individuals with intellectual and developmental disability during the first 100 days of the COVID-19 outbreak in the USA. J Intellectual Disabil Res 2020;64:489–496.
8. Centers for Disease Control and Prevention. Infection Control Guidance for Healthcare Professionals about Coronavirus (COVID-19). Available at: https://www.cdc.gov/coronavirus/2019-nCoV/hcp/infection-control.html. Accessed May 10, 2020.
9. Key Strategies to Prepare for COVID-19 in Long-term Care Facilities. Available at: https://www.cdc.gov/coronavirus/2019-ncov/hcp/long-term-care-strategies.html. Accessed May 19, 2020.
10. Yourish K, Lai R, Ivory D, et al. One-third of all US Coronavirus deaths are nursing home residents or workers. The New York Times 2020.

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Nursing Home Characteristics Associated With COVID-19 Deaths in Connecticut, New Jersey, and New York

Nursing home patients have been disproportionately affected by COVID-19. It has been reported that one-fourth of all COVID-19

Table 1
Adjusted Associations Between Nursing Home Characteristics and Occurrence of 6 or More COVID-19 Deaths

	All Nursing Homes		Nursing Homes With ≥100 Beds		Connecticut Nursing Homes		New Jersey Nursing Homes		New York Nursing Homes	
	Estimate* (95% Confidence Interval)	P Value	Estimate* (95% Confidence Interval)	P Value	Estimate* (95% Confidence Interval)	P Value	Estimate* (95% Confidence Interval)	P Value	Estimate* (95% Confidence Interval)	P Value
Mean age	0.4 (−0.1, 0.8)	.11	0.4 (−0.3, 1.1)	.25	−0.2 (−0.5, 0.1)	.22	0.6 (−0.8, 2.1)	.40	0.7 (0.3, 1.1)	.002
% female	−0.2 (−0.3, 0.0)	.108	−0.1 (−0.4, 0.2)	.40	0.2 (0.0, 0.4)	.08	−0.5 (−1.1, 0.0)	.07	−0.1 (−0.2, 0.1)	.24
% white										
Quintile 2	1.1 (−4.0, 6.2)	.66	0.8 (−5.9, 7.5)	.81	5.3 (−11.5, 22.1)	.54	8.9 (−3.2, 21.0)	.15	−7.2 (−13.9, −0.5)	.035
Quintile 3	1 (−4.4, 6.4)	.71	3.3 (−4.0, 10.6)	.38	2.4 (−9.1, 14.0)	.68	9.8 (−2.1, 21.6)	.11	−5.1 (−13.2, 3.0)	.22
Quintile 4	1.7 (−4.6, 8.0)	.61	4.3 (−4.9, 13.6)	.36	2.9 (−5.3, 11.1)	.49	15.7 (−4.1, 35.4)	.12	−7.9 (−14.8, −1.0)	.024
Quintile 5 (highest)	−4.6 (−10.9, 1.8)	.16	−4.7 (−13.6, 4.2)	.30	5.2 (−9.1, 19.6)	.48	0.9 (−21.1, 22.9)	.94	−13 (−19.2, −6.8)	<.001
% Medicaid										
Quintile 2	2.8 (−1.8, 7.5)	.23	3.3 (−3.2, 9.9)	.32	−2.1 (−13.1, 8.9)	.71	−4.4 (−17.2, 8.4)	.50	5.2 (0.6, 9.9)	.028
Quintile 3	0.9 (−3.2, 4.9)	.67	1.6 (−4.6, 7.8)	.62	−4.2 (−17.6, 9.3)	.54	−5 (−18.6, 8.5)	.47	3.5 (−0.5, 7.6)	.09
Quintile 4	2.2 (−3.5, 7.9)	.45	2.3 (−5.2, 9.8)	.54	−6.6 (−21.8, 8.5)	.39	7.4 (−15.5, 30.2)	.53	2.8 (−0.4, 6.1)	.09
Quintile 5 (highest)	8.6 (1.1, 16.1)	.03	9.9 (0.3, 19.6)	.04	3.2 (−10.8, 17.2)	.65	17.6 (−9.9, 45.1)	.21	6.1 (0.0, 12.1)	.048
% Medicare										
Quintile 2	−0.6 (−5.7, 4.6)	.83	−1.3 (−8.7, 6.1)	.73	−0.9 (−10.8, 9.1)	.87	4.9 (−10.7, 20.6)	.54	−0.9 (−5.4, 3.6)	.70
Quintile 3	−0.9 (−5.2, 3.5)	.69	−2 (−8.3, 4.2)	.52	−4.6 (−13.7, 4.4)	.31	3.1 (−12.4, 18.7)	.69	0.2 (−4.2, 4.5)	.94
Quintile 4	−1.2 (−5.5, 3.1)	.59	−3.3 (−9.5, 2.9)	.30	−1.4 (−11.0, 8.1)	.77	4.2 (−10.0, 18.4)	.57	−1.8 (−6.5, 2.8)	.44
Quintile 5 (highest)	5.7 (−1.1, 12.5)	.10	5.4 (−3.0, 13.9)	.21	−4.2 (−10.8, 2.4)	.21	17.5 (−2.1, 37.1)	.08	5.4 (−4.3, 15.0)	.28
Mean RUG case mix index	−5.9 (−24.8, 12.9)	.54	−5.4 (−34.8, 24.0)	.72	8.7 (−7.4, 24.8)	.29	−5 (−79.8, 69.7)	.90	−7.2 (−28.2, 13.9)	.50
Mean ADL score	2.6 (1.4, 3.8)	<.001	3.3 (1.4, 5.2)	.001	1.5 (0.3, 2.8)	.015	6.7 (2.0, 11.5)	.006	0.9 (−0.2, 2.0)	.13
% restrained patients	−0.1 (−0.6, 0.4)	.70	0 (−0.5, 0.6)	.90	−2.3 (−7.6, 3.0)	.39	−0.4 (−2.7, 1.9)	.71	0 (−0.3, 0.2)	.86
Total beds	0.1 (0.0, 0.1)	<.001	0.1 (0.0, 0.1)	<.001	0.1 (0.0, 0.1)	.07	0.2 (0.1, 0.3)	<.001	0 (0.0, 0.0)	<.001
Occupancy rate	0.3 (0.1, 0.5)	.009	0.4 (0.1, 0.7)	.007	0.3 (0.1, 0.5)	.001	0.7 (0.2, 1.2)	.006	0 (−0.2, 0.2)	.91
For-profit	4.8 (0.8, 8.8)	.019	5.2 (−0.6, 11.0)	.08	3.1 (−4.3, 10.4)	.42	14.7 (6.2, 23.2)	.001	2.5 (−1.7, 6.7)	.24
Multifacility chain membership	−0.3 (−3.4, 2.9)	.87	−0.4 (−5.0, 4.2)	.87	2.2 (−1.3, 5.7)	.22	−1.8 (−10.3, 6.8)	.69	0.2 (−4.3, 4.6)	.94
Direct care hours per patient day	−3 (−6.2, 0.2)	.07	−4.8 (−9.4, −0.3)	.038	−4.1 (−8.5, 0.3)	.07	−4.7 (−16.1, 6.7)	.42	−1.3 (−3.7, 1.0)	.26
Presence of a physician extender	−0.3 (−3.1, 2.4)	.81	−1.6 (−5.2, 2.0)	.39	1.2 (−4.9, 7.4)	.69	−0.5 (−9.2, 8.3)	.92	−0.4 (−2.8, 2.0)	.76
Alzheimer's special care unit	3.8 (−1.1, 8.7)	.13	2 (−5.2, 9.2)	.58	−0.7 (−5.0, 3.7)	.77	11 (−5.9, 27.8)	.20	1.5 (−3.9, 6.9)	.58
States										
New Jersey	12.5 (1.5, 23.6)	.026	12.4 (−2.3, 27.0)	.10						
New York	−7.8 (−15.6, 0.0)	.05	−12.4 (−23.9, −0.9)	.035						

ADL, activities of daily living; RUG, Resource Utilization Group.
*Predicted probabilities estimated with logistic regression.

deaths nationwide occurred in nursing homes and other long-term care facilities.[1] The objective of this study was to compare the characteristics of nursing homes with COVID-19 deaths to other nursing homes using data from Connecticut, New Jersey, and New York.

We merged data on nursing home characteristics from the 2017 LTCFocus database (Long Term Care: Facts on Care in the US) with data on nursing homes with COVID-19 deaths provided by the states of Connecticut, New Jersey, and New York. Data from Connecticut included deaths as of April 16, New Jersey as of April 20, and New York as of April 15. After excluding 28 facilities with incomplete information, our sample included 1162 nursing homes.

Data from Connecticut and New Jersey identified nursing homes with 1 or more COVID-19 deaths, but data for New York only identified nursing homes with 6 or more COVID-19 deaths. Therefore, we created a binary outcome of whether a nursing home had 6 or more COVID-19 deaths. Nursing home characteristics included mean age of residents, percentage female, percentage white, mean Resource Utilization Group case-mix index, mean activities of daily living (ADL) score, percentage restrained, total number of beds, occupancy rate, for-profit status, multifacility chain membership, mean direct care hours per patient day, presence of an advanced practitioner, and presence of an Alzheimer's specialty unit. Indicators for quintiles of the distributions of the percentage of patients covered by Medicaid patients and the percentage covered by Medicare were also included.

Predicted probabilities were estimated with logistic regression using the covariates listed above in addition to indicators for states. Secondary analyses were conducted (1) with samples for each of the 3 states and (2) by repeating our primary analysis with the sample limited to nursing homes with 100 or more beds. Although an outcome measure reflecting the number of COVID-19 deaths per nursing home bed would have been ideal, the data did not permit this. Nevertheless, our regression estimates reflect the probability of a nursing home having 6 or more COVID-19 deaths, holding the number of beds in the facility constant.

Among the 1162 nursing homes in our sample, 184 (15.8%) had 6 or more COVID-19 deaths.

Estimates from our primary analysis (Table 1) indicated that nursing homes with the highest percentages of Medicaid patients (quintile 5) had an 8.6−percentage point (PP) (P = .03) greater probability of 6 or more COVID-19 deaths than facilities with the lowest percentages of these patients (quintile 1). Other characteristics associated with COVID-19 deaths included having patients with higher ADL scores (2.6 PP; P < .001), more total beds (0.1 PP; P < .001), higher occupancy rates (0.3 PP; P = .009), and being a for-profit facility (4.8 PP; P = .02).

Secondary analyses of individual states (Table 1) indicated that nursing homes in New York with high percentages of white patients had a lower probability of 6 or more COVID-19 deaths (quintile 4: −7.9 PP; P = .02; quintile 5: −13.0 PP; P < .001) and those with high percentages of Medicaid

patients had a greater probability (quintile 5: 6.1 PP; *P* = .05); estimates for these measures were not statistically significant for nursing homes in Connecticut or New Jersey. The results of our secondary analysis of nursing homes with 100 or more beds (Table 1) were largely consistent with our primary analysis, with 1 key exception: more direct care hours per patient day were associated with a lower probability of COVID-19 deaths (−4.8 PP; *P* = .04).

Our analyses of Connecticut, New Jersey, and New York indicate that nursing homes with higher percentages of Medicaid patients were more likely to have COVID-19 deaths. There is evidence from New York that facilities with larger percentages of white patients were less likely to have deaths associated with the virus. Nursing homes with more Medicaid and nonwhite patients tend to have fewer resources compared with other facilities.[2,3] Policymakers should consider allocating more resources to these facilities to reduce morbidity and mortality associated with COVID-19 and future outbreaks of infectious disease.

References

1. Kamp J, Mathews AW. Fresh data shows heavy coronavirus death toll in nursing homes. Wall Street Journal 2020. Available at: https://www.wsj.com/articles/nearly-26-000-nursing-home-residents-died-of-covid-19-federal-tally-shows-11591053033. Accessed June 2, 2020.
2. Mor V, Zinn J, Angelelli J, et al. Driven to tiers: Socioeconomic and racial disparities in the quality of nursing home care. Milbank Q 2004;82:227–256.
3. Smith DB, Feng Z, Fennell ML, et al. Separate and unequal: Racial segregation and disparities in quality across US nursing homes. Health Aff 2007;26:1448–1458.

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